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(54) **Construction and/or application in relation to the generation or the use of pressures, forces, flows and movements in and by means of hydraulic or hydro-pneumatic systems.**

(57) The main object of this invention is the generation of pressures, forces, flows and motion and several methods are given in principle concerning the application of the hydraulic scheme as well as the constructions which are especially suitable for the generation.

Characteristic for these hydraulic schemes are the consistent pressure or volume controlled schemes and the flexible adjustment between the motion of the piston and the motion of the hydraulic flow. With this a universal rotating control valve is important; characteristic of it is the adjustability of the relative opening times in different phases. Further a mass motion reactor which transforms kinetic energy into pressure. The applications are mainly related to transport under influence of shock, asymmetric vibrations, dynamic effects by asymmetric vibrations and effects on the frictional resistance by vibrations and savings in and simplification of constructions by replacement of static forces which require a frame through dynamic forces where the reaction is supplied by the inertia of a mass, where this is useful for the speed, and the simplicity is the pneumatic drive combined with the hydraulic drive.

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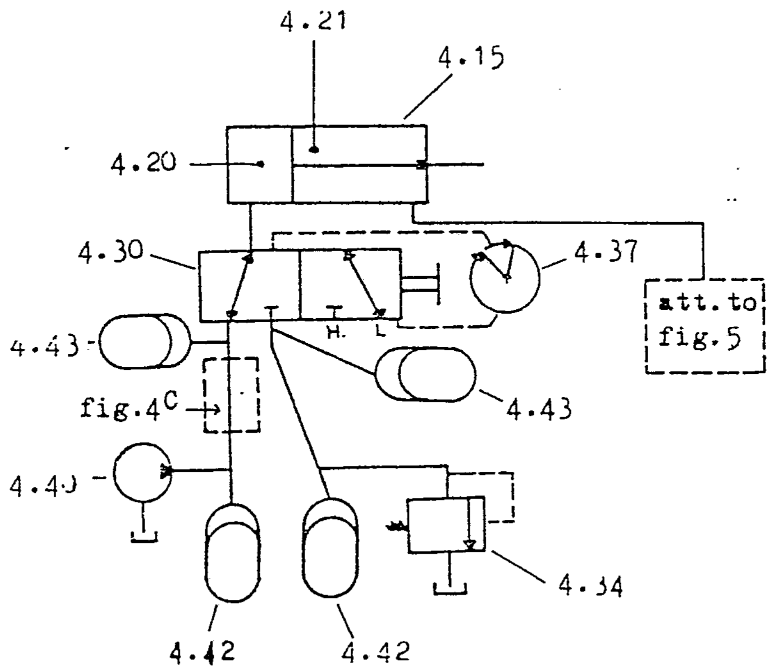

FIG. 4^A

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Construction and/or application in relation to the generation or the use of pressures, forces, flows and movements in and by means of hydraulic or hydro-pneumatic systems.

The invention refers to the construction and/or application in relation to the generation and/or the use of pressures, forces, flows and movements in and by means of hydraulic or hydro-pneumatic systems. The pressures and the hydraulic currents corresponding herewith concern hydraulic impulse- and altenating currents. The forces and the movements corresponding herewith refer to pendular movements, perodical impulses and vibrations wheel are generated either directly or by means of a hydraulic motor. Now and then the application of hydraulics is combined with pneumatics. Henceforth these pressures, forces, currents and/or vibrations will, for shortness sake, be named "Dynamic Phenomena", shortened to D.P.

In so far as the application of these DP themselves are part of the invention and in so far as for this application itself a patent is also applied for, it refers to the application of DP in the next cases :

Application of hydraulic currents in aid of the mixing of liquids, mixing or separating solid material present in a hydraulic medium, influencing the site of gas bubbles in a liquid.

Application of vibrations by means of a hydraulic motor, driven by DP in aid of the transport of materials in a shaker-conveyor, separation of materials in a shaker-sieve, separation of granular materials out of a liquid, sorting of granular materials by grain size in a liquid fatiguing a workpiece under the influence of rather important displacements, the pre-stressing of reinforcement bars in constructions and compacting granular material, viz ceramic material and concrete, to moulds.

Application of DP in aid of the cyclic charging of the workpiece in which the vibration as well as the cyclic charging of the workpiece in which the vibration as well as the cyclic charging of the workpiece in which the vibration as well as the cyclic force play a role. Herewith the mass of the equipment, for instance the piston, the transmission to a workpiece or a ballast, play a more important role in the game of forces than the fix .ng of the equipment. The applications are : vibrational d, iving of a roller on for the crushing of waste matter and other materials. Punching and pressing, compaction of the soil. (for instance a vibrating machine for road constructions) application as a "vibration-block" for the driving of piles and sheet piling, taking soil samples, machines for the dynamic testing and imitation of traffic loads on pavements), driving in tunnelshields, procedures for putting long bodies into the soil. Applications of DP for the excercise of extreme impulses on a workpiece in which for the reaction force or impact no static construction but only the inertia of the masses are used for instance : the "vibrating ram", the pile driver, the working loose of the hard sea-soil dredging activities. (see fig.1).

With the help of DP it is possible to solve many technical problems and to build many machines. The apllication of hydraulics for the generation of DP grows hand over hand. Thanks to the invention under consideration this application is totally new either because invention makes it possible or because an application according the actual state of technical science would be too marginal.

The application of DP, making use of hydraulics, used to be based first of all on the application of alternating current (A.C.) where a linear motor was driven by a hydraulic A.C.; or impulse current. These hydraulics of A.C. or pulsating currents are generated either directly by a hydraulic pump in which the pattern of the current or the pressure of the hydraulic alternating current corresponds with the movement of the pushing part of the pump or by transformation of a quasi-static, hydraulic current in an pulsing or alternating current. The transformation of a quasi-static into an alternating current is brought about by using a control valve. This may be a linearly moving valve or a rotating valve as well as a so-called servo valve. Some objections to the actual state of technical science are : the loss of a lot of energy in driving a linear motor according to the present system, on application of a rotating control-valve the movement of the pistons is ver; dependant on the load and the generation of motion according to a certain pattern of movement (a-symmetric, or not in a sinus cutre and not in block-form) causes large problems and even may be impossible.

In case a servo-valve is applied, very random and well guided movements are possible, but working with large capacities amplitudes causes large problems on account of the relatively small opening of the valve and the great loss of pressure over the valve.

These applications are often uneconomical on account of the cost of the valve and the great loss of pressure.

There is no information about the generation of thrust by primary application of hydraulics. In the construction of ram machines hydraulics are only applied limitedly, though this application is increasing. Eccentrics driven by hydro-motors are also applied. At the moment one does not develop thrust force properly as a function of time during the impact and often uncontrollable peaks of tension occur. One exception is the hydraulic ram; in relation herewith aniong others H.B.G. has applied in Holland for a patent registered under number 6600863. By this application the impact is buffered by the use of gas, however with the help of mechanical contact; where as the ramblock, be it hydraulically is lifted in the traditional way.

Another objection to the generation of thrusts by mechanical mears or to thrusting in which collisions do occur, e.g. with the H.B.G. method, which is the higher sound level.

In the present state of technical science liquids and small quantities of solid materials are mixed by making use of vibrations (so called ultra-sonar vibrations). This technique can not yet be applied to the mixing of large quantities of liquids or solid materials because one does not have D.P. with sufficient amplitudes i.e. sufficient flow at one's disposal.

As regards the separation of solid materials in a liquid-basin no data are available.

In the present state of technical science, e.g. in sewage cleaning installations, air is brought into the water, by which the oxygen has to be taken out of the air bubbles. The objection to this technique is the fact that the size of these air-bubbles can hardly be influenced and that due to the immediate rising of these air bubbles the air stays only for a very short time in the water.

It is known that D.P. are applied for the transport or separation of materials in a shaker conveyer or a vibrating stainer by which for the generation of D.P. mostly the so called vibration-motors are used, i.e. mechanical drive. The drive with vibrationmotors presents the difficulty of generating a vibration-pattern which matches with the exigencies of the case in question. Therefore one prefers working with the direction of vibration instead of the pattern of the vibration. In general it is not possible to switch such a system over to an other frequency. The sound-level of vibration-motors also presents difficulties. The same is the case with the sound generated by the displaced material because the movement is not optimal.

In the present state of technical science granular materials are separated from liquids by means of centrifuging sedimentation or compression.
Especially in case of very small grains or grains in collo condition, it is very difficult to reduce the procentual content of liquid in the mass of grains. Moreover the machines are vulnarable and expensive.

Fatiguing machines on the basis of hydraulics meet the objection that, in case of high frequencies, no great amplitudes are possible.

In the present state of technical science the prestressed reinforcement in prestressed constructions is brought about by hydraulic cylinders. The tensile force in the reinforcement is gradually increased, eventually with a resting-time on behalf of the relaxation.

Due to the prestressing, the bar will be extended and displaced in the prestressed constructions. By the shifting of the bar friction between bar and construction is caused. Due to this friction the prestressing force in the bar is reduced in proportion to the increase of the distance from the spancylinder. This friction is above all important in case of bars, bent as a result of the radical component which is present between the prestressed bar and the construction (sce fig.5OA). This loss of tension means a reduction of the prestressing force and often a less economic use of the prestressing reinforcement and/or less favourable sension of the construction.

Granular materials with a 7 à 8 percentage of water are compacted actively and with relatively little energy by exercising large acceleration and deceleration forces on the material, by means of shocks or pushes. The conventional tile-presses used to apply this shock-machinery by stamping on the tile. The compaction grows with a growing number of strokes. Therefore the numer of strokes per unit of time determines the cycle-time of this founding process.
To effect a sufficient acceleration for the rearrangement of all separate grains in the tile and also in the bottom of the tile, rather great pounding forces and drops are necessary. The sound level therefore is very high. In case the machinery exist which wehre driven by alternating-currents-hydraulics, this machine would meet the difficulty of adapting the vibration-pattern to the desired pattern in order to obtain a good and quick compaction without being obliged to stamp. The use of energy is also relatively high.

Rollers for reducing waste are often driven by a hydro-motor; when too large or too tough pieces in an unfavorable function are blocking the roller, it has to be stopped and turned back, in order to be able to remove the obstacles or to grind them in a more favourable position.

The technique of punching and pressing is sufficiently known at present. The objection to this technique is to be found in the fact a great power is needed to crush or press the material. Moreover this relatively power may necessitate heavy construction of the frame.

To day's soil compaction machines are based on the application of eccentrie-constructions, driven by a hydro- or a combustion motor. The objection to this motor is the fact that in practice it is less broadly regulable, the pattern of the vibration is not adapted to the compaction mechanism where as the hammering-power of the machine is completely linked to the frequency so that it is not possible to excercise a relatively great hammering power in case of low frequencies as well.

The construction of the existing vibrator rams is principally mechanical. They are based on the application of an eccentric which is driven electrically or hydraulically.
The objections to this procedure is the same as for the soil compactors viz. the vibration pattern is not regulable and the frequency is in evitably connected with the amplitude c.q. the supplied energy.

In the present state of technical science, especially on the seabottom, samples are taken by bringing a vibrating pipe into the soil. The pipe penetrates into the bottom and its inside is filled up with a sample. This vibration is generated by means fo an eccentric construction.
The objection to this technique is the same as the two objections mentioned above and is aggravated by the fact that the quality of the drawn sample can be influenced considerably by the vibrations.

In the construction of roads and aerodromes the planning and the interpretation of the knowledge of the behaveour of these pavements due to repeated mobile charges, play an important role. In the applied semi-experimental methods libke C.B.R. tests, plateload test, tests according to the Benckelman-Bean method and the Dynaflect methods, the interpretation of these

[illegible] many approximate calculations and an experience of years, as the greater part of these tests are not in direct contact with reality. Moreover most of the tests are very expensive and require a long term of execution and hinder the use of existing pavement or handicap the execution of construction of new pavements.
For the driving in of tunnelshields other techniques are applied.

The installation of pipes.

In the present state of technical science oblong bodies are installed in the bottom by means of ramming, vibrating or pressing. In this procedure the ramming- vibration or prestressing power is partly or entirely limited the non-penetrating end of the body. Objection to this procedure is the fact that the power does not apply at the place where it is needed, viz. preponderatly on the front side, and that, in this case, pushing power occurs instead of pullingpower.
Moreover, in this procedure, generally a relatively large friction occurs, which is often determining for longer bodies.
In case of horizontal driving into the ground the static force with which one presses finds its reaction in a anchoring structure, which is generally the wall of the trench.

The combination of vibrating ram and pile driver is not known.

In the present hydraulic ram-machine the pattern of the hydraulic drive is adapted to the movement of the ram. Therefore it is necessary to follow the movement of the ram by means of measure- and controlmechanisms. The objection to such a procedure is the fact that the vulnerability of the measure- and controlmechanism is considerable to the vehement shocks occuring in a ram mechanism.

In the present state of technique the hard seabottom is simply loosened by dropping a weight on this bottom. This technique however is expensive and time devouring on account of the hoisti · and dropping time of the weight and the underwater resistance, while little system in the position determination is possible.

The invention.

In the present invention the system and the construction in aid of the generation of D.P. has been built up logically and those applications have been determined which gain great profi by the use of the D.P. with the characteristics of the invention and which exactly by the totality of the invention, are possible and so belong to it.

The many advantages of this invention, as has been said before aure due to the great energy capacity of D.P. and the lower loss of energy and also to the possibility to adapt the main pattern of the D.P. to the exigencies and possibilities of regulating the pattern in detail, and to bring about a coupling between load process and labour process, by which an optimal effect exists. In fig. 1 a review is given of the D.P. as the are intended in the present invention. In order to be able tc read the figures easily on page a reference has been given to the codes of the numbering of the components to be indicated on the figures. This numbering consists of two parts; the first part is the number of the figure, the second part refers to the significance of the component so the reference now give this second number.

The equipment generating the D.P. can work according to two different main principles and is subdivided into a number of additional principles. For convenience sake a number of these principles have a fictitious name.

Generator principle.

Method of composition. In this method a volume driven system is applied by which the pattern of the flow is determined either by applying one or more pumps of equal or of different capacity or one pump only with different flow-feed elements of equal or different capacity. Now the desired pattern of the flow is determined by the sequence in which the different pump

deliver their flow or the plunger parts of the pump deliver their volume (see fig.2) in which examples of schemes and constructions are given.
This method offers the advantage of faicing the volume flow and independance of the load, but it misses some of the advantages of other methods.

Distribution method.

In this method one or more hydraulic sets (4.49) must be available each of which supplies an adjustable hydraulic pressure and each is connected to an accumulator which can take in or release a quantity of liquid which at least corresponds with the total volume of one period of the hydraulic current, in other words about the contents of the maximal piston stroke of one period multiplied by the useful piston surface. The accumulator must also possess of a charging and discharging speed of a number of liters per minute, which corresponds to the maximal piston speed multiplied by the useful surface of the piston. As one of the hydraulic sets has to cope with negative quantity of hydraulic fluid the pump can be replaced by a connection to the tank via a pressureregulator (4.34). Subsequently a control valve is needed which periodically and separately connects the hydraulic sets with the same (active) cylinder port. It is advisable to place accumulators as near as possible to the locking point of the control valve at the side of the hydraulic sets, in order to buffer peaks of pressure when the control-valve closes (4.43). The pipes should be as short as possible and be dimensioned to the flow, corresponding with the maximal piston-speed. An advantage of this system is the fact that the pendulay motion of the hydraulic flow in the first place is maintained by the charging and discharging of the accumulators, while the pump must only supply the consumed energy. In the present state of technique for a vibration of 40 Hz with 5 cm amplitude and a piston surface of 100 cm2 a pumping-capacity of 1.200 liters/minute would be necessary. A second advantage of this method is the fact that although a hydraulic spring-system is concerned, the necessary energy is nevertheless generated by the spring itself. The fact is that the balance of energy is maintained by the gradual discharge of a quantity of hydraulic fluid over the pressure control valve to the tank.

Fig. 1 illustrates the relation between total energy capacity (1.10) and the consumed energy (1.11). The return movement of the piston can be maintained either by the load process itself, by a mechanical spring or by a hydraulic spring system consisting of an accumulator (.42) and an pressure relief valve for the draining of leakage to the tank. An alternative for the invention is given in fig. 6 in which adouble operation cylinder is driven differentially which leads to a simplification of the hydraulic circuit.

Hydro-pneumatic propulsion.

The invention also provides the possibility to maintain the movement on the passive side of the piston by means of a pneumatic propulsion. This gives the advantage that the execution can be simple, that the pneumatic spring has a high reaction speed, that it gives little loss of friction and can be adjusted in a simple way. An important part of the invention in relation to the pneumatic propulsion is the construction of an airfluidblock, preventing that in case of leakage air penetrates into the hydraulic circuit. According to fig. 104 and 106 this lock can be fitted either to the piston or to the cylinder wall.

Alternating current generator. (A.C.generator).

Economic use of energy and relatively large displacements are possible with the hydraulic circuit. The regulation of the pressure of the hydraulic sets for the active side of the cylinder as well as the regulation of the spring pressure on the passive side of the cylinder are representive for the pattern of exelleration of the dynamic phenomena. However the construction and the operation of the control valve (.30) are representive for the frequency and the position of the piston. For the sake of brevity this control valve and the total system of operation are called "alternating current generator". By application of a linear control valve the operation is rather complicated and therefore electric drive is obvious

In hat case the application of a servo-valve as available on the market seems to be obvious. This however is not possible or is exorbitantly expensive in case of required flows of a 1.000 liters/minute as sketched above.

Therefore the invention provides a rotating control valve which is adjustable for manipulating the right position of the piston. The frequency is now regulated in a simple way by the number of revolutions of the rotating valve.

The main regulation of the relation between the times of opening has to correspond with the adjustment of the pressures of the hydraulic sets. The exact position and the couplingback of the movement of the piston can be attained either by hand or electricaly, pneumaticly or hydraulically way, by regulating in detail the adjustment of the rotating control valve, or via an extra valve (see fig. 18A en 18B).

Up to now the rotating valve was composed of a cylindrial haising and a rotor, whereas the German patent class 60A 21-12, number 1957-3A, dated 15.11.1973 mentions an adjustibility of the rotor by means of a lever. In accordance with the present invention it is possible to create a more universal design of the rotating control valve. The constructions of the rotating control valve includes the following innovations :

- construction of the side of the generator in broken surfaces in a way that the section forms a triangle, a square or a polygon. Now plate assembly is possible for the direct addition of other components, the avoidance of tubes and the stiffening of the construction (see fig.7).
- Furthermore the placing of one or more bushes between rotor and house, which are lying either opposite each other or axially behind each other or are dievided into two or more segments in tangential direction (see fig. 8).
- These bushes can be made either slide or to revolve or can be exchanged for other bushes after a partial dismantling of the generator.
- The bushes and the housing are constructed in such a way that during the action of the generator it is possible to slide the bushes axially or to rotate them by means of a lever and/or by a servo-drive and/or by building up a pneumatic or hydraulic

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dir ence of pressure against some of the sides of these bushes (c.f. fig. 9A,B,C). The advantage of these of the adjustability of these bushes is to be found in the fact that herewith the of openingtimes and/or the flow capacity can be regulated.

- Furthermore such a construction of the bushes) that they, during the action of the generator, can be driven with a certain speed, either by a second rotating drive or externally or internally coupled to a gear wheel construction, e.g. internally by means of planet gears. (see fig. 10A and 10B).
- The construction of the rotor in two, axially consecutive parts which can move in form of a telescope with regard to each other, by means of an hydraulic, a pneumatic or a mechanical drive. This construction has the advantage that the connection between motor and rotor can be fixed, while the second part of the rotor can be slid simply via a pneumatic or hydraulic drive, whereby a modification occurs situation of the groves and holes in the first part in relation to the second part of the rotor, and a slideable bush may be superfluors (fig.11).
- The construction of the rotor in such a way that parts of the rotor consist of one or more bushes which therefore revolve with the rotor but are axially slideable either during action or on partial dismounting in order to adjust or to exchange the bushes (see fig. 12).
- Construction of the rotor with turbine vanes by which the rotor can be driven hydraulically rotating to the right as well as to left by means of two different turbines. The position of the vanes can be adjustable by centrifugal control so that an automatic regulation of revolutions is brought about (see fig.13).

The invention of the universal generator also comprimes the design of grooves and openings in the rotor, the bushes or in the housing.

- The application of several grooves and openings in the rotor, the bushes or the hous so that several hydraulic circuits are formed, in which, through the adjustment of the bush or rotor according to the above construction, the distribution of the hydraulic medium over these several circuits can be influenced (fig. 14).

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- The construction of the bush or rotor with an oblique triagular opening or groove. By the sliding of the bush or rotor, a modified position in the opening time of the various circuit arises. This invention is very important for the control of the position of the cylinder and the regulation of the relation of the opening times with regard to the relation of the various of adjusted wording pressures (see fig.14).

- Arrangement of the openings and grooves in such a way that an opening or groove coincides with two corresponding openings or grooves. By adjustment of the bush with respect to the rotor another devision of the opening arises by which a multi way system is also realised (see fig.15). By these various possibilities of construction of the generator, special hydraulic circuits can be built up, of which examples will be given later on.

Rotating control valve with linear flow.

The invention also invalves a special construction of a rotating control valve in which the possibility that the hydraulic flow streams through the openings and gates perpendicalanly to the rotationel prevented.

In this construction hardly any deflection of the oil flow occurs and a compact construction of hydraulic motor, generator and accumulator is possible. In this construction the ports are to be found in those planes which are placed vertically to the rotation axis of the generator. The construction of the ports of the generator can be compared to a rotating diaphragm.

Now the generator can at one side be integrated with a hydraulic linear motor whereas at the other side the accumulators are mounted. Moreover it is possible that these accumulators, as piston accumulators, are integrated with the generator. With this construction, considerable oil flows are possible. The adjustment of the opening (diaphragm) is possible by fixing an extra diaphragm which can be rotated with regard to the no-moving part of the diaphragm but does not move with the revolving part of the generator.

In order to prevent the occurrence of very great axial forces between the housing and the rotor it is eventually possible to place the diaphragma at both sides of the rotor in such a way that the linear forces may be partially or entirely absorbed by the rotor itself. Further the reader is referred to the exam-construction example. The combination of linear motor, generator and accumulator to an oblong unit is also part of the invention.

PRINCIPLE OF THE MASS MOVEMENT REACTOR.

Kinetic excitation. According to this third method the D.P. are generated by means of the so-called "mass movement reactor", (M.M.R.) In the MMR kinetic energy is built up by setting a mass in a gradually accelerating movement until sufficient kinetic energy has been generated, after this the mass is decellerated again in such a way that the energy which comes free on account of the modification of this speed, is transferred on a hydraulic system. The hydraulic energy built up in this way can be applied either directly in the form of a reactiopower on one of the wall bottoms or a vessel or cylinder (reaction) or in the form of the propulsion of other hydraulic components.

In the present invention a mass (nr. 20.17 fig. 20) is brought into a linear accelerated movement until sufficient energy (1/2 mv2) has been built up. The mass can be driven by a linear hydraulic or pneumatic motor, nr. 20.12. Moreover the mass has to be connected with a plunger nr. 20.25 in a cylinder or vessel, which plunger displaces a hydraulic medium, called "oil" for the sake of simplicity. During the process of acceleration of the mass the plunger in the vessel or cylinder should meet as little resistance as possible when pushing away the oil. This happens either when the oil can flow relatively unpressened, through the plunger (fig.21) or flow relatively unpressered round about the plunger or can wash through by-pass channels outside the cylinder This means that for the displacement of the plunger, fig.20.25 no hydraulic set is needed of which set the capacity has a direct relation with the quantity of oil displaced by the plunger. When sufficent kinetic energy has been built up, the displacement of the plunger and with it the mass is suddenly braked by means of an apparatus which entirely or partly prevents the washing of the oil through or round about the plunger, or round about the cylinder. The inertia resistance of the breaking mass now will be tra: sformed in rising pressure in the oil which is pushed before the plunger and can no longer be washed around. The procedure of the sudden braking of the washing around of the oil can either be achieved by the construction of the plunger itself, (see fig. 21B, 22, 24A) or by an automatically functioning valve-construction (see fig. 25) or by a control construction or can be activated by a combination of those possibilities. When space nr. 20.22 (further on to be called compression chamber is completely blocked, the distance travelled by the mass after apllication of the brake is determined by the compressibility of the oil and the stiffness of the construction and the oil pressure will in most of cases rise until a uncontrolable height. The process taking place by the brǿaking of the mass can be used either for the building up of oil pressure on a wall (5.28) of the vessel or of a cylinder, by which a reactions force arises, or for a relative short driving of a hydraulic component under high pressure. In both cases it is useful to regulate the height of the oil pressure and also length of the deceleration way by connecting an accumulator with the pressure chamber. These or more accumulators (further one to be called brake accumulators), nr. 20.45 should have sufficient capacity to be able to take in a quantity of oil equal to the surface of the plunger, multiplied by the extended distance, travelled after the application of the brake. Moreover the absorbtion speed of the accumulator should be greater than or equal to the flow determined by the service of the plunger, multiplied by the maximum speed of this plunger. When all brǿaking energy is directly absorbed by the treated system, this means by displacement of the cylinder or the treated hydraulic system, no relative movement between plunger and cylinder will appear, resp. the brake accumulator will not or hardly be filled. The mass will stop. When however the vessel or cylinder is resting on an infinitely stiff underground or when the treated hydraulic system is very stiff, the largest relative displacement will arise between plunger and cylinder and the brake accumulators will be filled. Next, when the mass has come to rest the brake accumulators will discharge en will drive back the mass. Consequently there occurs a second shock

or c·e can say the first shock is extended. Now, little energy has been used up and, in case there was now loss of efficiency, the mass would be travelling back to the starting point. In order to regulate the driving back by the accumulator and to double the working period of the impact also, in this case in which much energy has be consumed or wasted on account of the loss of efficiency "friction" a seccond series of one or more accumulators nr. 20.46 - further to be called acceleration accumulators is applied which are continiously loaded by a hydraulic set. These acceleration accumulator however are to be provided with a valve which is closed when the pressure in the pressure chamber is low and which is opened in case of high pressure at the moment before the brake accumulators are discharged. To the application of the invention belong a number of constructions of this valve (fig. 26) which operates in such a way that the connection between acceleration accumulat and the pressure chamber is opened and closed at the right moment. It is to be noticed that a too longlasting opening of the valve will cause an exorbitant loss of energy by the flowing off of the oil to the wash and pressure spaces. In the case the propulsion of the mass in the direction which leads to reduction of the pressure space is brought about by a mechanical, a hydraulic or pneumatic spring or by gravitation, the movement of the entire system will be automatically maintained by the acceleration accumulators and the necessary energy will only be supplied by the hydraulic set which supercharges the acceleration accumulators.
To start up the movement a one-off propulsion of the mass in opposite direction is necessary by either a sudden opening of the valve of the acceleration accumulator, by a pressure impulse or by a mechanical movement of this valve (see fig.32). The invention provides a possibility of fixing the propulsion of the mass inside the vessel, by which a more closed construction will be created. It is also possible to construct the plunger and the mass as one part (fig. 27a).
Moreover the invention provides possibility to fix the propulsion either inside the plunger, which now has relatively dimensions, or on the outside of this plunger (see resp.figs.29 and 30)

In the present invention it is useful to provide a very reliable construction of the bearing of this plunger and the mass. Therefore the application of a hydro-static bearing with wed-shaped-slot-bearings (wigspleetlagers) is part of the invention.

Hydraulic impactjack.

The movement of the oil flow through or round about the plunger or round about the cylinder may produce a great friction in case of high speeds. An alternative to present invention (called "impact jack"), this objection disapear by reducing the movement of the oil to the de- and acceleration parts only. Hereby the construction only consists of a compactly built pressure chamber which expands when the ports of the acceleration accumulator are opened. In this case operation of the impact jack is to be compared with a mortar. As a matter of fact an impact on this mortar produces a amplified impact in return.

Therefore the impact jack can be used as an apparatus for the sudden application of an impact, however only in the case the acceleration accumulator can be induced to discharge by a pressure impulse or a mechanical opening of the valve.

The braking- and acceleration accumulators can be combined in one system, provided that it is possible to avoid a complete charging of this single accumulator, because in that case the system would loose its elasticity. In the examples (fig. 35) constructions of combined accumulators are shown.

Liquid- agitator.

This application provides for the fixing of hydraulic tubes which have a large sidewards expansion at high pressures. Thanks to the possibility of creating relatively large flows the liquid will start a vehement movement to the rather great expansion of the tubes. This movenent can be controlled by the pattern of the D.P.

The separation of materials in a liquid-bassin.

When the dynamic phenomena in hydraulic hoses according to the invention are determined in the right way the hydraulic tubes in a basin just a seperation of liquid and grains will occur instead of a mixing, or an acceleration sedimentation. This happens when the movement and the acceleration belonging to the D.P. in the apparatus [illegible] considerably greater in the one than in the other direction

Air bubbles.

Tests have indicated that besides the place of grains in a liquid also the position of air bubbles in a liquid can be influenced by means of D.P. When hydraulically expandable tubes are placed in a liquid and the right pattern of vibration is generated, the air bubbles will not simply rise from the liquid but can be directed to the bottom or to certain points, in general the nodal points of the vibration. Because the airbubbles also make a vibrating motion, the absorption of e.g. oxigen out of the air to the liquid, of the airing of the liquid in a purification plant, is relatively very high.

Conveyors and shaking sieves.

The invention meets the application of D.P. to provides the motion of a shaking conveyor or a shaking table. By application of the right frequencies and the right subdividing of the acceleration will by different accel in the one and the other direction of a conveyor, the materials start moving in a certain direction. Also the movement of smaller and bigger materials will be different on account of which a separating effect arises.

Separation of grains in a moving liquid.

The invention provides an application bringing a flowing liquid into a tube nr. 46.67 wherein the liquid flows rather slowly and is kept under a low pressure (see fig.46). The tube nr. 46.67, called shaking tube, is brought sideways in vibration so the liquid is forced to vibrate in the same way. This vibration is now executed in a very asammetrical way, i.e. a very strong acceleration in one direction and a small one in the other. Due to the inertial force and the resistance of the grains in the liquids, these grains will move towards one side of the tube. Either the liquid with grains will be more concentrated or grains of different diameter can be separated by placing different shaking tubes in series and dividing them into compartments (fig.47) (see furthermore the examples of construction).

Fatiguing machine.

The invention provides the application of a by a D.P. driven linear motor which activates a vibration of a relatively high amplitude and a relatively high frequency. By this method is it possible to execute fatiguing tests where big displacements are required e.g. spring structures, quickly.

Dynamic Prestressing.

In the invention a prestressing bar will either before, or after the prestressing be braught into the vibrations, (see fig. 50b) which causes a diminution of the friction by the dynamic effect and also, by application of a vibration of such a frequency that a longitudinal wave permits a better transmission over the length of the bar (see fig. 50c). It is possible to apply a spanjack which is driven by means of a D.P. or to span with a traditional spanjack which rests on a hollow cylinder, which cylinder is brought into vibration by a alternating current with a relatively high amplitude (fig.51a) or by applying a vibration motor of the eccentric type (fig. 51b). Because of the effect of the vibration the pre-tension in the spanjack will diminish. After that the reinforcement has to be poststressed unless a higher pre-tension is realised in advanced condidering the final situation (fig. 51c).

Because of the relatively great absolute stretch of a long spanbar it is necessary to generate a vibration with a relatively amplitude to create an important difference intension, so the invention to a profile the reinforcement or the wall of the hole, or of the dubtube which profile causes a difference in friction directions. This will cause a creeping of the bar like an ear of corn. It is also possible to apply tixotrop lubricant.

Compaction of granular materials.

In this invention the material that has to be compacted will be moved, together with the upper- and underplate, resp. the floor and the stamp, mostly up and down, in the matric. The floor and the stamp will be controlled by applying a D.P. On the one hand it is useful that the grains are in vibration to reduce the internal friction whereby they can displace themselves to a better position density, on the other hand it is useful to increasing maintain a certain medium pressure to force the grains in a more compact position. An advantage of this invention is that the acting D.P. can be adjusted to the demands of the material to be compacted by the possibility of controlling these D.P. Where in the past hammering was needed, now it is possible by means of aixilable D.P. to apply in one direction such a great acceleration that this corresponds to an impact without sound. It is possible to limit the upwards acceleration to the acceleration of gravity to prevent the grains from drifting and decompaction while the downwerd movement can end with such a great acceleration that it simulates an impact. This limits the function of the upperstamp and in extreme cases it could be omitted.

Refure crushing roller.

The invention provides the driving of the hydro-motor of the refuse crush roller with a hydraulic alternating current of an asymmetrical character. In fig. 55 the rotating movement is sketched linear and the movement is comparable to the vibratin motion of the piston of a linear motor. Through the dynamic effect the force is much larger than in the case of a quasi static movement. In an alternate application the vibrating drive of the hydro-motor is only plied at a moment in which the motor coupling usis above a certain value, i.e. at the moment that the roller is about to get stuck.

Modulated pressing.

The invention provides a hydraulic or hydro-pneumatic drive for the press for punching, pressing of bushes or rings, reforming of metal or such with D.P. The advantage of the modulated pressing is that the dynamic effect of the masse's which follow the movement of the stamp cooperate enlarge the pressing force. Further the vibration of the workpiece can be an advantage provided that it is in the right frequency. Also vibrations could be useful if they have high frequency that the material structure will be attacked. The impact of the mass of the vibrating stamp as well the lower pressure required by the vibrations achieve that the much more economic construction of the press.

Soil compacten.

The invention provides for the construction of a soil compacting-machine that consists of a impactplate nr. 57.17 which with the help of a singly working linear motor is connected to a mass called ballast nr. 57.18. The linear motor is driven from the bottom the side of the impactplate, by a strongly asymmetric vibration. The pattern of the D.P. has to be regulated in such a way that the ballast is accelerated in a fixed time by the acceleration of gravity and during a relatively much shorter time to a large upwards acceleration. Considering the highest position of the ballast, the following pattern of movement is valid. The ballast drops till it reaches its maximum speed at which moment the singing acting cylinder exercises a relatively large force on the ballast, which is decelerated. Meanwhile, the impactplate undergoes an accelleration with the character of a thrust. This causes an upwards motion of the ballast while the high pressure in the cylinder will be stopped at the moment that the ballast has sufficient velosity to reach its previous point of departure in spite of the gravity. The soil under the impactplate undergoes an impact which leads to compaction and a downward elastic movement. The machine works optimally when the frequency is adjusted in such a way that the impact on the soil resonantes with the resonance frequency of the soil. An alternate to the construction of the vibrating machine is the application of a mass motion reactor which rests on an impact plate. Here it is possible to realise a stiff connection between the housing of the reactor and the impactplate and it is also possible to adjust the spring in the mass motion reactor in such a way that the total weight of the construction acts as a fictive mass. An advantage of this construction is that the impactplate will stay in contact with the soil when the "explosion" is controlled in the right way. This machine can be driven by the hydraulic set of a road constructing machine.

<u>The vibrating ram.</u>

The invention of the vibrating ram accords in many points with the soil compactor, with the difference that the machine now is coupled to the workpiece. The pile vibrating ram exists out of a pileshoe nr 8.75 which is coupled to the pile or sheetpile by a hydraulic clamp. To the pileshoe is fixed a linear motor nr 58.14 which drives a mass here after on called ballast nr 58.18. The lineair motor is driven with D.P. This enables a high amplitude and a pattern of motion and acceleration that is useful for penetration. Since the weight of the pile, including the shoe is relatively large, in many cases even heavier than that of the ballast, the case exists of a mass spring system with three masse's and two springs. The invention enables the adjustment of the uppermass and spring-system (D.P.) in such a way that an optimal vibration is generated. This causes a movement of the pile just in fase or antifase with the movement of the soil while the pile has an unimportant upward swing in relation to the normal surface of the ground. The advantage of this invention is that the movements are much more adjustable than in the case of the traditional pile-vibrator based on the construction of the eccentric. It is obvious that with the asymmetrical vibration the cyclic load through the pile on the earth is much larger than the maximum possible cyclic load with traditional pile-vibrator. An alternative manner of construction of this invention concerns the application of a mass motion reactor instead of a linear motor with ballast in which the deceleration of the moving mass takes place less abruptly than usual. Such a vibration is a very asymmetricaly and has a shocking character. See also the chapter on the vibration and remblock.

Vibrating sampling.

In this invention a sampler nr. 59.76 is driven by a linear motor nr. 59.14 in connection with a ballast nr. 59.18. This construction also is comparable to a vibrating pile driver. Charatiristic is that the patternof penetrating the tube is of much more importance than the velosity. The penetration has to be provided in such a way that the sample which enters the tube is damaged as little as possible. Therefore the linear motor should be driven by D.P. in such a manner that the sample in the tube moves as much as possible in the direction of sampling and is not disterbed by shaking. Tests have shown that the length of the sample can reach 90% of the original length of the original soil, while by sampling with rams the length of such a sample can be reduced to 70% or 50%.

Dynamic testing of pavements.

The object of this invitation is to simulate the loads which exist at the moment of passing of a mobile weight over the pavement, such as a automobil an airplane or a wheel of a train over the rails, and also to repeat a rather large number of load passings in a rather short time. This removes the objection of the testmethods nowadays, where it is not possible to consider the horizontal velosity of a mobile load.

Further more in this invention it is possible to realise relatively large loads in a simple way. To illustrate this in fig.63 two airplanes nr. 1 and 2 are shown rolling over a pavement. Fig. 63 shows three positions of plane 1 at three moments with a difference of time ΔT. Herewith are determined three positions on the pavement. In the first position A the wheel will rest a short time. At the time ΔT later the wheel load has travelled to point B and again a time ΔT later the wheel load is travelled to point C. Afther a second interval of time a second plane reaches point A and in the times ΔT and two ΔT later the points B and C. The invention aims to simulate this phenomen by aplying at the time to a force equal to the wheel load with a direction of time of the distance AB divided by the velosity (see 79b). Next the same load is immediately after that moment placed at point B during a time equal to the velosity divided by the distance AB. This is next repeated at C etc. This system simulates not only the dimension of the wheelload but also the horizontal movement of the wheel. Such a load gives an impulse on this part of the pavement which causes a damping vibration. The invention provides to acuate a second load on the pavement as soon as the former impulse is damped according to a second wheelload corresponding to the passing of the plane. Tlus the invention consists of the placement of two orø more stamps on the pavement connect cleanly, and which have an area equal to that of the tire of a plane or another vehicle and which actuates a load equal to the load of that wheel. The time span of the load is now adjusted to equal the sojourn of the wheel in the area of the stamp, while immediately after that the next stamp is loaded just a moment after which corresponds to the velosity of the passing wheel.

A series of such loadings over a number of stamps is called a "passage" for short. Immediately after the vibrations caused by one passage have ebbed away a second series of loadings is activated which corresponds to the second passage and so on. The load is to be realised using a D.P. either with the help of a mass motion reactor or a linear motor controlled by a hydraulic pulsing current. See further the examples of construction.

Positioning of tubes.

With the help of D.P., such as is the case in this invention, the advantage is that the load to be used for penetration and for overcaning the friction along a tube of a respectable length takes hold on the front side of the tube or on some intermediate points and on the other hand that by using D.P. friction caused by the displacement of the tube through the soil is diminished. The next advantage of using the D.P. is that it is not necessary to have a construction such as the wall of a trech available to catch the reactionforce caused by static pressing of the tube. For brevity the "further penetration of an oblong object (tube) in the soil" is called "penetration" and the "displacement of the front of the tube, the hole tube of particie of the tube" is called "displacement". To make the penetration in the soil possible either the soil has to be removed or to be pushed aside. The removemal of the soil can be achieved by traditional methods; among others, drilling and flush augering. To aid penetration the invention provides the use of D.P. in form of a mass motion reactor or a linear motor controlled with an extreme impulse pattern alternating current (see distribution method or kinetic method), or an air rocket. Especially the force which can be developped by a mass movement reactor is in many cases sufficient to push the soil aside. Here there is a choice in constructions of using no anchoring force at all (see also ram- or vibratingram) or only a limited anchoring force, mainly to accelerate the mass or to stabilise the return movement.

Anchoring construction.

An important part of the invention is a anchoring construction. This construction consists out of a tube which can be anchored to the wall of the hole by a expansian body; an axial displacement is thus avoided. The same tubes could also be provided with a expansian body to anchor the tube which is to put into the soil or to anchor the structure to the tube. (see further the example of construction).

Displacement mechanism.

To effect displacement in the case of pushing aside the soil the crowding-machine nr. 55 can be used for the penetration besides for the displacement, or dragging of the tube. Another possibility is to displace the tube or the parts of the tube by linear motors placed on tube parts which cause a vibrating or schocking displacement by D.P. (see fig. 68A up to D).

When for the penetration of the head of the tube a rammachine, an air rocket or a mass motion reactor is used that will for brevity be called "penetration-unit" and that may cause excessive stresspeaks in the tube structure behind is possible to operate as follows : first the penetration unit is disconnected so that it can slide into the system behind, (see fig.69d). Then the penetration will be set to work till a penetration of 1/2m or 1 m is reached. Next a displacement unit has be put into operation whereby the tube is pulled by one or more linear motors. It is to be noticed that in this case only the friction has to be overcane.

Earthwormmethod.

In this method the tube is divided in to a number of pieces between which pieces the displacement units nr. (..58) are placed. In those diverse displacement units D.P. are activated in such a way that the different tube parts together form a axial longitudinal a symmetric wave which results in a cyclic loading between tube and soil and so the tube will displace itself axially.

Steering of the tube.

An advantage of the invention in question is that it is possible to prevent the head of the tube from deviating from a straight line or purposely can be steered according to a special pattern. To achieve this there are placed in the neighbourhood of the front of the tube one or more steering units. These steering units consist of 4 linear motors or of a hollow cylinder divided into four compartments or out of four flexible bellows or one bellows construction divided into four compartments. By expalsion of one or two cylinders or bellows constructions the tube at the point of the direction-unit wil beid, which causes a sideways deviation or will correct a sideways deviation, (see fig.74b).

Pile-driver :

The application of a D.P. in the construction of a pile-driver not only removes a number of objections to present techniques but has also the following advantages : the ram can be driven in such a way that the dropping energy is built up using a fictive drop mass equal to the weight of the ram including the deadweight of the pik driver. This causes an important reduction of the dropping height. Furthermore in special constructions it is possible to use the pik driver in a stoping or horizontal position. Furthermore by driving the rammass for accelaration accumulators the time of impact and the energy of the impact is doubled; besides stres peaks are prevented and also the sound level is restricked. It is also possible to construct a double acting ram-machine, which renders the possibility to drive an object in the soil and then return to the service itself or together with the oblong object that is used. It is also possible to construct a hollow pik driver which can be clamped around the structure so the structure can easely be leingthened. All these inventions are part of the application of D.P. in the form of a mass motion reactor (see further the examples of construction)

<u>Vibrating ram.</u>

This invention has the advantage that the same machine can be used as vibrator or as impact pile driver. In this case the machine consists of a double acting mass motion reactor which is regulated in such a way that the D.P. are to be compaired with a double acting shockwise vibration, or is regulated in such a way that the driver acts in one direction as a driving ram and in the other direction only as a weak impulse vibration. By this double action it could be possible to develop a resonance in the hole system. The invention also provides the using of D.P. where a combination of vibration and impact will be formed, this means a number of vibrations followed by an impact. The aim of the vibrations is to supply a motion to the pile and the soil to reduce the friction at the moment of penetration. The aim of the impact is the penetration itself. In this construction a mass motion reactor can be used, where the procedure of accelerating the mass will be partly braked a number of times, while at the end of the procedure of acceleration total braking occurs. (see fig. 24C). Besides there is the opportunity to realise the vibrating acceleration procedure directly by the application of the hydraulic alternating current according to the composite method (see further the examples of construction).

The loosening of hard sea-bottom.

This method removes the disadvantage of the traditional method, especially due to the much quicker success of the impact on the sea-bottom. To realise this method simply a piledriver, a vibrator or a vibrator-ram can be used which are provided at the bottom with necessary bits which are adapted for the case in consideration. Natuarally the piledriver has to be of a sealed construction.

(The invention provides). In this case and perhaps in other cases where it is useful for the use of a relatively cheap hydraulic medium, for inst. water or a watery solution of a lubricant or sealing agent. Because only the consumes energy has to be supplied the needed amount of hydraulic medium is restricted in comparasion with other methods, and also there is no need of xrusidial pressure to press the hydraulic medium back up to the tank. By using this method in the case of penetrating of tubes it is possible to use this hydraulic medium at the same time as flushing liquid to loosen the soil by spraying (flush augering).

Examples of application.

A. Composite method.

Fig. 2 gives an example in which one pump is uses with a capacity of 1 Q and another pump with a capacity of 2 Q. Fig. 2 gives the principle of a hydraulic scheme, where a six-position controlvalve is used. Fig. 2b gives a block diagram of the flow pattern. This pattern should approximate the slope line as much as possible. As a matter of fact the pumps can only deliver their capacity in the system for a part of time. Therefore it is necessary to construct the control valve to permit the pump to circulate to the tank, at the other times so there is no energy lost. Furthermore it is useful to place relatively small accumulators in the circuit between the pumps and the point of locking of the control valve to suppress the shock at the moment the control valve closes. The prepressure of the accumulator has to be enough to maintain the stiffness of the system, (as a matter of fact higher than the maximum stiffness of the system), but not so high as to loose the possibility of buffering the shock. Fig. 3a gives a hydraulic scheme where a pump is used with cylinders of different capacities here there are three plungers which realise three different cylinder capacitie. To realise the desired pattern of motion of the lineair motor the volume of the stroke and the timing of the plunger has to be regulated, e.q. by the construction of three different cams. As illustrated in fig. 3b and 3c where a diagram is given of the flow brought about by the three plungers as a function of time. As th volumes are fixed by the cams, only a simple distribution valve will be sufficient. Also in this case it is usefull to buffer pressure shocks in the system with a small accumulator.

B. <u>Distribution method.</u>

Fig. 4 shows an example of an hydraulic scheme relating to the control of the active side of a piston. The accumulator nr.4.42 supplie the needed large flows for feeding the cylinder, the accumulator nr.4.43 buffers the pressure peak at the moment the circuit is closed by the valve. By passing the cilinder there is a flow from port 4 H to port 4 L just in relation with the consumption of the energy. So in the circuit from port 4 L it is possible to subsitude the pump by the thank under the condition that an overpressureregulatorvalve (4.43) is placed before the thank, to maintain, in combination with the accumulator nr. (4.42) a rather small pressure in the system to prefent a vacuum and to realise a fast flow to the cilinder. Fig. 4a illustrates a scheme in the case it is usefull to activate three different pressures on the active side of the cilinder instead of two. Fig. 5A illustrates a hydraulic sheme on the passive sive of the cilinder, which operates as a hydraulic spring. In general it is possible to omit the pump because in most of vases there is a supply of oil-leak in the direction of hydraulic spring. Fig. 5A illustrates an example where a pneumatic springsystem is used. The needed pressure in the springsystem is supplied by using a gas bottle (5.50) and a reducing valve (5.36). Naturally the hydraulic or pneumatic spring could be repleaced by a mechanical spring or the loadsystem itself, in the case that this loadsystem has sufficient elasticity. Especially in the case of a mechanical spring, the spring force is not constant and so there are aberations of the

ideal pattern vibration, which is illustrated in fig. 1. It's always necessary to adjust the wished pattern by a good choice of the pressure in the high pressure circuit and to adjust the proportions in the time of opening of the control-valve of the high pressure and low pressure circuit. On port 4 H resp. port 4 L. Fig. 6 illustrates an example of an hydraulic sheme where the supply of the cilinder operates on a different base. Where the flow of energy blows from port 6H to port 6L, it is possible to substitute the pump in the low pressure-circuit by the thank over a pressure-control. The fig. 5 and 6 illustrates a symbollic method to indicate the control of the valve, as a matter of fact by a circle which is devided by two or more radius into two or more segments. As a point travels along hole this circle it means a full period of control of the valve. The two ore more segments of the circle represent two or more positions of the valve. The dotted line illustrates which position of the valve is related with the segment. So it is possibly to see that the openingtimes of the different positions are unequal. In the most of cases the times of opening should be unequal, because of the fact that they have a considerable influence on the average place of the piston. So if the average position of the piston has to stay on the same place, it is necessary to control the proportion of the times of opening. In the chapter "alternating/current/generator" this will be discused furthermore. As the piston has to make a long vibrating stroke, p.e. on behalf of lifting the dropside body of a truck, it will be sufficient to regulate the proportion only one time. The piston travels in that case as a superposition of a quasi static and a vibrating movement. The result is that the through is housted as normal but meanwhile vibrates and so the materials will slide easily and more smooth while the driver dont has to left his cabine for cleaning up the through. This pattern can also be used for sampling.
The fig. on page 11 illustrates a alternative excecution of a D.P. with a-symmetrial shock-movement.

C. <u>A.C.-generator.</u>

Fig. 7 illustrates a number of constructionexamples of the housing of an rotating control-valve. Fig. 8 gives an example of a rota-

ting valve where three bushes are placed. These bushes can be slided or rotated, independed, to another, in lineair, or resp., in circulair direction. Fig. 9 gives an example of the sliding of the bush, with the use of a servo-cilinder, fig. 9b of generating a hydraulic pressure on the side of the bush. Fig. 9c illustrates a hydraulic controlled movement of the bush actuated by the mechanical movement of the plunger of a cylinder. Fig. 10a illustrates an example of a planetary gear driven bush.
Fig. 10c illustrates a direct driven bush. It seams as has the generator an supplementary hollow rotor. Such a construction, with two rotating bushes, could be used to omit a number of periods or phases out of a periodical D.P. Whenn the rotor and the bush has different speeds and relatively few parts, only on special moments, the openings will coincidate and only then, an impuls will be produced. Such a construction is usefull to generate very fast opening of the ports on relatively low frequenties, p.e. by using D.P. for simulating loads on pavements (see the correspondening chapter).
Fig. 4 illustrates a rotor with can be adjusted telescopicly.
Fig. 12 illustrates a bush with is driven by the rotor using a key, but axial is moveble by means of differences in hydraulic pressures.
Fig. 13 shows a vane driven rotor, with automatic control of speed of revolutions. A very important construction of the generator exists in construction of triangular grooves in the rotor, as shown in fig. 14a and in the detail fig. 14b. Fig. 14c give a detail of the influence of the sollution of the bush when this is used as a device to control a two way system. Fig. 14d illustrates a rollation where triangular holes are made in the bush and a hollow rotor is used. So the oil flow out of the ports in the rotor, through the bush and through the ports in the housing. Fig. 15 shows more details over the application of a twoway system where by sliding or by rotating of the bush the coördination of the two systems can be effected. Fig. 16a illustrates a detail of the operation of the rotating controlvalve in dependence to the number of connections during one revolution. Fig. 16b illustrates a unequal time of opening of fase I in relation to fase II on application of

4 half or entire revolutions pro period.
Fig. 16b illustrates the direction of the flow and the position of the valve, as well in fase I, as fase II. Naturally it is possible that the flow during one fase streams in two directions as in the case of the schemes 5 and 6. Fig. 17a gives the construction of the grooves of the rotor, on behalf of a certain composition method, of which the principal is illustrated in fig. 2. Fig. 17b illustrated a more complex-constructions of the grooves. For the further construction of the generator can be noticed some special applications of the P. and other figures.

Rotating control valve with a linear flow.

Fig. 19 illustrates examples of constructions of a rotating control valve to which is given all resistance against flow on behalf of a linear, or nearly lineair flow through. There is also played attention to the possibility of compact assembly, direct on the cilinder and a direct assemblence of the accumulators. As illustrated in fig. 19a is the flow perfect linear and are the ports acting as diafragmas. Fig. 19b shows a detail of the principal where diafragmas are adjustuble to manipulate the proportions between the times of opening.of the flowtimes are illustrated in detail 19c. More simply it is to maintain a fixed proportion of openingtimes as illustrated in fig. 19d, where it is possibly to determine the proportions on behalf of changeble pieces. This generator is usefull in cases where only a modulated flow is needed, c.q. a piston has to travel in one direction under vibration. An accurate adjustment of the motion of the piston will then not be so important. Now it is possible to make a overall adjustment of the a-symmetry by making a choice of a fixed proportion in opening times, meanwhile ther is yet a coarse regulation by choising the height of the high and low pressions. For accumulators could eventually be used piston accumulators or special constructed break or accelerate accumulators, as mentioned by the mass motion reactor.

Hydropneumatic control.

Hydropneumatic control as illustrated in fig. 101a and 101b consists of more separated cilinders. In the chambre 1 enters via the pipe 2 hydraulic liquid under pression, with the result that

the piston 3 liffts the vibrating table. The pistons 5 however will be lifted also because the are in connection with the vibrating table 4. This results in an compression of the air in chambre 6. When by means of a controlvalve, as illustrated among others in fig. 112, the pression of the liquid lowers in chambre one the liquid is in the opportunity to return via pipe 2 the compressed air in chambre six can expend and by means the pistons five pulls the vibration table four down. At the same time the piston three will push the hydraulic liquid in return. In the case there is air escaped through the jointings eight in the time of compressing there would be tendence to creat a vacuum in the chambers six. This will however not accur, because of the opening of the oneway valve seven which admits the open air to supply. Fig. 101b illustrates the same configuration, but with the diffence, that here no air is compressed but a vacuum is caused in chamber nine. As a matter of fact while the downwards movement pulls the vacuum at piston five and so causes the now possitif admosferical pressure on the side of eleven the greater downwards velosity.
Fig. 102 demonstrates construction in order to the matching according to fig. 1b by applicating one piston and two cilinders placed in one line behind another. This piston has two diameters 13 + 14, here the ring shaped surface 12 forms the surface, effective to the hydraulic liquid in chamber one on behalf of the upwards movement. The vacuum in chamber 9 is caused by the effectif surface five. Ther is no need of a separation space or airlocking, because of the possibility of escaping of the leakoil, by one way valve. In fig. 103 the hydraulic liquid in chamber one pushes the piston 16 upwards, by which air is compressed in chamber 6. Leakoil and escaped air will qather in the separation chamber 17 and will be discharged by the leak conductor 18. Also in this case the oneway valve seven realises the supply of air.
Fig. 104 illustrated a construction where the invention applies one piston 19 and one cilinder 20. By the construction 21 is a separation chamber 17 created, where it is possible to discharge leakoil and air by means of the leak conductor 18 or via an intern leakconductor 22. Fig. 105 is the design of an construction of two cilinders according to fig. 104, applicated in an ram or stamconstruc-

tion, where a ram 23 is housted before falling at the anvils 24. Fig. 106 illustrates a otherwise construction of the airlocking. In this case a ringshape channel 25 is placed in the cilinder-wall and so the piston 26 is perfect smooth. Fig. 107 is the principal of a ramconstruction where a airlock according to the before mentionned constructions is not needed. The onestrook hydraulic cilinder 27 pushes the ram 23 upwards. Air is compressed in chamber 28 by the piston 29 which is fixed to the housing of the ramconstrution the oneway valve. The one way valve 31 profides open air supplies in case of air leakage. In fig.108 is shown how the maximum compression in the chamber 32 can be variated by using one of more extra air-containers 33 by opening up the tapes 34. Tape 35 is able to reduce the maximum airpressure, by the pressureregulator 36 it can be ingrased increased again. One application of the invention is a ram- or stampconstruction as shownin fig.109. The hydraulic liquid in chamber 37 pushes the piston 38, at the same time ram, upwards, by which means the air in chamber 39 will be compressed. The separation chambers 40 is usfull to prevent the mixing of air and oil. By expanding cq. decompressing, of chamber 39 the piston 38 will hit the envil 41. To have the possibility of operating under water it is necessary that the ramconstruction totaly watersealed is, constructed. This is illustrated in fig. 110A. Now the necessary aircompressor has a dubbel function. Primerly a constant pression is realised in the compressionchamber 43, which is connected by conductor 44 with the compressionchamber 45. Secondely a possitif airpressure prevents water enterring in the remconstruction. In the ultimated position of the piston 28 of fig.110A. The compression chamber 43 has more volume then the chamber 45. This is necessary to activate a downwards velosity of the piston 38 by expansion. In the design 110b is, in conductor 42, a oneway valve 46 placed to obtain in the chambers 43 and 45 according to fig.110A, a higher compression. The tap 47 ables to shutt off the oneway valve 46. In fig. 111 the hydro-pneumatic cilinder 48, according to fig.4 is applicated as topcilinder of the dropram 49. Fig. 112 illustrates a sheme of a hydraulic driven part of the hydro-pneumatic cilinder where a rotating controlvalve 50 is applicated, driven by a hydraulic motor or airmotor 53. They oil is supplied from the hydraulic set of the rotating valves 50 by a conductor 56. In the conductor 51 who is spliting in the conductors 52, in the case of 2 cilynders, flows an hydraulic alternating current. The accumulator nr 54 collects the oil of the pump during the downward movement of the piston and buffers at the same moment the hydraulic pressure-peaks. Accumulator nr 55 buffers the pulsating flow in the returnconductor 57 to a quasi static oil flow. Fig. 113 shows a sheme of a construction, that is comparable with fig. 101b and while his application is comparable, as far as its concerns the air-part, with fig. 108 or fig. 110b. By this construction is not made use of separated compressorcilinders but so called air-bellows 58. In practice of technique this air-bellows are know among others as air-springs in autobushes, or clamingcilinders in industrial applications, or as buffers under vibrating machines. Conductor 60 ables to bring the bellows under a primelavy adjusted pressure. It is to be noticed that instead of bellows also airfilled synthetic bellows can be used. In fig.114 is the invention and application illustrated in a shock-installation, on behalf of the compaction of grain mixtures, as concrete. The compression-cilinder 65 can be hold by conductor 60 under pression on the same manner as by fig.113. It is also possible to use more air-bellows in line, or an air baloon, instead of a compression-cilinder. The compression-cilinder or bellow has in this application a double function, even as in other mentioned applications, to provide the return, or downward movement, but also to provide in this specific application a constant adjustable underload on the grainy mixture. This prevents the demixing and reducing, of the allready realised compaction. The effect of these specific application of the invention is as follows : a granular mixture 66 is clampt between a vibration table c.q. unserstamp 61, fixed with the piston 3, of the hydraulic part and the upperstamp 62, fixed with the piston 5 of the compression cilinder 65. The granular mixture 66 is on the sides supported by a mould 63 which is strongly connected to the frame, in rest, of the construction. The piston 3 accelerates the granular mixture upwards while in the meantime the, under-air-pressure loaded stamp 62, prevents the granular mixture to re-enter out of the mould 63. The positive air-pressure in chamber 6 gives the upperstamp 62 and also the particals 66,61 and 3 a downwards acceleration between the vertical walls of the mould 63 which are in rest-position. After that the understamp 61 hits the rubber synthetic wooden or steel anvilknocks 64. At this very moment the mixture 66 endures a compaction. The entire mass owever rebounds by cause of elasticity partly upwards. This coulds cause however again a loosening of the compaction. To prevent this phenomen, now the compression cilinder and upperstamp 62 is of importance in the invention. In the application of fig. 114 it is of no importance iff the to the understamp 61 connected hydraulic cilinder is of a single acting, divertior of two strook type, differential acting of a double acting type.

Kinectic exitation.

Figure 20 illustrates the general scheme of a single acting mass movement reactor. The fig.21, 22 and 23 illustrate examples of the construction, on the principals as mentionned before. Fig. 24a shows a construction of the plunjer and the cilinder on behalf of a vibrating ram, where, while building up of kinetical energy, short interactical impulses are activated, because of the hydraulic liquid can not flow around the plunjer for short moments, while at the end of the still going on movement a total break appears. Fig. 25a untill 25h illustrate different examples of constructions of valves. In fig. 25g is a well known valve used which valve has a normal application for safety sake in case of breakdown of conductors. The construction of accelerating of decalerating accumulators can be realised on two manners. In one manner normal accumulators with great flow-velocity are used, bit in this case, one need many accumulators to realise a sufficient flowspeed in case of advanced dynamic effects. In this case the accelerationaccumulators has all together to be connected with one chamber which chamber has to be connected or disconnected with the compressionchamber by means of one or more valves. It seems to be more simply to construct a special accumulator with more ports which ports itself are constructed as valves of the wanted conditions.

A second advantage is that the shape of the accumulator can be adapted to the reactor. Fig. 26a-b-c shows three different shapes, in which cases, it is even possible to applicate a hollow accumulator according to figures 26c. Fig.26d gives the principals of the valve. The valve should have a small mass because of the great accelaration forces working on it. There is also a spring needed to open the valve. The spring force has to be brought in relation with the difference of pressure in the pressurechamber and the accumulator chamber, by which pressure, the accumulator has to open on behalf of the start of the motion, or ons behalf the application as inpackjack. Normally the valve will be held in closed position by the oilpressure in the accumulator or by the pressure of the membrane when the accumulator is fully disloaded. As the pressure in the compression-chamber increases, there will be a moment, on which the valve is opening and the accumulator discharges, but in the situations where the pressures in the compression- and accumulatorchambers ar nearly equal, the valve will be held in open position by the springsforce. Only as the accumulator is fully onloaded, th valve will be closed by the membrane. In difference at fig. 26d it is recommended to equalize the surface of the valve, with the surface of the house of the accumulator, by which means the membrane becomes a flat position and the chance of demolishing the membrane has be reduced (fig.26e). In the case of construction of the accumulator according to fig. 26b+c they assembly of the membrane and the prestressing of the housing of the acculator, to reduce deformation, are possible, by application of a ramshaped wedge 26.29 (C.f.fig. 26c). Fig. 32 gives the principal of construction to start up the mass movement reactor by either, to perform a pressure-impuls in the compressionchamber, that causes the opening of the valves, or by forcing one or some valves to open on mechanical hydraulical or pneumatical way while after that, pressure will be build up in the compression-chamber and all the valves will open itself. This causes the accelaration of the mass in return. The fig. 27a-b-c illustrate how respectively, the driving can be arranged in the reactor, the mass can be arranged inside the reactor and the driving and the mass can be arranged inside the reactor and how the mass can combined with the plunjer. Fig. 28 is an example of the construction of the massmotionreactor with seperated break- and accelarationaccumulators. The breakaccumulator nr 28.45 is not constructed with valves, but an immence number of holes is arranged, which holds are of such a small diameter, that the membrane cannot be demolised by belsing in those holes. The mass and the plunjer are integrated and are constructed with automaticly closing controlvalves of the type of fig. 25h. When the machine is matching, the plunjer will be driven in return by the spring nr 28.61. The drivingcilinder 28.14 on the top of the reactor, is needed for starting up the motion and/or to supply or create the kinetical energy. Here alternatively can be used compressed air for controlling the driving cilinder, either only the cilinderchamber nr. or also the other cilinderchamber nr. . This propulsion is then hydropneumatic. In the case of design fig. nr. 28, a hydraulic differential control is possible as shown in fig. 28a. In the example of construction of the figures 29 and 30 the accumulators are taken out of consideration, but there is indicated how the mass, the plunjer and the driving can be integrated by bringin the driving cilinder of the mass an inside the mass itself. In fig.29 is noticed how this cilinder can be brought between the massa and the wall of the reactor, while the mass is constructed hollow to admit the transportation of oil, between compression and scavenging chamber. The construction fig. 30a gives an example of a pneumatic driven mass betweer the mass and the wall of the reactorcilinder. This driving has the advantage that great plunjerspeed can be reached wit hout the disadvantage of the hydraulic function between mass and wall. Determining is in this case the flowvelosity through the mass. In this construction between the mass and the scavenge and compressionchambers are oil-air-lockings needed witg a construction, according to the principals of fig. 105 or 106. In the case a linear motor is applicated to drive the mass i.i. to accelerate the mass and to return the mass, while no accelarationaccumulators have applied, or while the motion has to be started up, it is necessary to drive this linear motor with a relatif great flow to obtain sufficient plunjerspeeds. Therefor it is usefull to applicate the D.P., according to the principals fig.4 and 5. Fig. 31a and 31b illustrates the example of construction of a mass-movementractor with traditional accumulators and a special valve, on behalf of the control of the accelarationaccumulators, Fig. 20a illustrates the hydraulic scheme. The, on the moment of discharging from the accelaration-and breakaccumulators supplied oil-volumes has to be discharged, in accordance to the law of continuty, by a returnconductor to the hydraulic set. This would lead to an unnecessary great momentane flow in this conductor. Therefor the invention provides somewhere in the scavengechamber a flexible gas-container or accumulator, which container enables to enlarge suddenly the volume of the scavengingchamber. The oil which has to discharge can, after that, return in medium flowvelosity (see fig.28a). Fig. 36 shows the possibility of using this gascontainer also for the smooth breaking of the mass, when the returnaccalaration of the mass was too strong and a collision, on the wrong side of the reactor, with the housing has to be prevented. Fig. 32 renders another example of construction of a hollow mass motionreactor, which can be clamped around the pile, with clampingstructure nr 32.63 by means of hydraulic clamping. This application fig. 32 is matching automaticly and can be started with a leverstruction or an impulse in the compressionchamber as given in detail. The pretension of the valves of the accelarationaccumulators has in the case of using an impulse to be brought in accordance with the obtainebly pulsniveau during the puls. Fig. 33a and b renders an example of a dubbel matching construction of the massmotionreactor. Inside the mass there is constructed an auxilery driving control, including a rotable valve to swith the driving pressure. This switching matches automaticly, when pressure is build up the concerning compressionchambers, by means of a hydraulic momentswitch (see scheme fig.33a). Fig. 33b shows schematicly that both of the accelarationaccumulators has to be in connection with a hydraulic set. The flow of oil around the mass of the plunjer can deliver relatively much friction. Therefor it should give much advantage, when it was possible to eliminate the scavenging of oil, during the passive away and return moving of the mass. Fig.34a renders an example of construction where the mass and plunger can move free from the oil and on the moment of decellaration splashes in the oil. To prevent the oil from absorbing air it is better to close the surface of the oil fig.34b. This leads to more separation between systems of the ac- and decaleration from the system of controling the motion of the mass. Fig.35 and 36 illustrate an example of a so called hydraulic impulsjack which only exists out of a hydraulic construction as a cilinder and piston. Fig.37 illustrates an cilinder as produced by Firestone. In this case the bellow has be made apted for the high pressures by reïnforcing, or in the other case, it is necessary to operate with relative low pressures. In this construction a one-way valve placed in the returnconductor to the tank is of importance. This valve has to function in combination with the resetspring nr 35.62 in such way, that the hydraulic liquid added to the compressionchamber nr 35.22 by discharging of the exelarationaccumulator has the opportunity to return to the tank at moments when the upperplate nr 35.28 is unloaded. This could be realised by springstructure or a leverstructure (35.64). Fig.34b renders the combination of an impulsjack with a ramconstruction.

Liquidagitator.

In fig. 39 is illustrated a bassin nr 39.65 where hydraulic tubes are arranged with a relatif great sidewards delatation (39.66). These tubes are traded. The hydraulic scheme 39b is arranged in such a way that great volumes of oil can be displaced but inminimum of energy is used. The scheme is approximately equal to the fig.4 and 5. The hydraulic tubes functions in this case as the accumulator from fig.5 eventually completed with a normal accumulator to prestress the system. Futhermore it is adviced to applicate a collector which collects several tubes on behalf of reducing the flow-velocity pro tube. The extra accumulator nr 39.41 is of importance to have the possibility to balance the system and to adjust the resonancefrequency. The system on the actif side of the cilinder has, if possible, to be adjusted on the same resonancefrequency. Further more it could be of advantage to ballast the piston with a certain mass, in the case the mass of the hydraulic liquid in the tubes and accumulators is not sufficient to maintain a smooth movement. It is possible to make overall calculations on behalf of the dimension of the system. The exact adjustment has to be made in practice and has to be determined from case to case. The vibration of a liquid could be intensified in an important way, when the mixing base is of an elastic construction and so happens also to vibrate. Scheme 39c gives a direct connection to the collector without the cilinder.

Separation of agregates in a liquidcontainer.

Here the same system is applicated as mentionned above, but the position of the tubes, the construction of the container and the D.V. has to be arranged in such a way, that the vibration has a resultant in a special (in this case vertical-direction). Owing to this agregates in the liquid will be moving in a special direction (per example downwards). Therfor the vibration has to be strong a-symmaticly (v.i.z. also fig. 37 and the description of an example of application i.c.w. the separation of granuals in the liquid).

Manipulation of gasbubbles.

This application concerns to the same principals as those of fig. 39 and 40, but the patern of the vibration is more critical. In that case it could be usefull to provide a stiff construction of the container, which causes better control of the vibrationpatern. Fig. 41a renders an example of construction of a cilindrical container with a tube in the middle. By the vibration the liquidcolumb will become longer and shorter, which generates a longitudinal wave. Experiments have proved that the airbubbles displaces to special points of this wave. Fig. 41b illustrates a construction where the vibration of the liquid is amplificated by an extra seperation wall. Aslo here it is the best way to obtain optimal results by experiments. The invention als prevents an application of D.V. directly to the liquid (see fig.42). On the top of the liquid there is applied an aircussion that refills the function of an accumulator.

Conveyor and vibratingstrainer.

Fig. 43 illustrates the example of construction of a conveyor. The conveyor is controlled by a D.V. accordingly to fig.4 and 5. In this case the mass of the conveyor is of importance in the equation of motion. According to fig. 39a a springconstruction on the conveyor could substitute the hydraulic control of the passif side of the piston, but in that case the resonancefrequency of the system is fixed. Fig.44 illustrates the control of the passif side of the piston by an hydraulic springsystem where the stiffness c.q. the resonance frequéncy is adjustable. There the conveyor has to displace only axiaal, it can be, in opposition to most of the shaking-conveyors, relatively long. This displacements of the materials is caused by a strong a-symmatically vibration of the shaking conveyor. Fig. 45 illustrates a construction of a shaking conveyor where the materials not are seperated by opening but will be separated in the surface of the vibratingstrainer. The conveyor will be controlled in longitudinal and transvertical direction by a D.V. The control inaxial direction provides the transport of the material. The control in the transversal direction causes the separation of the material because of the fact that the velocity of the displacements are depending of the size of the particals.

Separation of granulars in moving liquid.

Fig. 46. illustrates the application of D.P., in which case granulars in liquid are separating which causes that a part of the liquid can be discharged without granulars. The liquid streams with a relative low velocity through a pipe, which pipe is sidewards in a-symmatricly vibration. To obtain a better separation the system is repeated in different steps. This system is applicated to concentrate sludge. In fig. 47 illustrates an application, where the liquid is separated in more liquids while every liquid has an overall different grainsize. This principal is comparable with fig.45.

Fatigue testingmachine.

The application can be realised according to fig.39 when the flexible tubes are substituted by other hydraulic components, as accumulators for tubes while the liquidcontainer can be omitted. On behalf of mechanical fatigueing the principal of fig. 43 and 44 can be applicated by substituting the shaking-conveyor by the material to be tested p.e. a spring. An advantage of the application in comparaison withe the usuble fatigueingmachines is the variability of the patron of motion and the great applitudes.

Dynamic prestressing.

Fig. 50 illustrates the principal of the application of dynamic prestressing. The hydraulic scheme is to be found in fig. 4. Fig.51 renders an example of the mounting of the spanjacks (51a and 51b) and the spanscheme 51c.

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Fig. 52 indicates the possibility to reduce the friction, c.q. to stimulate the moving along of the reinforcementbar.

The compaction of granulated materials.

It is to notice that the numbering of the parts of the figures is in this chapiter not according to the renvooi but at hoc. The matching of the conseption according to figure 201 is described on the pages 7 and 8 of the patentclaim - Netherlands 79.04566. The hydraulic cilinder pushes by means of understamp 5 the grainmass 3 upwards to the upperstamp 4 which is under pneumatic pressurecontrol by cilinder 2. In the downwards movement the total mass falls on the buffers 6. From the point of vieuw of the switchtechnic and the pistonspeeds a pneumatic controlled upper cilinder is to be preferred above a hydraulic controlled cilinder. In the case of low plunjerspeed and relative great masses of the upperstamp it is also possible to choose a hydraulic cilinder. The hydraulic liquid can be remained under certain pretension by means of an accumulator. In fig. 202 is the same construction designed, with hydraulic buffers and ballast and a heavier upperstamp 4. The tile becomes in this configuration primely a schockload which causes almost the endcompaction. Secondely a cyclic load, by the energy of the mass of the upperstamp. So the shock is increased and the surface of the tile will be smoothend. The schock will be realised because of the closing of the opening 15 by the plunjer 8 in his downwards movement, which prevents the hydraulic liquid to discharge via conductor 12. Because of the very small compressibility of the oil, the breaking distance is very short. This causes not only a great increasing of the pression of the oil in chamber 10 but also a great deceleration force in the piece of molding 3. The oneway valve 11 provides a quickly reentrence of the oil in the buffer where the opening 15 not yet is free by the upwards moving. By catching the impuls in an hydraulic buffer the noise is strongly reduced. In the fig. 203 until 205 the hydraulic schockconstructions (buffer) are combined with the driving. The construction, according to fig.

204, has here the advantage of conducting the plunjer 16 which admits a smaller tolorance. Bij the conductors 13 and 14 will be charged and discharged, each on his time, volumes of oil with the required frequency. Fig. 205 illustrates how by rotating of the piston 9 the oblique side 17 (torsionline) also rotates. This causes earlier or later closing of the opening 15. This causes that the volume of the compressed oil in space 10 can be regulated. By enlarging the volume 10 a longer breaking distance is realised and so also a larger force of energy. The fig. 206a till 206e are other examples of constructions to adjust the compressionvolume 10 and so also the needed force of inerty : fig. 206a adds one or more compressionchambers 19 by the taps 20. In fig. 206b there are mounted different inserts of different heights.

Fig. 206 piston 22 and a spill 23 on behalf of adjustment. In fig. 206d by application of a hydraulic accumulator 24 where the gaspressure can be adjusted by the conductor 25. In fig. 206e the height of compression of the chamber 10 is adjusted by displacing the opening 15 by a slidable bush 18. In fig. 207 demonstrates a hydraulic scheme of the control. Here the cilinder is designed as a differential control. At point P the hydraulic liquid is supplied. Valve 27 controles the direction of moving of the piston in cilinder 7. The accumulator 28 provides the storage of energy and also the buffering of pressurepeaks in the supply conductors. The accumulator 29 reduces the pressurepeaks in the supplyconductors and provides also by valve 30 a small pretension of the buffers. The pressurepeaks which are caused by the suddenly breaking of the moving mass are fully catched in chamber 10 and cannot enter in the hydraulic driving system. The valve 27 can be a linear hydraulic valve (servovalve or proportional valve) of the usual type or valve of the rotation type. The control of the understamp 5 can be realised also very effectif. by means of a cran- rod or exenter 35 together with a pneumatic cilinder 32, as illustrated in fig. 8a. The controlmechanism 35 drives the piston 33 which compresses the chamber 31 in the cilinder 32.

At the moment a certain pressure is generated, the understamp 5 is housed. The compressed air in chamber 31 will after reaching the maximum pressure drive the mechanism 35, this will also accur under influence of pneumatic cilinder 2 (fig.201 and 202) which also moves downwards and carries with the tile 3. During the downwards movement the stamps 5 together with the moldingpiece 3 and the upperstamps 4 falls on the buffers as designed in the fig. 1-2-and 7. In fig. 208b the cilinder 36 is driven and the piston 37 moves together with the stamp 5 up and down. The valve 34 provides the sucking of air to prevent vacuum in the chamber 31. Illustration 209 explanates the driving mechanism 35. The motor 38 drives via coupling 39 and axe 40. Which is beared in the bearings 42. The crang 43 is picked up by the one-direction coupling 44. The one directioncoupling 44 locks in one direction of rotation. Such a mechanism is known in technics. Now the crang 43 will be driven by expension of the air in chamber 31 (fig.208), after reaching the upper death point, not by axe 40 but by expending air of chamber 31. The crang will develop a great momentane angular velocity admitted by the one-waycoupling 44. The mouldingpiece 3 (fig. 1 and 2) can now together with upper and understamp fall free with the accelaration of gravity, under superposition of the uppercilinder 2. The flywheel 41 provides a continious supply of energy to compensate the discontinity in the consumption of energy and to prevent unlikely changes in load of the motor 38. Fig. 210 illustrates a hydraulic alternator current control consisting of a single acting plunjerpump 46 with driving 35 and a single driven hydraulic cilinder 45. In the conductor 47 flows a onephase alternating current. It should be noticed that in the mechanism 35 the one-directioncoupling 44, according to fig. 209, is not necessary. On behalf of the accumulator 52, it is possible to regúlate amplitude by adjust a higher or lower gas prepressure in the accumulators. Fig. 211 illustrates the possibility the understamp 5 to drive with a vibrating motor 53 of one of the constructions in trade. Fig. 212 illustrates a hydraulic scheme designed on behalf of the feeding of the hydraulic buffers in the case they cannot be coupled to the hydraulic controlsystem of the understamp 5. The accumulator 54 provides constant low supply-pressure. The pressureswitch 55 switches valve 58 and so 56 when the needee supply pressure is reached. Pump 59 will then be matching without pressure.

Fig. 55 shows the principle of an application example for the use of the refuse crushing roller invention with the aid of d.p. Fig. 55A gives an example in which the hydromotor is driven continuously with a hydraulic alternating current instead of a quasi static drive. The quasi static drive is thus replaced by two intermediate oil streams of unequal pressure, while the relation and timespan of both direct current impulses can be adjusted. Fig. 55B shows an application in which the roller normally operates on direct current but when the limit of the coupling is exceeded, that is, the pressure in the system is too high, switches over to a pulsing flow drive. In fig. 55C the hydromotor is set up by placing an accumulator with safety valve in the reverse flow to the tank. Through this it is even possible to operate the motor with an alternating current, thus with a changing rotational direction.

Modulating press

Fig. 56 gives a construction example of a modulating press with which it is possible to stamp metal, and this with a support in place. In this construction the force is exercised by a mass motion reactor no. 56.13 with a cylinder no.56.15 and serves for lifing by the mass motion reactor and for the pressing on of this with a certain pressure.

Fig. 56B gives an example without mass motion reactor in which the punch or press support is directly driven by a hydraulic cylinder driven by d.p. Considering that the required amplitude is relatively small, no high demands are made on the capacity of the hydraulic circuit. Testing has shown that the necessary purching or pressing force for the punching of rings is less than 60% of the force for static punching or pressing.

Earth compactor.

Fig. 56A shows an example of a vibration plate for earth compaction in which the work piston is connected to the percussion plate no. 56.73 and is held in place by means of spring supports. Fig. 56B shows a vibration plate on which a mass motion reactor is mounted. Stability and direction can be adjusted with the aid of support 56.74. It is noted that with this invention it is fairly simple to increase the ballast mass with the same machine and to enlarge the surface of the percussion or vibration plate, so that several types can be united in one machine in contrast to the traditional vibration plate (see fig. 56C).

The vibration block.

A vibration block is shown schematically in fig. 58A based on the application of a linear motor controlled by d.p. The block can be fixed is place on the pile or dam wall with a hydraulic Fig. 58B schematically shows a vibration block based on the principle of the mass motion reactor whereby in fact the brakeway is chosen to be fairly long. Further the vibration thrust block is referred to.

Sampling vibrationally

Fig. 59A shows the principle of sampling vibrationally whereby the sampling tube nO. 59.76, which is purposefully profiled on the underside according to the present state of technique, is driven by a linear motor which finds its reaction force in a traditional bore scaffolding which is used as ballast herewith. An alternative is the application of a separate ballast which is spring suspended in the bore scaffolding (see fig.59B) In fig. 59C the principle of the mass motion reactor is used in aid of the sampling tube drive. The mass motion reactor moves in a gliding carriage on the bore scaffolding and is vertically spring suspended, e.g., on a winch construction. This last construction is the most suitable by way of its compact structure for taking samples under water. Steering should be done by means of d.p. with a regular frequency and an adjustable asymmetry. The setting up of the frequency and the pattern of the vibration ought to take place in conjunction with the kind of earth to be sampled. The construction example of fig.60 provides for the application of a drive construction for vibrational sampling which can be mounted in a familiar probe apparatus and thus can be used as an extra addition to this machine. The cylinders of the probe derrick can now be used to exercise a constant downward pressure while the mounted sampling construction generates the d.p. Fig.61 shows the application of the sampling tube drive with the aid of a hollow cylinder in which the tube is attached with a hydraulic clamp. This clamp is always packed when the tube has been pressured away ± a half meter. This construction can also be applied for so-called tubing tables to aid the bore tubes in taking borings. The bore tube can now be pressured away and turned at the same time with the help of a hydromotor as this is applied with the rotating tubing table, which motor can be driven according to the principle of the refuse crushing roller drive. Fig.62 shows the construction of a tube clamp working with an expansion construction such as applied by Ménard for example; herewith the clamp is in fact controlled with a pulsing flow whereby the pressure develops at the same moment that the tube is in downward vibration. The clamp relaxes on upward vibration with the consequence that the tube is automatically "packed" and the sampling can go on continuously.

Dynamic stressing of road surfaces

Fig.64A shows the schematic set-up of the stressing machine no.64.80 which is a construction to transmit force to the roa surfacing. The force is transmitted by a closed in sand box which is held together on the underside by a flexible membran of rubber or a similar foil. Fig. 64B schematically shows th construction on which the forces generate, e.g., a linear motor driven by d.p. or a mass motion reactor no. 64.18, and also shows the conduction and supporting of the constructions no. 64.80 and also a weighting by which the sand boxes remain continuously pressed against the road surfacing. In order tc simulate the crossing of the wheel purposefully, the control of in this case 3 supports ought to take place accurately. When for example a speed of 100 km. per hour, which is ± 30m. per sec., has to be imitated and thus the distance between the supports is 50 cm., then the time interval between the operation of the 2 supports ought to be 1/60th of a sec. This corresponds with one phase of a vibration of 30Hz. When the frequency of a thrust outswing is 20Hz for example, and the thrust is sufficiently swung out after 20 vibrations, then the following crossing, or in such a case the simulation of the following airplane, can begin one second later. The d.p. must be dimensioned on three successive thrusts with an interval of 1/30th of a second, with a repetition of the whole each second. By application of 3 mass motion reactors each reactor should have a swing time of ± one second while the swings are 1/30th of a second after each other. It follows from this that it is necessary to control the three mass motion reactors hydraulically, and to set up this control with an adjustable system. It will take some time to have this properly set up after which the machine can run for some time but must continue to be controlled and adjusted with a stroboscope for example.

Fig. 79D shows the hydraulic scheme by application of 3 linear motors for which the reaction force is delivered by the above lying mass no. . When 3 rotating control valves are now applied the axles of which are coupled, then by turning this coupling a difference in opening time of the various ports is adjusted quickly and accurately. Further, provision ought to be made whereby vibrations generated by these rotating control valves are blocked and only one vibration per secons is transmitted. This can be done by adding a rotation construction for each control valve as in fig.10 or 12, whereby the openings are so constructed that a vibration is transmitted only once per second. An alternative is to insert the rotating control valve in the feed circuit of the 3 generators which open only once a second. This is only possible if a large overlap in the timespan of each thrust is present or if only two supports instead of three are applied. The most elegant method develops when the thrust is generated by accumulator which is in fact so slowly charged that it can only feed a thrust intermittently.

Placement of tubes.

Fig.66A shows the principle of an anchoring construction against the wall of the aperture in which the tube is placed. Fig. 66B shows an anchoring construction with which another tube can be firmly clamped and fig. 66C an internal as well as external anchoring construction. The construction in fig. 66A can either be connected directly to a tube or to the tube head in which a penetration construction is found, whereby the anchoring construction can deliver the reaction force for the penetration. Model 66B is suitable for the coupling of two tubes. Model 66C can move backwards as well as forwards by means of the alternate operation of the internal and external anchoring in combination with displacement of the tube. 66.56 is a tube which must give stiffness to the construction. 66.57 is an expansion body. This can be of a flexible material but then it must be strengthened with a reinforcement of steel threading or nylon, in order to drain the anchor force off to the tube. The expansion construction on the outside can also consist of steel plates or be lined with them so that the steel plates resist wear and absorb the anchor forces. In order to allow enlargement of the cross section the plates ought to be placed scalewise or alternatively to consist of an inside and an outside layer. (see fig.66e).

The expansion can take place by inflating the flexible bubble which may or may not be provided with scales as in figs.66d and e. This inflation can be done with a hydraulic fluid or with air. It is also possible to make the plates expand by the application of a number of hydraulic or pneumatic jacks with hinge construction as in fig.66f.

Fig. 66g shows a shelter construction whereby the tube is occupied by short cylinders or bellows all around, e.g., by Firestone. These cylinders or bellows make a good connection with the ground and form an anchorage with a lot of roughness. Fig. 67 gives an example of a displacement mechanism which normally consists of a hydraulic or pneumatic jack between two sections of tube or between two anchoring mechanisms (see resp. fig. 67a, 67b and 67c). When the anchoring mechanisms in the peripheral figure 67c are each connected with a tube, it is possible to move the tube in both directions provided that the piston construction is double working, or furnished with a reversing spring. Fig. 67d shows the most universal construction with which tubes can be displaced in both directions and which construction can also move along the tube in both directions. Fig. 68a to 68d inclusive give a number of examples of the cylinder construction, which can be single working with a reversing spring (fig.68a), or double working (fig.68b), or are aided by a bellows construction (fig.68c) which can be assembled quickly (more quickly than the metalurgic welding of tubes), or constructed with hollow bellows (fig.68d) for the transport of piping and the absorption of cross forces between the two different tube ends. In many cases it will be necessary to fit the bellows with a reversing spring which drags the hind tube section along. Fig. 69 gives construction examples of a set-up in which the displacement mechanism is coupled with a crowding or cramming mechanism. The crowding mechanism no.69.55 can consist of a mass motion reactor which "beats" the tube forward whereby the acceleration forces and peak tensions can be kept under control to such an extent that the reactor can be connected to the tube lying behind which is thus rammed as it were with the pile driver on the front. Fig. 69b gives a construction example in which the pile driver is connected "springingly" with the tube behind through which peak thrusts are not transmitted to the tube but the spring is so taxed on being strained that the tube is pulled along during the petering out of the pile driver shocks. Fig.69c gives an example of a crowding meachanism with an anchoring construction (internal anchorage) which is connected to a displacement mechanism. The pile driver is now uncoupled during the operation of the system behind and can penetrate the ground in the most "rough" fashion without damaging the system behind after which, when sufficient advance has be gained by the pile driver, the tube can be pushed or pulled. Fig. 69d shows a construction in which the pile driver remains entirely separate from the system behind whereby care must be taken that the pile driver cannot fly loose from or out of the tube. Instead of a mass motion reactor in front of the pile driver, another pile driver can be used such as an air rocket or the like. By application of a mass motion reactor the drive of which has a cheap hydraulic medium the return flow can be used for spraying the earth loose or softening it, with spray heads on the front of the reactor. Hereby the system can be so assembled that the prespraying takes place under high pressure.

Fig.70 shows a sketch of a construction on which patent is also being applied for, in which the tube is made of flexible material, either the whole tube (fig.70a) or a combination of a rigid tube with a flexible tube around it (fig.70b). This way it is possible that this tube has different diameters by turns by pumping up the tube or by making it smaller by cross contraction when strain develops. This way the diameter is made smaller on displacement of the tube whereby friction is reduced. The whole tube can also be used as an anchorage unit by causing it to expand with hydraulic or pneumatic pressure.

Fig.71 gives a summary of the earthworm method. The tube of random length is subdivided into a number of sections, which sections are flexibly coupled to displacement constructions. By putting the displacement constructions under pressure by turns the tube is displaced in the form of a longitudinal vibration. When a reaction force can be added at the end of the tube outside the earth, a pressure wave, whereby single working bellows without reversing constructions will suffice (see fig. 71b). The bellows ought to be driven by a hydraulic alternating current in a single piping. The d.p.'s developing in each bellows really must be accurately phased with respect to each other. A generator with several constructions can be applied for this, or still better, several generators with constructions for adjusting vibration form where, however, the diverse generator rotors are coupled among themselves and are so adjustable that a fixed shifting exists among the diverse vibration patterns.

Fig. 71c gives an example of the hydraulic design. Since the vibration is a low frequency one, and although the amplitude must be fairly large, there is no great objection to the lenght of the piping sections because the bellows at the end of each section works as an accumulator, or alternatively is provided with an air bubble for the purpose of making the hydraulic system flexible. Every bellows construction and its piping ought to be dimensioned with a suitable frequency of its own.

Fig. 72 shows an example of a hydropneumatic bellows. The closed bubble works as a spring.

Fig. 73a gives a summary of the whole system in which penetration at the head can be done by a pile driver or alternatively by a boring or washing machine. (flush auger)

Fig. 73b gives a construction example of the application of a pile driver coupled to a flexible tube under an initial low pressure and undergoes an important cross contraction in aid of a pulling force. After each thrust of the pile driver the strain wave runs through the tube, whereby just at those points where pull develops and the tube tends to be displaced, it becomes narrower and friction is thus destroyed. Through this a very elegant system develops.

In fig. 74a the principle of a construction to steer the tube is shown, whereby expansion bodies with four different compartments are applied, in which the expansion can be asymmetrical and the tube can be pushed away sideways.

Fig. 74b gives a more elegant solution in which the tube is bent by displacement mechanisms with different compartments (see fig. 74c). For the application of four compartments it is possible to steer the tube according to an octagonal system, that is to say, a horizontal tube upwards, downwards, to the right or to the left, a vertical tube northwards, southwards, eastwards or westwards.

Fig. 75 gives a construction example on which patent is also being applied for, and in which a mass motion reactor is applied. Herewith the earth is injected with a two component fluid which hardens fairly quickly. The fluids are supplied separately and injected in separate apertures in the wall of the mass motion reactor. The fluids mex and harden only after injection so that blockage is out of the question. The aperture wall is hardened by injection and a tube which has a smaller diameter than the mass motion reactor can be dragged along practically without friction, especially when a lubricant is put between this tube and the hardened perforated wall.

Pile driver.

The already considered figs. 28 to 34 inclusive are referred to for construction examples of the pile driver.

Fig. 76 gives a construction example of a pile driver with a large falling weight. The diameter of the plunger will be considerably smaller for a relatively heavy falling weight; here the weight is placed on the outside of the mass motion reactor. Fig. 43b gives an example of a ram pile driver assambled as a combination of a percussion jack and a falling weight.

Vibration ram.

For this fig. 24 can be referred to while figs. 59a and 59b show that for the generating of a vibration the mass as show in fig. 59b is only driven up and down by the drive and not braked, while in fig. 59a a vibration is brought about which has a long brakeway, thus a weak thrust in both directions. When the reactor vat is constructed according to fig. 24 impulses arise at regular intervals which are shut off by a thrust when the mass is at the end of its movement (see fig. 24c).

Working loose from hard sea bottom.

In fig.77 it is shown how a mass motion reactor provided with suitable serrated edges on the underside can be drawn along the sea bottom by a ship.

Fig. 78 gives an example of how tunnel shields can be driven with mass motion reactors.

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List of topics.

1. d.p. = dynamic phenomena - pressures, forces, flows and motion in and/or by means of a hydraulic or hydropneumatic system. Forces and motion are related to pendular movements and/or periodic thrusts and vibrations. Pressures and flows are related to hydraulic pulsing and alternating currents.
2. Symmetric vibration (1A)
3. Asymmetric vibration (1B)
4. Symmetric shock motion
5. Asymmetric shock motion (1C)
6. D.p. with fixed support point
7. D.p. with fixed support point and influence piston mass
8. D.p. with support point on flexible supported mass
9. D.p. with support point on free mass
10. Standard for energy content of the motion
11. Standard for consumed or supplemented energy
12. Motor driven by d.p.
13. Mass motion reactor
14. Linear motor
15. Cylinder
16. Work piston
17. Mass
18. Ballast
19. Frame
20. Active piston side
21. Passiv piston side
22. Stowage space
23. Wash space
24. Detour channels
25. Plunger
26. Autoclosing valve
27. Adjustable valve spring
28. Vat wall on which reaction force takes hold
29. Wedge shaped ring
30. Control valve

31. Electric control valve
32. Servovalve
33. Rotating control valve
34. Safety valve
35. Low pressure valve
36. Reduction valve
37. Symbol for relation opening times
38. Alternating current generator
39. Piping
40. Pump
41. Accumulator
42. Capacity accumulator
43. Pressure peak damping accumulator
44. Accumulator for increasing drain capacity and light pretension of the system
45. Brake accumulator
46. Acceleration accumulator
47. Combined brake and acceleration accumulator
48. Volume bringing pump part
49. Hydraulic aggregate with adjustable pressure and variable volume.
50. Housing
51. Rotor
52. Construction
53. Bearings
54. Sealing
55. Crowding machine
56. Anchoring tube
57. Expansion body
58. Displacement mechanism
59.
60. Reverse coupling
61. Mechanical spring
62. Return spring
63. Hydraulic clamp
64. Spring or lever construction

65. Basin
66. Expanding hydraulic hose
67. Injection tube for gas or air injection
68. Vibration drain or vibration tube
69. Pre-tensioned bar
70. Duct
71. Tension jack or spanjack
72. Hollow cylinder
73. Vibration plate or percussion plate
74. Directional support
75. Pile foot
76. Sampling tube
77. Probe tower
78. Sectional support
79. Impact gauge machine
80. Weight supports (load supports)
81. Special drain valve with upper and lower limitors
82. Tube to be placed
83. Metal scales
84. Bellows
85. Flexible reservoir
86. Patterns of vibration
87. Support
88. Elastic support
89. Adjustable Support
90. Workpeace to treat
91. No energy consumed
92. Energy is consumed
93. Alternative
94. Semipressure controlled
95. Microprocessor
96. Utrosonar transmitter
97. Reached Density
98. Compaction ready
99. Alarm compaction unsufficient
100. A longer the compaction time

101. Another mixture to use
102. Volumecontrolled
103. Cam
104. Clamp
105. Servorestriction to adjust position of piston
106. Drivevanes and revolutioncontrol
107. Short phase
108. Long phase
109. Tank
110. Gyrating bus
111. Strangeld port
112. Velocity
113. Acceleration
114. Amplitude
115. Oil-flow
116. Bush sefarated sliding
117. Transducer
118. Alternative blockade method
119. Groove
120. Pressure control
121. Generator for phasecontrol
122. Servovalve for pistonpositioncontrol
123. Point of switching the pressure
124. Differentialcontrol
125. Pistoncontrol
126. Pistonaccumulator
127. Open
128. Surface rotor
129. Surface housing
130. Gyrating diaphragm
131. Accerationprocedure
132. Gasbellow
133. Restposition
134. Starting lever
135. Pressurepeak to start
136. Houstingcontrol

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7 Suppl .P.

138. Conce ation A

139. Concentration B

140. Rotating

141. Force

142. Alternative inpactjack

143. Gassupply

144. Gasdrain

145. Special Drainvalve

146. Tixotrope mixture

147. Total tension

148. Stress spanside

149. Stress anchorside

150. Pulsating

151. Modulating

152. Treatimed in two steps

153. Static Prestress

154. Longitadenal waves or postvibration

155. A-symmetry wave by a-symmetric friction

156. A-symmetry wave by a-symmetric vibration

157. Begin of vibration

158. End of vibration

159. Contraction

160. Profiled

161. Alternative simultaneous or

162. with an vibrocylinder

163. Vibrationmotor

164. Quasistatic

165. Presureswitch D.P. on/off

166. Reverse rotation

167. Growing amplitude

168. No ampl.tude

169. Extanding

170. Air

171. Integrated L.P. generator

172. Boring tower

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173. Aperture
174. E.g. firestone bellow
175. Compressed air or liquid in D.P.
176. Compartment
177. Injection
178. Injected soil
179. Repeating frequency
180. Bearing
181. Buffer
182. Pile
183. Swinging liquid columb

CLAIMS.

1. Construction and/or application with respect to the generation and/or the use of pressures, forces, flows and motion in and by means of hydraulic or hydro-pneumatic systems with the characteristics that :

these pressures, forces, flows and motion are of a periodic nature, that these are generated so that practically all the energy used is through consumption by the load and by internal friction, which means that the energy to be supplied is determined only by the damping of the system and that it is hereby possible to apply relatively large amplitudes, that is, to store relatively large amounts of energy in the system of motion, that it is possible to control the pattern of pressures, forces, flows and motion (for the sake of brevity hereinafter referred to as "dynamic phenomena", d.p. for short) in such a way that a relatively large difference in pressure and acceleration can occur in parts of the d.p., for example, a large difference in the acceleration in the one direction of motion with respect to that in the other direction,

that it is possible to adjust this form to the pressure system in such a way that a portion of the motion harmonizes with the motion following the frequency peculiar to the pressure system; or by an acceleration which is restricted to that of gravity; or harmonizes with a periodic impulse, or upswing, of the motion of the pressure system; or by the periodic application of a relatively large thrust,

that it is possible to regulate the motion so that the requirements of frequency and the requirements of average displacement or requirements of an average state of a hydraulic motor are satisfied,

that these d.p. are applied in processes where it is favourable to apply d.p. with :

either a large amplitude or energy content with a good output,

or a large difference in acceleration, thus force, between the units of motion,

or a good control of and adjustment to the pressure process, Claim(s) Nr 1 to 3, 5, 8, 10 to 23, 27, 28, 30, 33 to 35 AND 38 - 106 deemed to be abandoned

or a difference in acceleration such that the pendular motion, which is sufficiently large that the large acceleration in a part of the pendular motion is comparable to a collision in which force and timespan are adjustable (see fig.),
or provides an economical solution,
or a combination of the aforementioned properties.

2. Construction with respect to the generation of flow and pressures in and by means of a hydraulic system with the characteristics that :
the hydraulic pressure and flow is generated in, and by making use of, different hydraulic pumps, alternatively, by using one pump with various plungers, and each of which pump or plungers has a fixed yield,
that the yield per pump or plunger is spread over a linear motor by one or more control valves and repercussion valves,
that the control valve or valves have the function of causing the hydraulic flow from one pump or one plunger to stream to the linear motor in a fixed time and thereafter to cause the yield to flow from the other pump or other plunger to the linear motor (see figs. 2 and 3).

3. Construction and/or application according to patent claim 1 with the characteristics that :
a hydraulic systemis formed which consists of one or more motors, one or more control valves, one or more hydraulic aggregates with accumulators and the necessary locks and pressure limiting valves, as well as the necessary hydraulic piping,
that the dimensions of the through flow of the piping, the capacity and speed of the accumulators, the capacity and operation of the control valves, the capacity of the pump be so calculated, and the hydraulic circuit be so designed, and the working of the control valves be such that the periodic pendular flow of oil or pressure changes flow through the system, by which occurence the hydraulic fluid remains in the system as long as possible and under as high as possible a pressure, and by which occurence only as much hydraulic fluid flows back to the tank as is necessary for pressure loss and to balance

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Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35, AND 38-106 deemed to be abandoned

the energy absorbed by the friction of the system and by the pressure process.

4. Construction and/or application according to patent claims 1 and 3 with the characteristics that : in the case of application of a linear motor, the hydraulic circuit is so constructed that the piston is set in between a hydraulic circuit (20), hereinafter referred to as the "active circuit", on the active piston side, and a hydraulic or pneumatic circuit on the other side of the piston (21), hereinafter called the "passive circuit" and "passive piston side", that is, a mechanical spring system on the passive piston side that the passive piston side is controlled by a hydraulic, pneumatic or mechanical springsystem,

that the active piston side, depending upon the state of the control valve, is driven by two ore more different hydraulic pressures each of which can work independently, on the one hand as a spring system due to the presence of accumulators with sufficient capacity and sufficient speed, and on the othe hand as a source of energy due to the flowing off of hydraulic fluid from one or more aggregates with higher pressure to the aggregate with the lowest pressure and thereafter over a safety valve to the tank.

5. Construction and application according to patent claims 1, 3 and 4 with the characteristics that : it is possible to restrict excess pressure impulses in the ci cuit on the aggregate side of the control valve (43) by placing extra accumulators as close as possible to the closing point of the valve, whereby the mass of oil arriving at high speed can detour to this accumulator when the opening is blocked, and can be flexibly braked.

6. Construction and/or application according to patent claims 1,3,4 and 5 with the characteristics that : the opening and closing of the caps of the control valve consists of two patterns, the first a recurrent pattern which sets up the period of the d.p.; the second is within this recurrent pattern, and the distribution of the connection to th

comparative oil pressures of the different aggregates can be finely adjusted by regulating the proper position of the piston.

7. Work method and/or application according to patent claims 1, 3, 4, 5 and 6 <u>with the characteristics that</u> :
the control valve or valves can be regulated by linking back with the movement and position of the cylinder; alternatively, that one control valve remains adjusted to the main pattern of the motion and the second control valve regulates the fine movement of the piston by linking back to the motion and position of the piston (see figs. 18a and 18b).

8. Construction and/or application according to several of the aforegoing patent claims <u>with the characteristics that</u> :
figs. 4 and 5 give an example of the construction and word method in principle.

9. Construction and/or application according to patent claim 1 and the claims 3,4,5,6,7 and 8 partially, <u>with the characteristics that</u> :
it is also possible to integrate the passive spring system in the active spring system by application of a differential switching (see fig.6),
<u>that</u> one or more high pressure accumulators and pumpsare connected to the active side and that a low pressure accumulator (42) is connected to the passive side, from which side the piston surface is smaller,
<u>that</u> the lower pressure on the active side now develops through a temporary short circuit of the active and the passive piston sides whereby a pressure component originates on the piston, which drives the piston back,
<u>that</u> balance is maintained by the energy taken up due to the flowing away of hydraulic fluid from the active piston side to the passive piston side and to the tank by a pressure limiting valve (6.34).

10. Construction and/or application according to a number of the above mentioned patent claims <u>with the characteristics that</u>
the control valve can consist of a rotating control slide here-

Claim(s) Nr 1-3, 5, 8, 10-25 27, 28, 30, 33-35 AND 38-106 deemed to be abandoned

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inafter called "generator", such that the generator consists of a housing and a rotor which is so constructed that through rotation of the rotor hydraulic circuits are opened and closed in a predetermined fashion and order, such that, after a complete or partial gyration, the pattern of opening and closing repeats itself,

that the housing is provided with gateways for the supply and discharge of the hydraulic fluid, and the rotor with slots or apertures whereby certain gateways of the housing are made to connect with each other via a certain position of the rotor, and then this connection is again broken by another position of the rotor.

11. Construction and/or application according to the aforegoing patent claims with the characteristics that :

the generator is so constructed that the opening times of the different circuits are unequally divided within a fixed period (see fig. 16B)

that the main pattern of the d.p. acquires a certain asymmetry through this unequal distribution (see figs.1B and 1C)

that it is possible to adjust the pattern of the d.p. in detail by placing a second adjustable valve in the circuit, which valve can be a servovalve or a hand- or mechanically controlled valve, making it possible to couple the mechanical control of the valve to the exceeding of the ultimate position of the piston (see fig.18A - 18B; link no. 60).

12. Construction and/or application according to patent claim no. 10 with the characteristics that :

the generator is so constructed that it is adjustable with respect to the relation of the opening times of the gateways.

13. Construction and/or application according to patent claim no. 12 with the characteristics that :

adjustability of the so-called generator is made possible by the addition of one or more constructions between the housing and the rotor, which constructions can be axially displaced or rotated with respect to each other and/or the housing (see fig.8),

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14. Construction and/or application according to a part of the aforegoing patent claims <u>with the characteristics that</u> : the generator can be partially or entirely constructed according to the following particulars :

Construction of the side of the generator in separate surfaces, such that a cross section forms a triangle, rectangle or polygon (see fig.7),

The placing of one or more constructions between rotor and housing, which are either concentric with respect to each other or divided into two or more segments in the tangential direction (see fig. 8), The building of these constructions so that they can either be displaced or ratated, or are interchangeable with other constructions after partial dismantling of the generator (see fig.8), Completion of the constructions and the housing such that during the operation of the generator the constructions can be displaced or rotated or both, by means of one or more levers and/or by a servo control and/or by the building up of a pneumatic or hydraulic pressure difference on the sides of these constructions (see fig.9),

Building of the generator with construction such that they can be rotated with a fixed speed during the operation of the generator by a second rotating drive connected to the main drive either internally or externally by a cogwheel construction, for example by planet gears (see fig.10),

Construction of the rotor in several successive parts which can move telescopically with respect to each other by means of a hydraulic, pneumatic or mechanical control (see fig.11),

Fabrication of the rotor such that this consists partially of one or more constructions turning with the rotor which are removable or exchangeable after partial dismantling, or can be displaced during the operation of the generator (see fig.12),

Construction of the rotor with turbine blades with which the rotor can be driven hydraulically, possibly with a double set of turbines for right, respectively left, turning drives (see fig. 13),

Construction of the rotor with adjustable turbine blades, pos-

Claim(s) Nr 27,28,30,33-35 deemed to be abandoned
AND 38-106

sibly blades which can be adjusted by the centrifugal force during the operation of the generator through which an automatic revolution adjustment arises (see fig.13A), Construction of the bearings of the rotor over the entire su: face via the constructions or by absence of constructions on the housing, alternatively, construction of the bearings of the rotor directly on the housing, and independent of the co: structions (see fig.8), Construction of the generator such that sealing is present be tween rotor and construction or housing and/or grooves in hou sing, construction or rotor for the discharge of oil from lea kage, especially in those cases where pneumatic or hydraulic control is present by way of displacement or rotation of part of the generator in order to prevent influencing of the control by leakage from the hydraulic circuit.

14. Construction and/or application according to several of the aforegoing patent claims with the characteristics that : the grooves and/or openings in the rotor, constructions and housing are so made that an alteration in the relation of the opening and closing times themselves develops through adjustment of the constructions or parts of the rotor; alternativel the distribution of the oil flow is altered in both ways by the presence of a multiway system.

15. Construction and/or application according to patent claim no. 14 with the characteristics that : triangular openings or grooves are made in the construction o the rotor, whereby an altered distribution in the opening and closing times of the circuit results through shifting of the construction or the rotor (see fig. 14). Construction such that a shifting of the opening and closing times of the circuits belonging to the different construction or generators appears due to the application of several constructions or the application of several successive generator by repositioning the constructions with respect to each other or alteratior of the position of the rotors by generators pla ced in series.

Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35 AND 38-106 deemed to be abandoned

16. Construction and/or application according to portions of the aforegoing patent claims with the characteristics that : the rotating control valve is so constructed that the hydraulic fluid can flow straight through as much as possible and thereby encounters a minimum of resistance,
that this is achieved by making the gateways of the generator in one of the surfaces perpendicular to the rotation axis of the generator, or in the form of grooves in the direction of the rotor axis (see fig.19),
that, if necessary, provisions are made during construction whereby the resulting force in the length of the rotor is limited as much as possible.

17. Construction and/or application according to the aforegoing patent claim with the characteristics that :
the "diaphragms" on the head side of the grooves of the generator are adjustable so that the relation of the opening and closing times of the various gateways can be altered, either after partial dismantling or during operation.

18. Construction and/or application according to a portion of the current patent claims with the characteristics that :
a linear motor and a generator are connected to each other, preferably a generator with linear through-flow which is immediate and without the intervention of piping, on the active piston side and
that the accumulators are connected whereby a very compact construction requires only the energy used for transporting and not the energy content of the d.p. itself.

19. Construction and/or application according to the aforegoing patent claim with the characteristics that :
the built-in accumulator can be constructed as a hollow concentrically placed tube accumulator and
that the drive of the rotor be constructed to be resistant to vibration, for example, by a turbine (among others, such as described in patent claim no. 13 (see fig. 19A ,13)

20. Construction and/or application according to several of the aforigoing patent claims with the characteristics that :

fluid pressure prevails on one side of the work piston, and positive or negative gas pressure directly or indirectly on the other side,
<u>that</u> the indirect gas pressure is developed by one or more linear gas motors which are connected by a conveyance on the piston (see fig.).

21. Construction and/or application according to patent claims no. 19 and 20 <u>with the characteristics that</u> :
a so called separation space or air lock is present between the fluid space and the gas space in the cylinder and
<u>that</u> this separation space can be mounted in the work piston as well as in the cylinder mouth (see fig.13).

22. Construction and/or application according to patent claims no. 19, 20 and 21 <u>with the charasteristics that</u> :
the gas on the side of the work piston in which it is found can consist of air supplied from outside or delivered by an air compressor with a pressure regulator, locking tap and air reservoirs in order to regulate the required compression pressure (see fig.), alternatively delivered from a gas such as nitrogen from a high pressure nitrogen cylinder with reduction valve.

23. Construction and/or application according to aforegoing patent claims <u>with the characteristics that</u> :
a blacklash valve exists between the cylinder space containing the gas or air and the outside air or the air-gas aggregate which closes on reduction of the cylinder space, and opens when a pressure prevails which is lower in the cylinder than in the backlash valve.

24. Construction and/or application according to the aforegoing patent claims <u>with the characteristics that</u> :
the total system can be so sealed that it is possible to work under water with it.

25. Construction and/or application according to patent claim no. 1 <u>with the characteristics that</u> :
a mass is brought into continually faster motion until sufficient kinetic energy is built up, after which the motion is

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AND 38 – 106
to be abandoned

braked in such a way that the energy released due to the reduction of the speed of the mass is delivered to a hydraulic system,

that the hydraulic energy thus built up is applied either in the form of a reaction force on one of the walls of a vat or cylinder (reactor) or in the form of the drive of other hydraulic components.

26. Construction and/or application according to the aforegoing patent claim with the characteristics that :

the motion of a plunger is coupled to the motion of a mass which is present in a hydraulic medium (vat or cylinder), or comes into contact with this medium suddenly, whereafter this medium, herinafter called oil for short, is displaced by the plunger,

that during this acceleration process of the mass, the plunger in the vat or cylinder, hereinafter called vat for short, meets as little resistance as possible while pressing out the oil; herevy the space formed by vat and plunger from which the oil is pressed, is named stowage space (.22), and the space formed by vat and plunger in which the oil flows back is named wash space (.23),

that the almost pressureless flow of oil from the stowage space to the wash space can take place either through the plunger or around the plunger or detour through channels around the vat,

that the displacement of the plunger and thereby that of the mass is braked suddenly and wholly or partially by means of a construction which wholly or partially hinders the displacement of the oil from the control space to the wash space, and the oil pressure in the control space will increase because the oil can no longer wash around without pressure.

27. Construction and/or application according to a portion of aforegoing patent claims with the characteristics that :

the procedure of the sudden hindrance or restriction of the washing around of the oil is realized by the construction of the cylinder and the plunger itself, or by an automatically operating valve construction, or by a regulator or a combination of these.

28. Construction and/or application according to the latter four patent claims with the characteristics that : the construction about the washing around of the hydraulic medium is so adjustable that the blockage develops at the moment that the mass reaches the desired speed.

29. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the stowage space is connected with one or more accumulators of large absorption speed and sufficient capacity which are subjected to a predetermined gas pressure, and in which the oil, which can no longer flow from the control space to the wash space, can escape after a pressure has been set up in this oil in agreement with the gas pressure of these accumulators, called "brake accumulators" for short, whereby a brakeway for the mass develops which is approximately equal to the kinetic energy shared by the oil pressure and by the surface of the plunger, after which, when the mass has come to rest, it is again speeded up by the brake accumulator emptying again.

30. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the pendular motion of the plunger and the mass can be partially or wholly maintained by a linear motor with a hydraulic or hydropneumatic drive, and/or wholly or partially by the supply of extra oil in the stowage space at the moment of relaxation of the brake accumulators.

31. Construction and/or application according to the last two patent claims with the characteristics that : the supplementing of oil in the control space can be done by one or more accumulators with very high outflow speed.

32. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the design or the valve construction or an extra valve construction is so arranged that the acceleration can be continuously loaded by a hydraulic aggregate and can only be unloaded after

the braking of the mass in aid of the driving back of the plunger and the mass.
that the valve constructions can be completed according to figs. 26a to 26e inclusive and 31B.

33. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that :
the activating of the mass in order to build up kinetic energy can be done by gravity or a mechanical, pneumatic or hydraulic spring system.

34. Construction and/or application according to aforegoing patent claims with the characteristics that :
the system can be kept in motion by making use of an acceleration accumulator according to patent claim no.31 and a spring system according to aforegoing patent claims as long as provision is made for starting the motion.

35. Construction and/or application according to the aforegoing patent claim with the characteristics that :
the starting up can take place by means of the initializing of a pressure thrust in the stowage space whereby the acceleration accumulator opens, alternatively by the direct opening of one or more valves of the acceleration accumulator by mechanical or other aids.

36. Construction and/or application according to aforegoing patent claims with the characteristics that :
it is possible to make the construction double working by applying acceleration and brake accumulators on both sides of the vat and to brake the mass at both ends of the pendular movement.

37. Construction and/or application according to patent claims no. 29 and 31 with the characteristics that :
the brake and acceleration accumulators can be combined as one accumulator as long as provision is made to ensure that this accumulator is only partially filled by the aggregate to maintain sufficient absorption capacity for the flexible braking of the mass.

38. Construction and/or application according to the latter 13

patent claims with the characteristics that : the drive of the mass and/or the mass inside the cylinder can be set up and/or the plunger and mass can be arranged as one unit (see fig.27).

39. Construction and/or application according to the latter 14 patent claims with the characteristics that : the drive cylinder can be brought inside the mass and integrated herewith, alternatively it can be mounted as a hollow cylinder on the outside of the mass between the mass and the vat.

40. Construction and/or application according to the latter 15 patent claims with the characteristics that : the bearings of the mass in the wash space and/or the bearings of the plunger of the drive cylinder are constructed hydrostatically according to the principle of the so-called wedge slit cylinder.

41. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the mass which is brought into collision or apparent collision in aid of the generation of d.p. is divided into smaller masses whereby the construction of these masses is so arranged that the several masses brake one after the other in the fashion of a cascade (see fig. 37A, 37B, 37C).

42. Construction and/or application according to the aforegoing patent claim with the characteristics that : a hydraulic suspension or damping is placed between two successive masses whereby the forces of inertia from the braking of the different masses develop at successive points in time (37D).

43. Construction and/or application according to the aforegoing patent claim with the characteristics that : the first mass has a relatively small weight and undergoes an immediate collision, after which the collision of the remaining masses is braked via a hydraulic or mechanical spring or damping system as shown in fig. 38A. The collision of the following masses damps down so that a pressure flow develops as shown schematically in fig. 38B.

44. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the construction consists of only one stowage space (fig. 35. 22), an acceleration accumulator with the usual valve construction (fig. 35.46), an aggregate with a connection between the return piping and the storage space, whereby a backlash valve is present in the connection, which valve is opened when the control space has a volume greater than a fixed value,
that this backlash valve opens when there is no high pressure present in the stowage space, whereby only that part of the oil can flow back to the tank which is used to drive the unit (see fig.35),
that the stowage space can consist of a cylinder such as a flexible bellows construction (fig. 36).

45. Construction and/or application according to a portion of the aforegoing patent claim with the characteristics that : one or more hydraulic hoses with a large sideways expansion (no. 39.66) is either connected with the hydraulic circuit at one end and with an accumulator (no. 39.41) at the other end, or closed at the other end, or connected with the hydraulic circuit at both ends,
that these hoses are immersed in a basin filled with one or more fluids which may or may not be mixed particles or solid particles in suspension,
that the hydraulic circuit connected to the hoses generates d. p. in these hoses whereby these hoses cause agitation in the fluid by the changing expansion,
that the construction and the hydraulic scheme are so arranged that d.p. are generated with a relatively large displacement and a vibration pattern which is adjusted to any random agitation of the fluid in aid of the mixing, or an agitation with a one-sided vibration direction whereby particles in the fluid move in a fixed direction,
that the basin can be so constructed that its walls vibrate along with the fluid, whereby the effect of the agitation is increased.

46. Construction and/or application according to the aforegoing patent claim with the characteristics that : in aid of the generation of movements in the fluid basin, different hoses can be applied in which an asymmetric vibration pattern is generated and which vibrations have a small displacement in time if necessary, so that vibration waves develop in a certain direction in the basin, that the phase shifting can be realized by the application of several generators linked one after the other, that matter in the basin can be brought to sedimentation more quickly in this way.

47. Construction and/or application according to patent claim no. 45 and 46 with the charasteristics that : This construction can be applied in aid of the manipulation of the position of gas bubbles in a fluid with the understanding that the automatic rising of the gas bubbles can be prevented and that these are transported in another manner or kept in their places for the benefit of the vibrations in the fluid, that the gas bubbles are in vehement vibration, and through this a relatively good exchange of molecules present in the bubbles with molecules present in the fluid is possible because the sojourn of the gas bubbles in the fluid is relatively long, as well as the fact that the friction surface between gas bubble and fluid is relatively large.

48. Construction and/or application according to the aforegoing patent claim with the characteristics that : the basin can be constructed stiffly, for example, cylindrically, according to fig. 41A, alternatively, put together according to fig.41b whereby a vertical movement of the fluid develops.

49. Construction and/or application according to a portion of the aforegoing patent claims with the charasteristics that : a fluid with gas bubbles can be brought directly to agitation in a tube according to fig. 41. In this case the tube filled with fluid itself operates as a hydraulic conductor (no.). The gas above the fluid is put under a certain pressure by the

tube and forms a resonance circuit together with this gas. The gas then works as an accumulator,
that it is possible to add a pump above the fluid which blows gas into the fluid, or alternatively only into the tube; the gas is hereby blown into the fluid by excess gas pressure at those moments when the hydraulic exchange pressure in the fluid is lower than the gas pressure,
that a backlash valve is added to the injection tube (no.42.67) to prevent the reverse effect.

50. Construction and/or application according to patent claims no. 45 to 49 inclusive with the characteristics that :
the impedance of the circuit of hydraulic hoses or the tube filled with fluid or gas is so set up, and that the frequency and the frequency peculiar to the circuit of the d.p. are so set up that resonance develops whereby the desired vibrations can be generated with a minimum of energy and a maximum of amplitude.

51. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that :
a movable drain is set up in the direction of the length so that the drain can vibrate with a certain preferred frequency by means of a spring construction according to fig.43, or alternatively, the movement of the drain is determined only by the movement of a linear motor which causes the drain to vibrate as in fig. 44,
that the linear motor is driven by a hydraulic pulsing- or alternating current according to the principle of the d.p., whereby the pattern of the vibration is asymmetrical in such a way that the grains will displace themselves in one direction through the drain.

52. Construction and/or application according to the relevant part of patent claim no. 51 with the characteristics that :
the drain has a greater width as shown in fig. 45,
that the bottom can be set up to slope sideways if necessary,
that the drain can also be driven in the cross direction with asymmetrical d.p.,

Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35 AND 38-106 deemed to be abandoned

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that the drain empties into several silo's or that the drain merges into several suchlike vibration drains through which grains supplied over the drain are separated by size and/or specific gravity.

53. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : as in fig. 46, a fluid flows through a tube which remains at a low pre-tension, such that the fluid follows a sideways movement of the tube completely, that this tube is caused to vibrate sideways by controlling it with a d.p. having a strongly asymmetrical pattern, the things mentioned being in principle such as is shown in fig.46,
that the grains displace themselves sideways in the fluid, whereby a concentration difference develops,
that it is possible to place several systems behind this one so that the separation develops in a progressive cascade,
that it is also possible to apply the principle of claim 48, manipulating solid particles instead of air bubbles, and braking the fluid with safety valves (see fig.42).

54. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the principles of these patent claims and, among others, those of figs. 39,43 and 44 can be applied for the constructing of a fatigue machine for hydraulic components or for mechanical parts.

55. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the lead jack is driven by d.p. whereby a bar under tension, e.g. in a taut concrete construction, is stretched (fig.51),
that the pattern of vibration is so arranged that the friction between the tension bar and the surrounding construction is reduced,
that it is also possible to cause the pattern to progress by shocks, whereby the friction between the bar and the construction is reduced by the so-called 'fright" (see figs.50b and 50d)
that it is also possible to give the vibration pattern a fre-

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quency and amplitude such that a longitudinal wave develops which supplies a "creep" effect whereby the pulling tension in the bas is transmitted, less loss of friction, to the other side and a better bar movement where friction is overcome is possible (fig.50c)

56. Construction and/or application according to patent claim no. 55 with the characteristics that :
bar or perforated wall is provided with an asymmetric profile such as shown in figs. 52A and 52B, or alternatively that a casing is added between the bar and the perforated wall with a suitable profile whereby the friction of the bar with respect to the surrounding construction is smaller in one direction than in the other so that the bar will creep like grains of corn (52B),
that it is also possible to place a hollow cylinder or eccentric vibration motor between the tension jack and the concrete construction according to fig.51A and 51B, and the stretching can take place according to fig. 51C.

57. Construction according to a portion of the aforegoing patent claims with the characteristics that :
the mould(s) are moved up and possibly down by means of a drive on the underside in a stationary matrix. The mould is held on the upper side under an almost tension by a pneumatic or hydraulic cylinder which also takes care of the downward movement or an extra downward movement (acceleration) of the mould. During the downward movement the mould falls together with upper and lower support on a damper, dampers or damping construction or shock device.

58. Construction according to patent claim 57, with the characteristics that an extra mass can be attached to the upper support.

59. Construction according to patent claims 57 and 58 with the characteristics that the drive can be chosen on the underside for a vibration motor of a type known to this technique.

60. Construction according to patent claims 57 and 59 with the characteristics that the drive on the underside can be chosen

Claim(s) Nr [illegible] 27,28,30,33-35 AND 38-106 deemed to be abandoned

as a crankshaft or eccentric mechanism.

61. Construction following patent claims 57 and 60 <u>with the characteristics that</u> the crankshaft or eccentric mechanism works together with a compression cylinder situated between lower support and eccentric mechanism.

62. Construction according to patent claims 57-61 <u>with the characteristics that</u> the crankshaft or eccentric mechanism directly drives a plunger or parallel coupled plungers in a hydraulic cylinder (s), whereby the hydraulic fluid is sent directly to a hydraulic cylinder the piston of which drives the lower support.

63. Construction according to patent claims 57-62, <u>with the characteristics that</u> the hydraulic drive is constructed according to patent claim with suction valve(s), pressure limiting device, accumulator(s) and locking taps.

64. Construction according to patent claims 57-63 <u>with the characteristics that</u> the crankshaft or eccentric mechanism can be provided with a one direction coupling and a flywheel on the drive axle.

65. Construction according to patent claims 57-64 <u>with the characteristics that</u> the drive on the underside can also be provided for by a hydraulic system where the hydraulic drive cylinder can be controlled by a regulating device of the linear servovalve (or proportional valve) of the rotation type and whereby accumulators are placed in supply and discharge piping.

66. Construction according to patent claims 57-65 <u>with the characteristics that</u> the damper or dampers consist of a more or less elastic element or elements of steel, wood, synthetics or rubber.

67. Construction according to patent claims 57-66 <u>with the characteristics that</u> the damper(s) or damping device can also consist of one or more cylinders with hydraulic fluid and that a plunger moves up and down in the cylinder(s) synchronized to the motion of the lower support, and whereby one or more apertures are closed during the downward motion of the

cylinder(s) whereby the hydraulic fluid can no longer flow away, ending the downward motion abruptly.

68. Construction according to patent claims 57-67 with the characteristics that the hydraulic damping device can be provided with its own fluid sypply system, so that this can be applied with each type of drive.

69. Construction according to patent claims 57-68 with the characteristics that the hydraulic damping device can also be connected to the hydraulic drive system.

70. Construction according to patent claims 57-69 with the characteristics that a light overpressure is maintained in the fluid of the hydraulic system for the damping device by means of an accumulator and backlash valve, or by an accumulator with tension valve.

71. Construction according to patent claims 57-70 with the characteristics that the hydraulic damping device can be placed in the hydraulic drive cylinder by coupling the "shock plunger" to the drive piston.

72. Construction according to patent claims 57-71 with the characteristics that the thrust force in the hydraulic damping device is adjustable by volume increase or by reduction of the compression volume by applying an extra volume space, inserts, plunger with spindle, slideable constructions or coupled accumulator(s).

73. Construction according to patent claims 57-72 with the characteristics that compaction can also take place between two separately driven cylinders in conformity with figs.53A and 53B,

that both cylinders operate with the same frequency but not entirely equal amplitude and speed as in fig. 53C whereby an extra pressure develops in the material to be compacted at the desired moment.

74. Construction according to patent claims 57-73 with the characteristics that the hardness of the tile, that is, the elasticity modulus, is monitored by ultrasonic measurement, and the compaction time is adjusted if necessary, e.g., as

Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35, AND 38-106 deemed to be abandoned

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the flow char of fig. 54.

75. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : the hydromonitor of a refuse crushing roller is continuously driven with d.p., either alternating with a quasi direct current or d.p. dependent upon the loads of the roller, that it is also possible to drive the hydromotor with d.p. the asymmetry and the amplitude of which (as in fig. 55D) can be gradually adjusted so that they can merge from a quasi direct current into a shocklike advancing vibration whereby the adjustment can be regulated from the coupling which operates on the hydromotor.

76. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : d.p.'s are applied for punching, pressing forms and rings and re-forming metal, that the support of the transfer device remains in contact with the material to be shaped, that the maximum pressure exerted by the d.p., for example, as modulated pressure by which shifting, sliding or deforming of the material develops, is significantly lower than the maximal value when a static pressure is developed, that the mass of the moving or vibrating parts exercise a favourable influence on the necessary pressure and/or the necessary weight of the press frame, that it is favourable to set the frequency so that resonance of the work piece develops, that application of high frequencies can have metalurgic advantages in connection with premature loss of structure of material in juxtaposition with the load.

77. Construction and/or application according to patent claim no. 76 with the characteristics that : the d.p. can be exercised as in figs. 56a and 56b either by a mass motion reactor or a linear motor driven by a modulating alternating current.

78. Construction and/or application according to a portion of

Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35 AND 38-106 deemed to be abandoned

the aforegoing patent claims with the characteristics that : a vibration plate, vibration roller or a vibration lance construction is driven with a d.p. such that the material to be compacted is subjected to vibration, cyclic weighting, impact weighting,

that it is possible to set up the frequency, the pattern and the amplitude of the d.p. so that the compaction proceeds optimally and the energy consumed by the earth is transformed into compaction as much as possible, and not in petering out or transferring of vibrations,

that it is favourable to let impacting take place on the ground in such a timespan that the ground has time to bounce back in its own frequency (see standard vibration pattern in fig.1).

79. Construction and/or application according to the aforegoing patent claim with the characteristics that : a earth compactor can be constructed with a vibration or percussion plate (no.57.73) with a surface which can be enlarged or diminished and a mass (hereinafter referred to as ballast) the inertia of which is used to supply a reaction force for a linear motor which is connected to the percussion plate on the one side and to the mass on the other side,

that it is also possible to use the mass to generate kinetic energy by means of a mass motion reactor resting on the percussion plate which strikes the earth (see fig. 57B),

that it is possible to use the aggregate of an existent road building machine for the supply of hydraulic fluid and possibly also the crane arms of such a machine to exercise counterbalance,

that it is also possible to enlarge or diminish the ballast as well as the percussion plate to achieve the desired depth effect and percussion force of the machine (fig.57C).

80. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that : a mass motion reactor or a linear motor which is connected to a ballast on one side, can be connected to a long shaped object to be driven in such as a pile or dam wall with a pile foot

provided with a clamp construction, e.g. a hydraulic clamp, that the mass motion reactor or the linear motor driven by d.p. subject the pile or dam wall to a vibration which produces a resultant in the direction in which the pile or sheet piling must be driven into the ground, that the forces and movements of the pile called up at the behest of these d.p. have a more favourable effect and/or output than the normal cyclic weighting exacted by a vibration block based on an eccentric construction.

81. Construction and/or application according to the aforegoing patent claim with the characteristics that : the vibration block can be constructed as in figs. 58A and 58B and the mass motion reactor present within it according to the principles of the figs. 29,30,31,33,59a and 59b.

82. Construction and/or application according to a portion of the aforegoing patents claims with the characteristics that : a sampling tube in aid of taking samples profiled according to the usual methods is connected with a vibration block, percussion block or a mass motion reactor or a linear motor connected to a ballast and directed by d.p., the aforementioned conforming to the principles of fig. 60.

83. Construction and/or application according to the aforegoing patent claim with the characteristics that : it has been shown that, by application of a pattern of d.p. adjusted to the earth, or else, of a hydraulic alternating current, on the linear motor or the operation of the mass motion reactor, the length of the sample taken can be greater than 90% more than the original length of the corresponding earth body, through, among other things, the influence of vibration and the reduction of friction between the inside of the tube and the sample, as well as through the dynamic effect of the d.p., the concentration of energy in the cutting head of the sampling tube and not in the vibration of the sample, that this effect is comparable to pulling a tablecloth jerkily out from under a glass so that the glass remains almost motionless.

Claim(s) Nr 27, 28, 30, 33-35, 38-106 deemed to be abandoned

84. Construction and/or application according to the aforegoing patent claim with the characteristics that :
an ordinary probe construction, in which the hydraulic impression apparatus as well as the necessary ballast is already present, is to be provided with an apparatus for taking samples vibrationally,
that the apparatus is placed in the probe tower and probe tubes are added instead of the pressure piece,
that the apparatus is placed and connected with the sampling tube,
that by application of the probe cylinders as support and conductors of the sampling apparatus it is possible to integrate the backlash valves into the hydraulic circuit controlling these cylinders, so that the fluid in the cylinder is blocked on the upward movement of the smapling apparatus, whereby the hydraulic aggregate is not damaged and a greater stiffness develops in the support system of the sampling apparatus.

85. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that :
one or more supports are put on a road surfacing such that these supports attain a good and rigid join to the road surfacing,
that these supports are controlled by a mass motion reactor or alternatively, a linear motor which finds its reaction force on a mass no. above,
that the one or more supports are driven in such a way that the force always corresponds to the pressure of the wheel thrust which passes the road surfacing at the point of the support,
that it is possible to simulate a relatively very large number of thrusts, and in this case, the passage of a large number of wheels, within a short time by application of d.p.,
that it is possible to push the sampling tube or boring tube down by vibration or shocking as in figs. 61 and 62 and also to rotate the shocking with the aid of a hollow cylinder and hollow hydromotor as with the refuse crushing roller,
that by application of a number of supports it is possible to

Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35, 38-106 deemed to be abandoned

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simulate the horizontal displacement of the wheel load with a series of multiple thrusts in the successive supports in a timespan divided among themselves which corresponds to the wheel speed,

that it is possible to have the surface of the support as large as the surface of the tire after impression, and the support pressure on the road surface equal to the tire tension,

that it is possible to measure the deformation of the road surface during the hammering from the supports with the aid of acceleration recorders, and to determine the energy absorbed by the road surface,

that it is possible to discern the pattern of the absorbed energy when the hammering is damaging to the road surface by repetition,

that with the help of these weightings it is possible to determine how many crossings over the surface are possible before important damage develops and after how many wheel crossings damage arises.

86. Construction and/or application according to the aforegoing patent claim with the characteristics that :

the apparatus for testing the road surface is constructed following the principles of fig.64,

that it is possible to construct the control valves of the hydraulic circuit as servovalves or electric valves which are operated electrically at the right moment,

that it is possible to construct the control valve as a rotating control slide which works in two steps, the one stage for the control of the thrust load, and the second stage for the elimination of a number of thrusts and the transmission of the thrusts at the desired time interval concurrent with the basing of the following wheel,

that it is possible to load the accumulators so slowly that after a thrust is generated they need some time to build up sufficient pressure and to deliver sufficient oil for the following thrust.

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Claim(s) Nr 1-3,5,8,10-25, 27,28,30,33-35, 38-106 deemed to be abandoned

Placement of tubes

87. Construction and/or application according to a number of the aforegoing patent claims with the characteristics that : long shaped bodies or capsules, horizontal, vertical or bowed, are put into the ground beginning from the surface or from the bottom of the sea or a waterway,

that such a body, called "tube" for short, must be put into the ground,

that a lengtly hole must be made in the ground, whether injected or cemented for other purposes or not,

that this "putting into the ground" can be subdivided into "penetration" which is the farther progressing into the ground and "displacement" which is the displacing in the direction of the length of the tube and in the direction of the penetration,

that it is possible to carry out penetration and displacement separately or in an integrated fashion,

that when penetration tends to depart from the desired path it can be corrected in direction while said penetration is taking place, or alternatively, to consciously change the penetration direction according to the desired path.

88. Construction and/or application according to patent claim no. 87 with the characteristics that :

the force required for penetration and displacement is applied in a limited amount on the surface (the start of the penetration), and for the remaining part largely near the fore side of the tube; the force required for the displacement is applied to one or more points distributed along the tube in the earth and/or between the tube parts themselves,

that the penetration is made possible by pushing away the earth on the fore side of the tube, or by removing the earth on the fore side of the tube by means of thrusting, boring or washing, or a combination of these,

that, if necessary, provision is made to reduce the penetration force and/or to reduce the friction along the tube during the displacement,

that it is possible to put relatively long tubes into the ground,

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and in this case, to drive the capsule very deeply into the ground.

89. Construction and/or application according to the two aforegoing patent claims with the characteristics that : it is possible to cause the necessary penetration and displacement forces not to take hold at the end of the tube above the ground while using an anchoring construction but to cause this force to take hold at the head of the tube or at other points along the tube in the ground either by using the d.p., or by using an anchoring construction in the ground along or between parts of the tube which can deliver a reaction force for the static displacement of or penetration by the tube, or by combining d.p. and anchoring constructions.

90. Construction and/or application according to the latter three patent claims with the characteristics that : the penetration, whether or not combined with displacement by compaction, takes place on the following conditions; that a percussion apparatus is used which hammers the ground away, that this percussion apparatus can consist of a so-called air rocket,

that the percussion apparatus can consist of a mass motion reactor,

that the percussion apparatus can consist of a traditional percussion block if it is suitable for working in the ground and under water,

that should the percussion apparatus work less prominently as a percussion apparatus than as a vibration apparatus, this can consist of a linear motor driven by strongly asymmetric d.p..

91. Construction and/or application according to the latter four patent claims with the characteristics that : the percussion apparatus is not connected to the tube lying behind but can move sliding within it or around it over a certain length (see fig.69d), this applying especially when the thrust would otherwise exercise too large a strain on the tube lying behind,

that it is also possible to connect the percussion apparatus

Claim(s) Nr 1-3, 5, 8, 10-25, 27, 28, 30, 33-35, 38-106 deemed to be abandoned

elastically with the tube lying behind, whereby the tube is dragged along, but peak tensions which are too large for the tube can be avoided,

that it is also possible to connect the percussion apparatus to the tube fixedly when the percussion or vibration apparatus exercises not all too great forces on the tube, e.g., in applying a mass motion reactor or a vibration block,

that in the case that the percussion apparatus is not connected to the tube after it has caused the tube to penetrate to a certain depth, the tube is displaced by a displacement mechanism until it is again shoved farther beyond the percussion apparatus or in the hammering direction.

92. Construction and/or application according to patent claims 86 to 90 inclusive with the characteristics that :

the penetration force can be reduced by pressurized fluid which is injected into the ground at the head of the penetration apparatus whereby an excess water tension develops and ground tension diminishes, or alternatively by displacing ground particles with the flow pressure,

that this fluid injection can take place by using a mass motion reactor or a linear motor; then the hydraulic fluid is not sent back to the tank but injected into the ground under pressure.

93. Construction and/or application according to patent claims 86 to 91 inclusive with the characteristics that :

the wall of the aperture made during penetration, is injected during the functioning of the penetration unit so that it hardens and remains standing and/or also acquires a relatively large resistance to letting fluid through,

that the injection takes place by spouting two fluids through separate channels in the ground which react rapidly when they contact each other,

that it is also possible to use an emulsion for the injection, e.g., with an ashphalt or tar product as base,

that it is possible to reduce the friction of the tube in the perforated wall by adding a pressurized fluid between the tube

Claim(s) Nr 1-3,5,8,10-25, 27,28,30,33-35 AND 38-106 deemed to be abandoned

and the wall of th aperture in the case that the perforated wall has a relatively large resistance to letting through fluids because of the injection,

<u>that</u> in those cases where the ground is not injected, resistance to letting through fluids is achieved by placing a flexible foil against the wall of the aperture, which is either sprayed on on the spot or rolled out during the setting up of penetration apparatus.

94. Construction and/or application according to the latter s seven patent claims <u>with the characteristics that</u> :

the tube is so constructed that the friction between the tube and the wall of the aperture is relatively small or non-existent through :

<u>either</u>, as in fig. 70B, a fairly rigid tube being encased in a second (flexible) tube whereby a fluid or pressurized air is added between this tube and the flexible tube or foil so that the crosssection of the aperture is enlarged during the exercising of pressure, while pressure is diminished during tube displacement, thus creating space between the aperture wall and the tube construction,

<u>or</u> making the surrounding flexible tube double-walled and filling only this double-walled tube with air or fluid (see fig. 70C),

or making the tube itself of a flexible material so that the tube expands under air or fluid pressure, after which space for tube displacement exists when the pressure is reduced,

or making the construction of flexible tubing which possesses a large cross-contraction co-efficient, for example a flexible tube reinforced with spiral shaped reinforcements so that the tube becomes smaller if it is put under a pulling tension.

95. Construction and/or application according to the aforegoing patent claim <u>with the characteristics that</u> :

by application of d.p. the tube moves under reduced friction by vibrational displacement so that the tube expands step by step and becomes shorter, displacement and shortening taking place at the same time, that it is also possible to reduce the friction by connecting the flexible tube directly to the penetration apparatus so that a pulling tension develops in the tube with every forward shock and this easily follows by the reduction of the resistance due to the cross-contraction of the tube.

96. Construction and/or application according to the latter nine patent claims with the characteristics that :
as is shown by testing, it is possible to reduce the tube friction and tube penetration force by pressing the tube away vibrationally using d.p.

97. Construction and/or application according to the latter ten patent claims with the characteristics that :
an anchoring construction is applied as in fig.67 which consists of a tube, a so-called anchoring tube, which can anchor by expansion bodies on the outside of the anchoring tube as well as on the inside and on both sides,
that the expansion body consists of a flexible reinforced bubble which can expand hydraulically or pneumatically,
that it is possible to strengthen the tube by adding metal scales on both sides (see fig. 66D),
that it is possible to absorb the anchor forces entirely with overlapping steel plates which are made to expand either by the aforementioned flexible or by hydraulic or pneumatic cylinders (see fig.66E, 66F).

98. Construction and/or application according to the latter eleven patent claims with the characteristics that :
the tube or parts of the tube can be displaced by so-called displacing mechanisms which are either dynamic by nature and are equivalent to the percussion apparatus but so constructed that they can be placed between two tube parts, or are constructed hollowly, e.g., by using a hollow mass motion reactor, that it is also possible to construct the displacement mechanism from hollow jacks whose reaction forces are found against both tube parts, against either one or two anchoring constructions (see fig.67).

99. Construction and/or application according to the aforego-

Claim(s) Nr 1-3,5,8,10-25 27,28,30,33-35 AND 38-106 deemed to be abandoned

i patent claim with the characteristics that :
the cylinder or hollow cylinder can be driven by air of hydraulic fluid and can be double or single working, whether or not provided with a return spring system and/or can consist of a hollow bellows construction or a bellows construction such as manufactured by Firestone.

100. Construction and/or application according to the latter thirteen patent claims partially, with the characteristics that : the control construction of the tube consists of either an anchoring construction in which the expansion body is divided into four different compartments so that the tube can be tilted in the expansion body by means of one or more hinge points mounted on the front side of the tube. These hinge points consist of hydraulic or pneumatic cylinders, hollow if necessary, and are divided over the four compartments which can be pressurized separately. The tube will bend in a certain direction depending upon the comparments which are pressurized and thus the tube direction will change slowly by further penetration.

101. Construction and/or application according to the latter thirteen patent claims with the characteristics that :
the total moving portion of the tube consists of the so-called earthworm method as in fig.71,
that the tube is subdivided into diverse pieces which are connected by displacement units and the force of this is so chosen that a section of tubing between two displacement units can always be pressed down,
that the diverse displacement units are separately operated so that the tube moves forward through the ground as a longitudinal stress or strain wave,
that it can be necessary to exercise an anchoring force or control force on the front or back of the tube whereby the wave attains a certain direction (see fig.71,73).

The percussion machine or pile driver

102. Construction and/or application to a portion of the aforegoing patent claims with the characteristics that :

a percussion machine is constructed <u>which</u> has an adjustable striking force, adjustable in degree and timespan of the force,
<u>which</u> works on the principle of the mass motion reactor, as described in detail in foregoing claims
<u>which</u> has the ability of developing a striking force in both directions,
<u>which</u> can be built compactly and can be used under water,
<u>which</u> can work in such a way that the striking weight corresponds with the fictive striking weight which is as large as the total weight of the percusssion block, and if the percussion block is anchored to the construction to be impacted, equal to the total weight of the percussion block plus this construction.

103. Construction and/or application according to the aforegoing patent <u>claim with the characteristics that</u> :
the percussion energy is supplied by a hydraulic aggregate,
<u>that</u> this is done by the building up of a work capacity by raising the percussion weight from its place or alternatively, by exerting the percussion weight against a spring system. The raising or exerting takes place dynamically so that this energy aids the doubling of the timespan of the blow,
<u>that</u> through this the construction of a lifting mechanism becomes redundant, which is a benefit to the simplicity and reduction of vulnerability.

104 Construction and/or application according to the latter two patent claims <u>with the characteristics that</u> :
a vibrating percussion block is constructed by using d.p., by application of a mass motion reactor whereby either the thrust has a relatively small force but holds on relatively long by means of the large brakeway (see figs.59A-59B) or a construction is applied in which the thrust is preceded by a number of smaller thrusts and construction is carried out following the principle of fig.24, or alternatively fig.24A with application of a regulating valve.

105. Construction and/or application according to a portion of

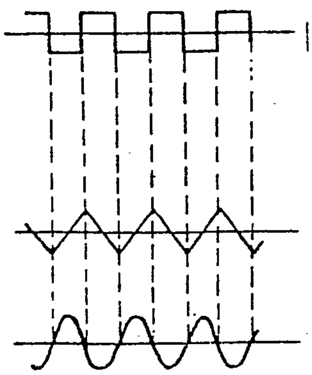
the aforegoing patent claims with the characteristics that : a percussion block, vibration block or vibrating percussion block is applied as in the construction described above and it is so constructed that it can work under water and can be provided with teeth on the underside,
that this construction can be dragged along behind a ship over the sea bottom, and in this case the bounding motion of the ship is so conducted that the serrated edges crush and crumble the sea bottom.

106. Construction and/or application according to a portion of the aforegoing patent claims with the characteristics that: a linear motor is driven by two striking jacks as in fig. whereby it is possible to exercise a very large impulse force on the piston and to bring about large displacements.

It is to be noted that the so called aggregate means hydraulic set.

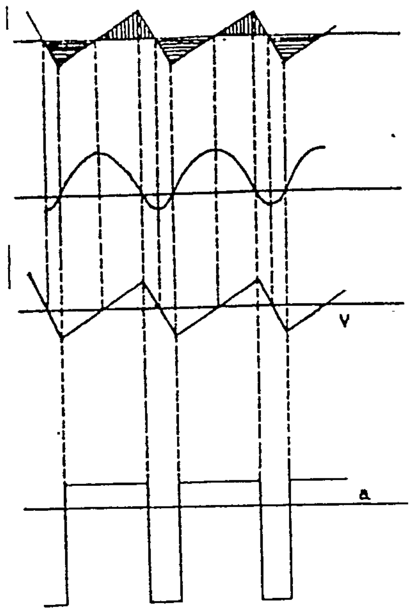
weight = load.

Fig. 1 : 1.1
1.86

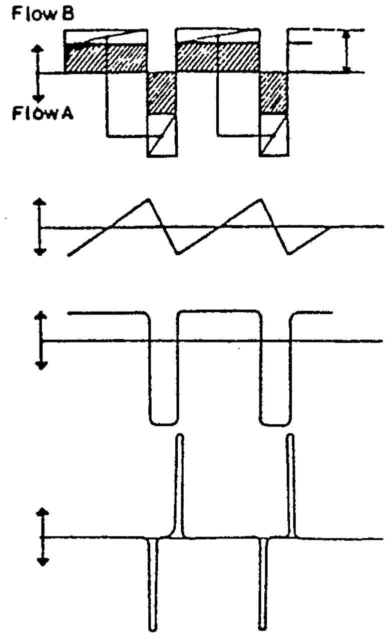


1.2

fig 1a



1.3
fig 1b



1.4
fig 1c

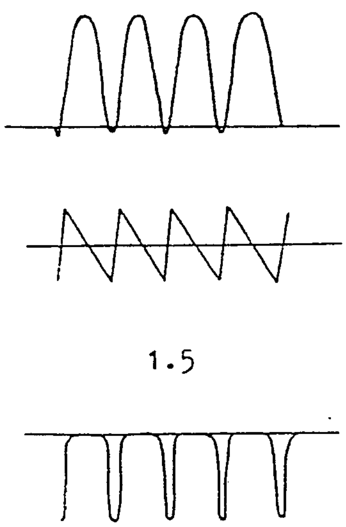
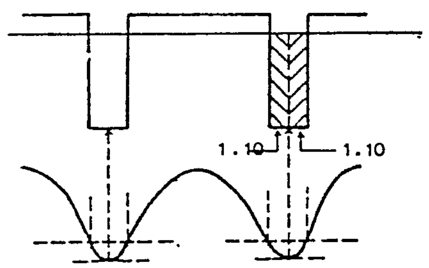
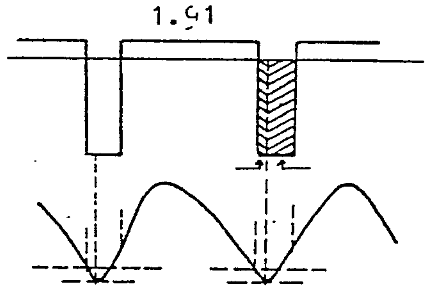


fig 1d



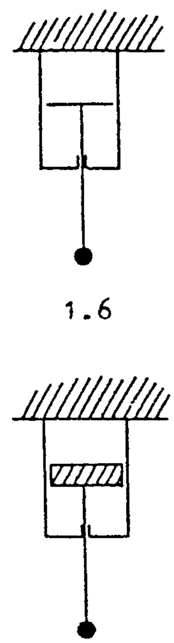
1.11 = 1.10r − 1.10ℓ ≃ 0

1.91



1.11 = 1.10r − 1.10ℓ ≅ 2 x 1.10ℓ

1.92
fig 1e



1.7
fig 1f

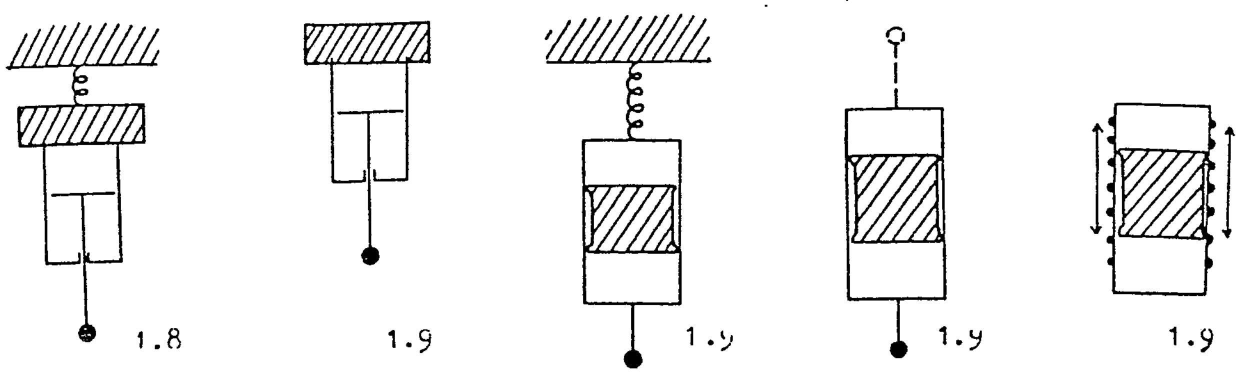


fig 1f

BAD ORIGINAL

$1^{C°} = (-93)\ 1^{C}$

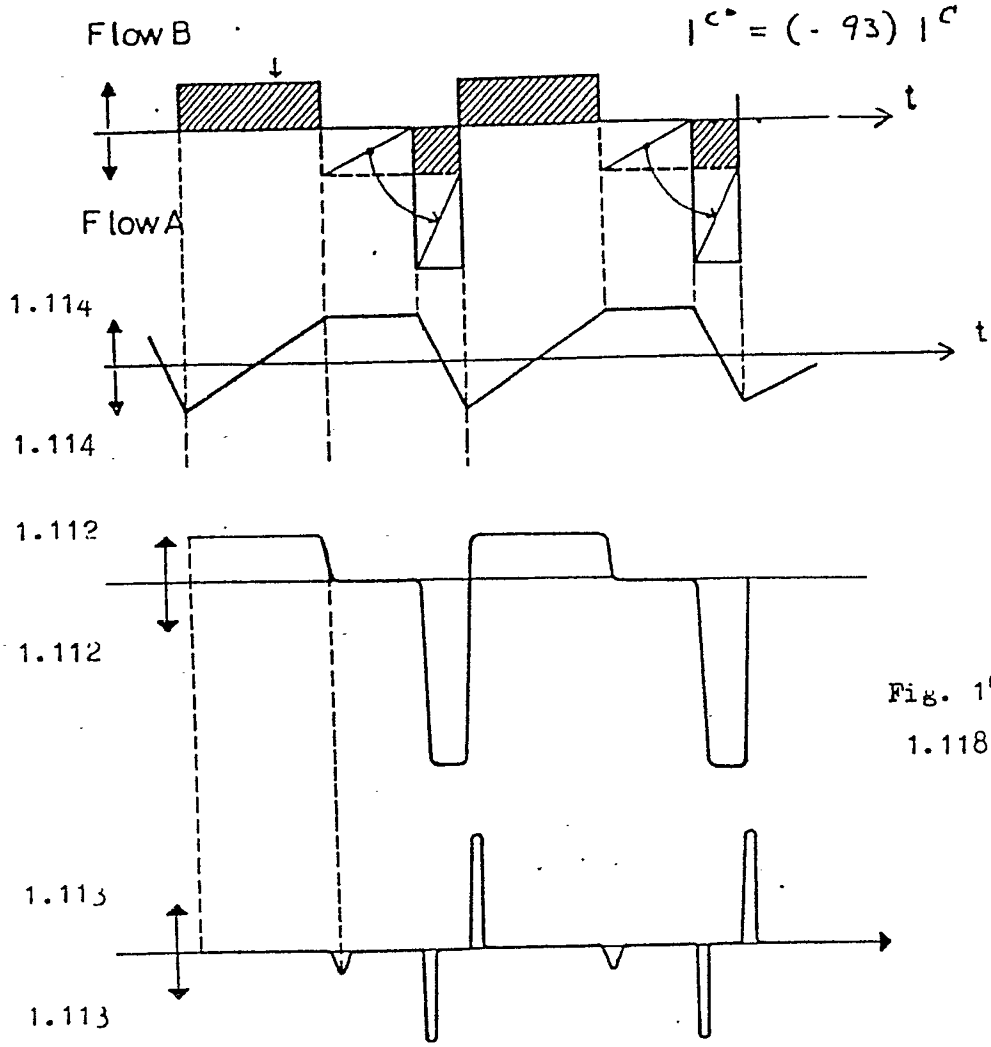


Fig. 1C°
1.118

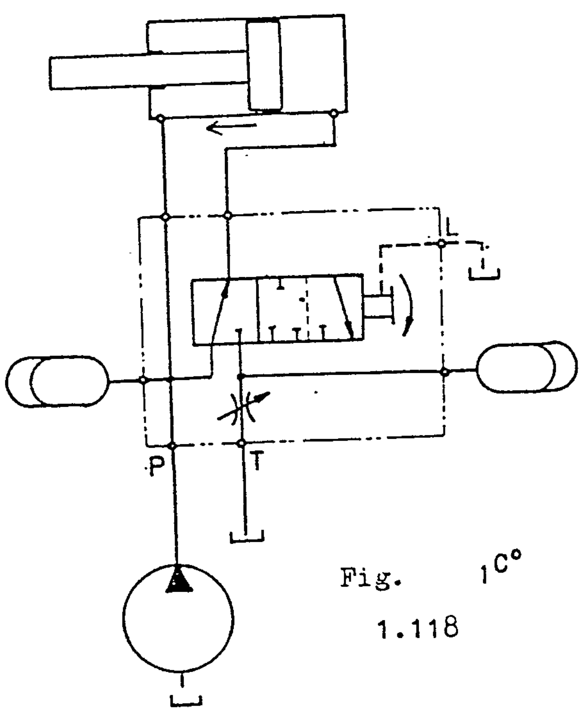


Fig. 1C°
1.118

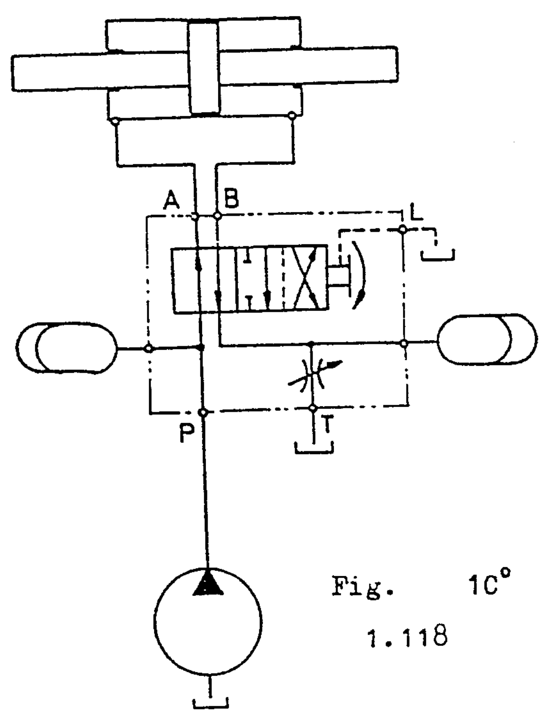
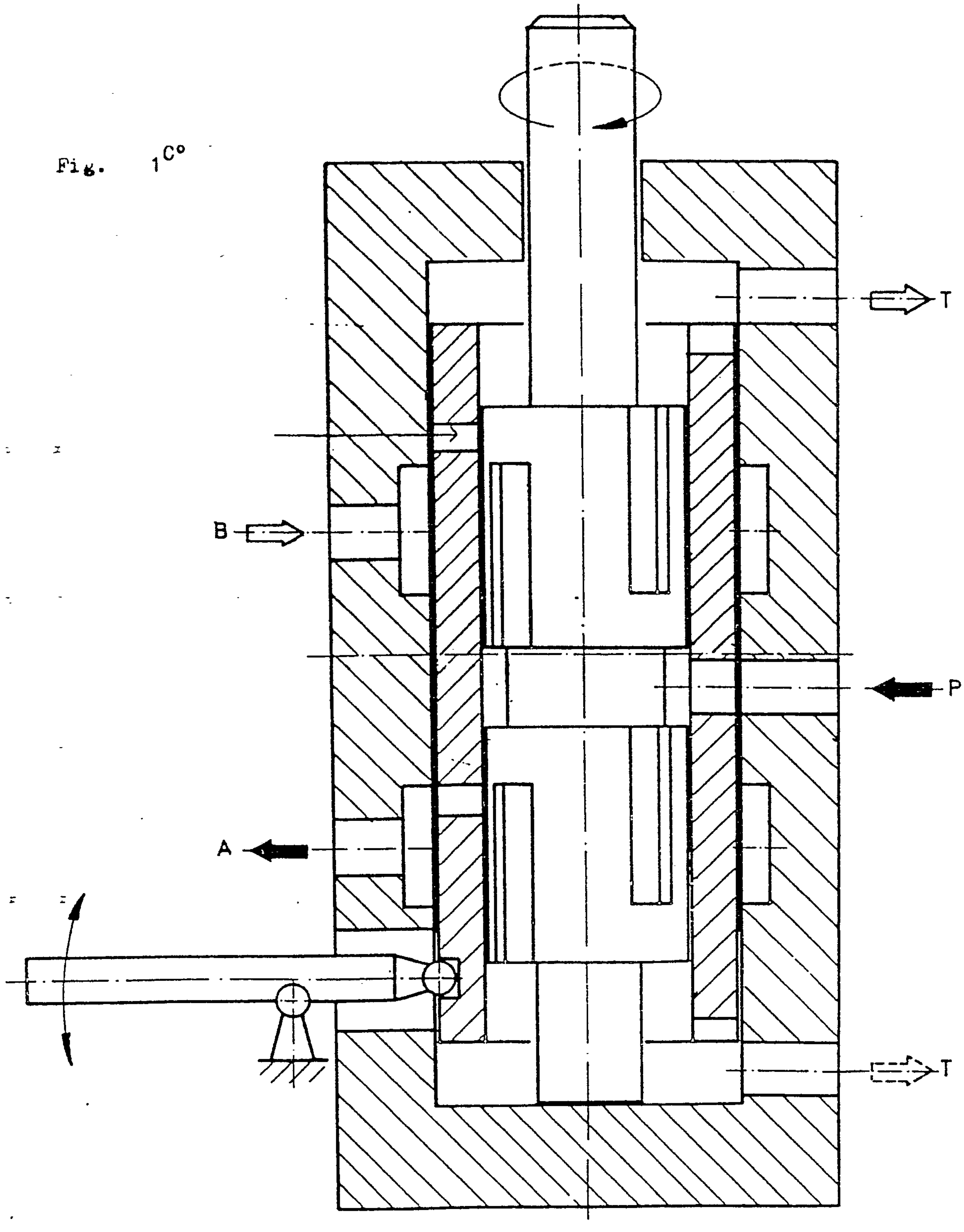


Fig. 1C°
1.118

$1^{C°} = (.93)\ 1^{C}$

Fig. 1C°



$1^{C^o} = (\cdot 93) 1^{C}$

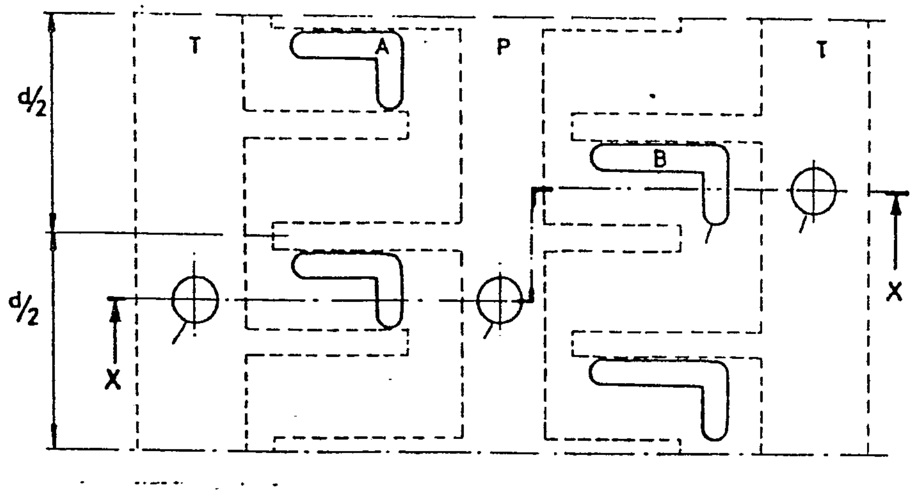


Fig. 1^{C^o}

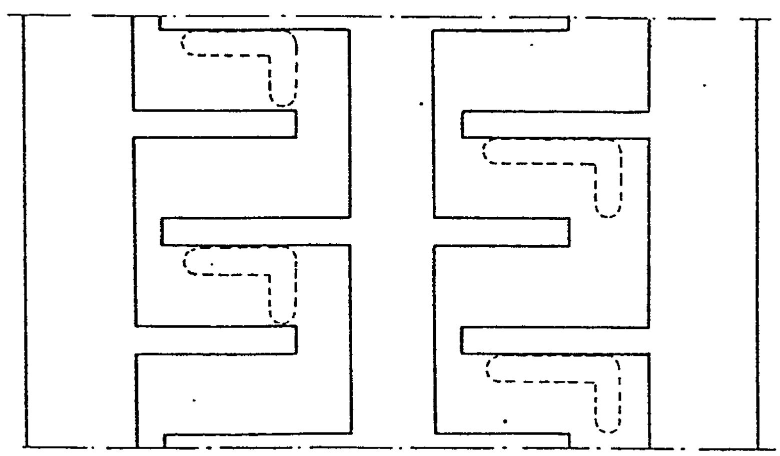


Fig. 1^{C^o}

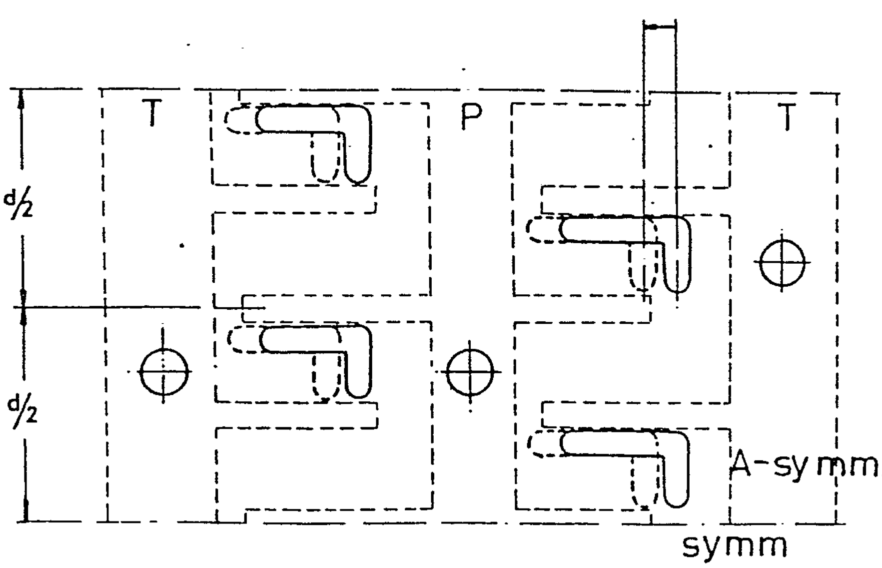


Fig. 1^{C^o}

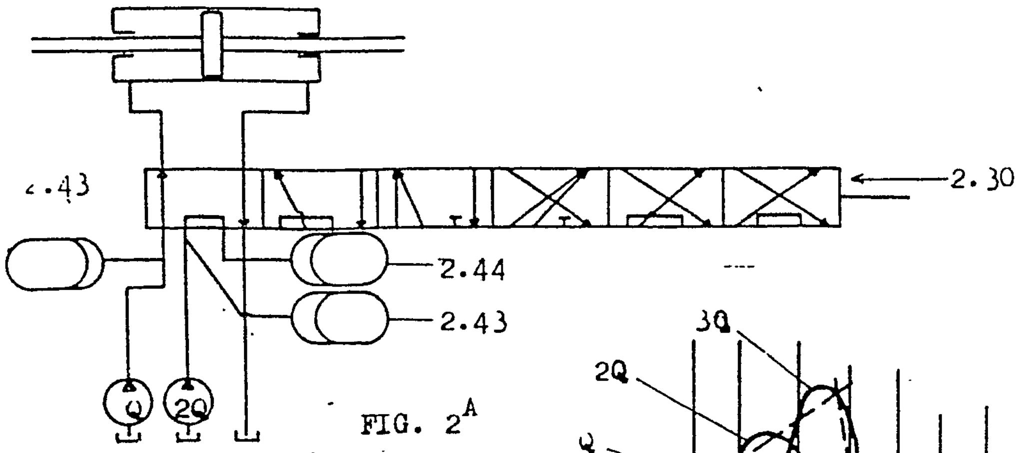


FIG. 2A

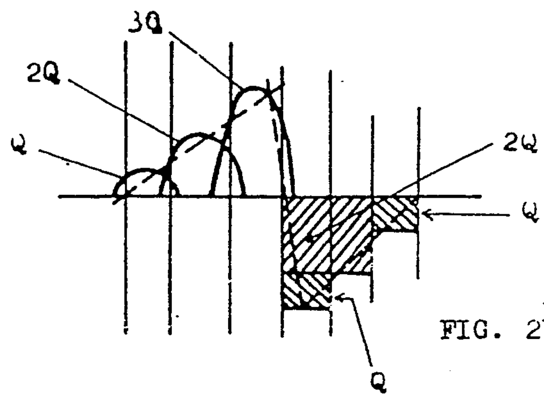
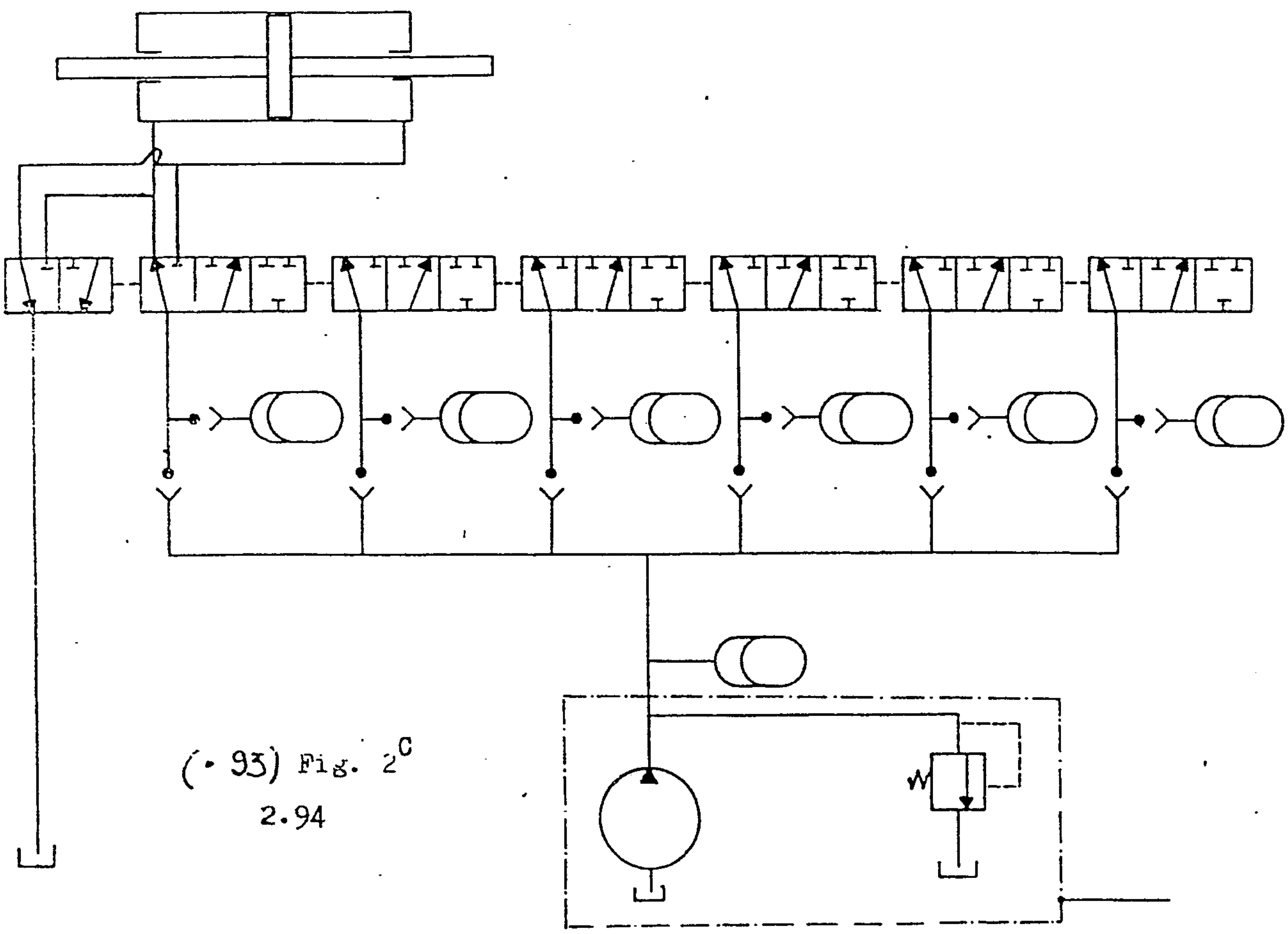


FIG. 2B



(· 93) Fig. 2C

2.94

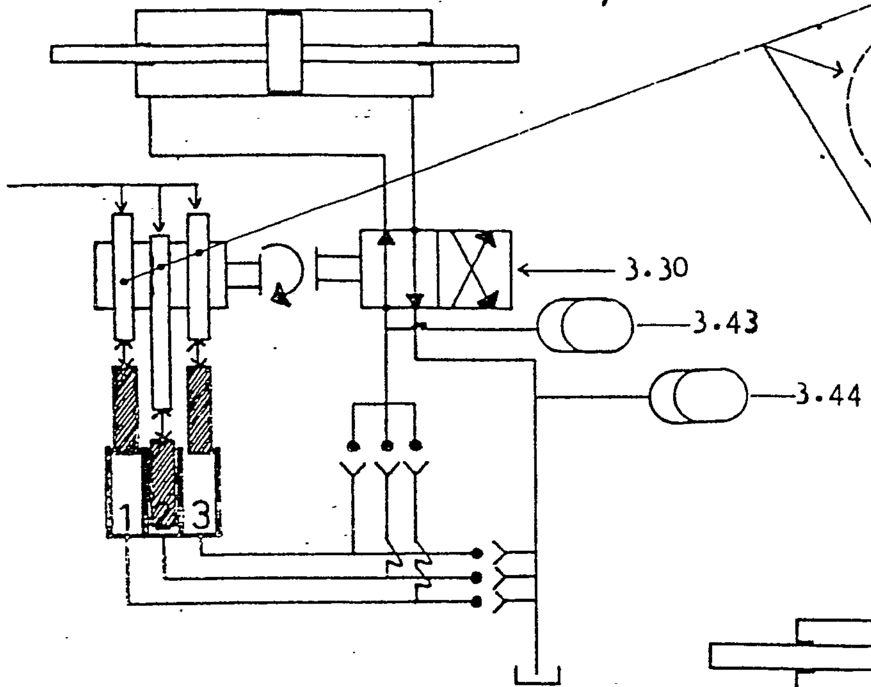


FIG. 3A

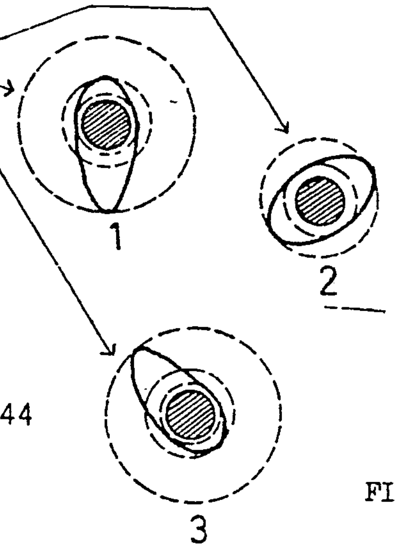


FIG. 3B

3.102

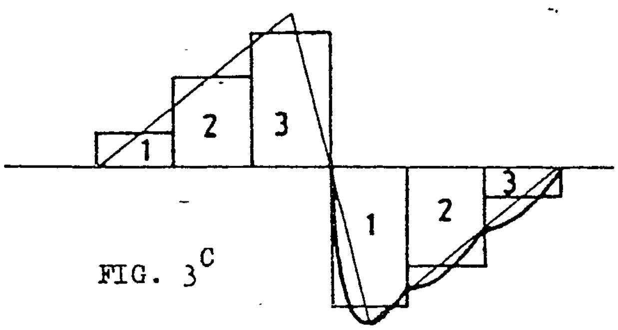


FIG. 3C

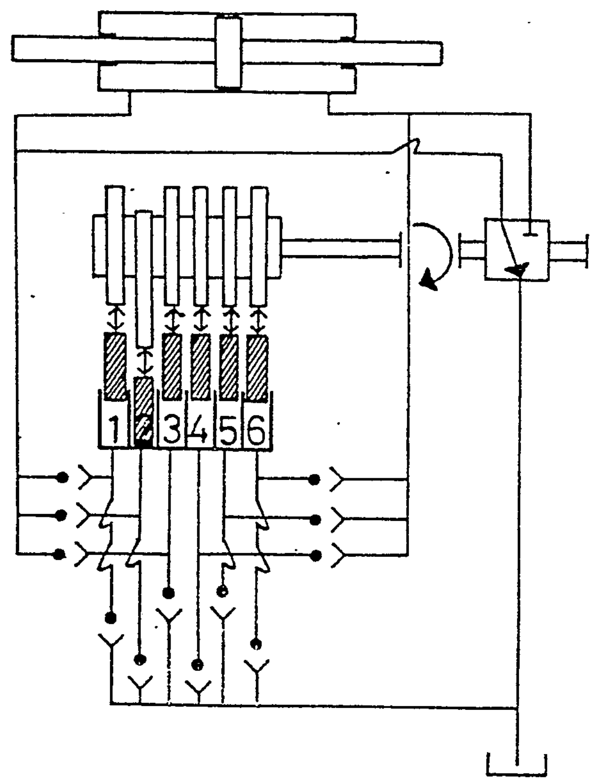


FIG. 3D

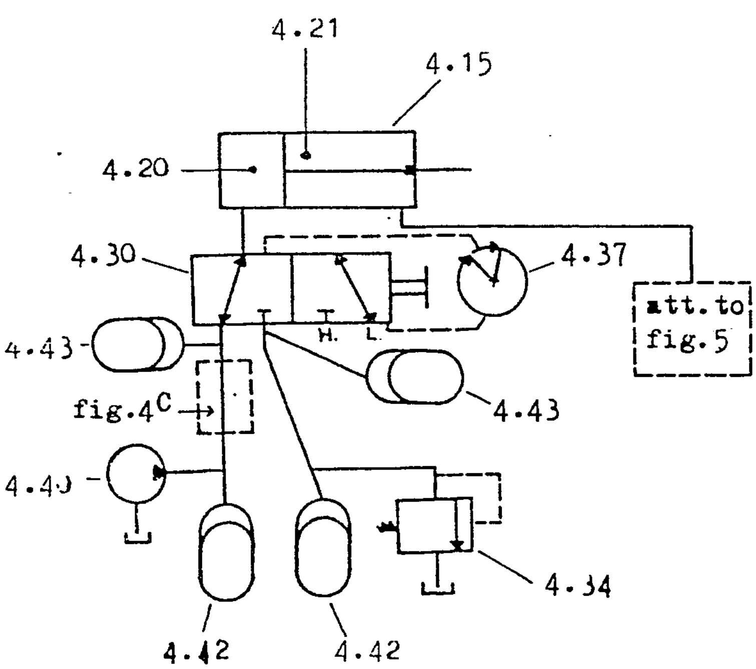


FIG. 4A

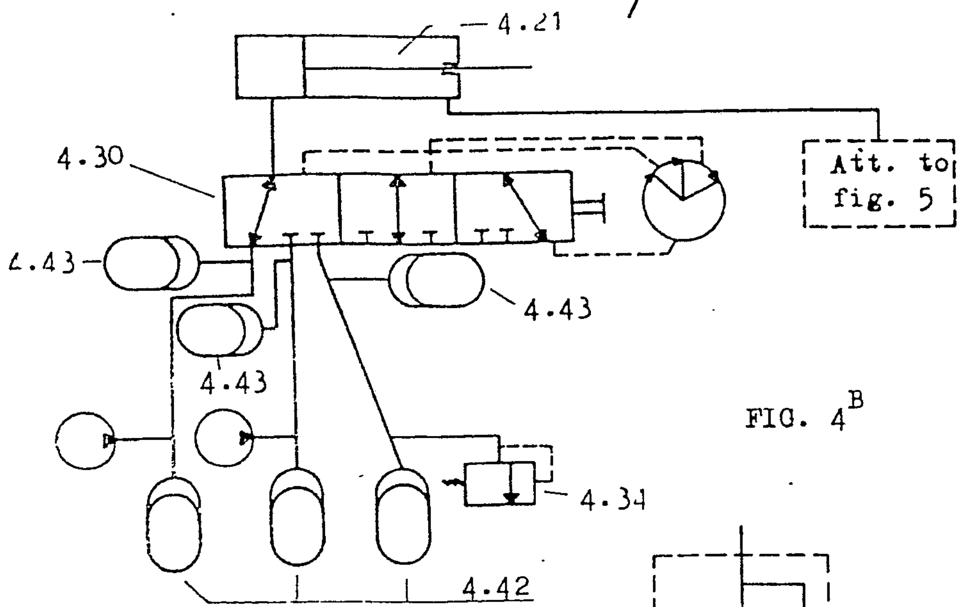


FIG. 4B

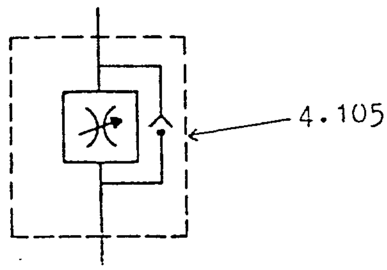


FIG. 4C

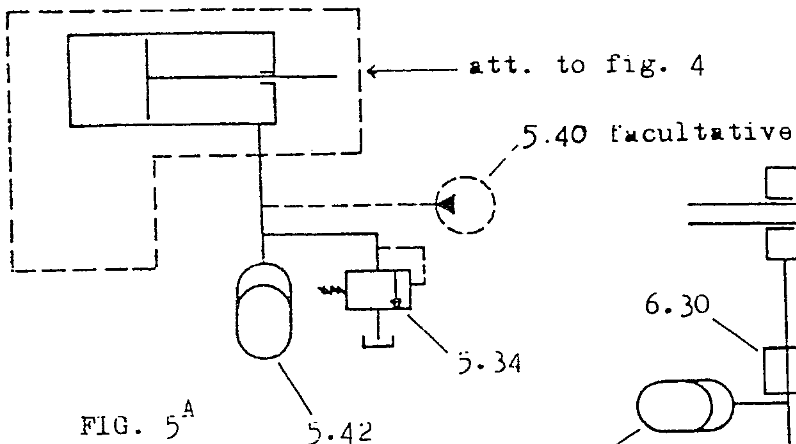


FIG. 5A

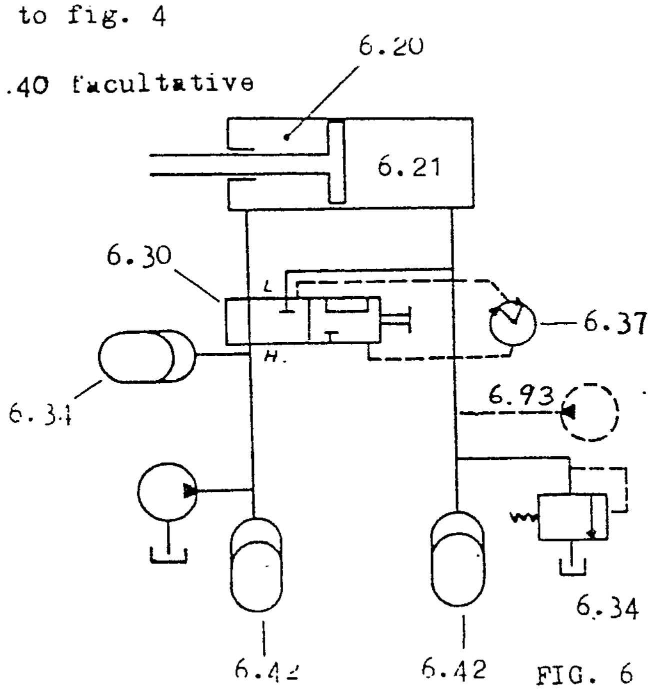


FIG. 6

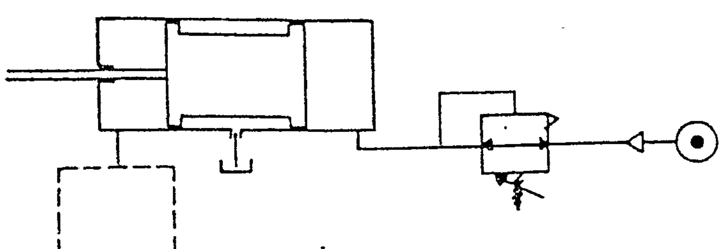


FIG. 5B

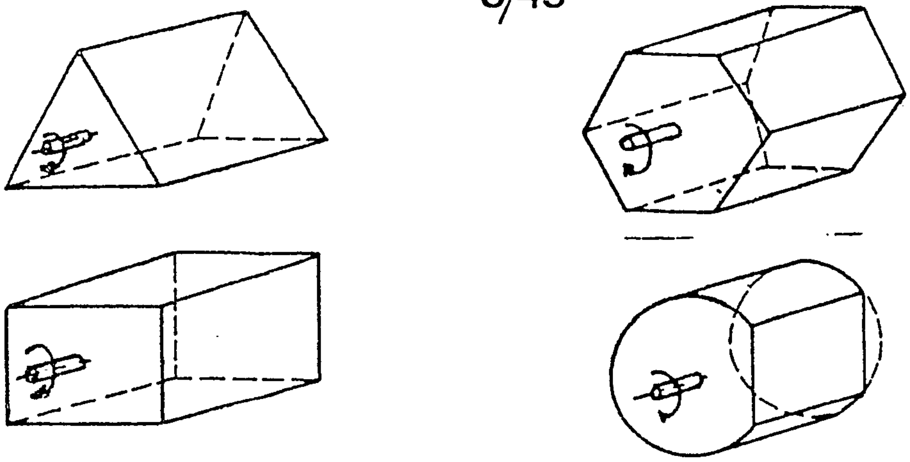
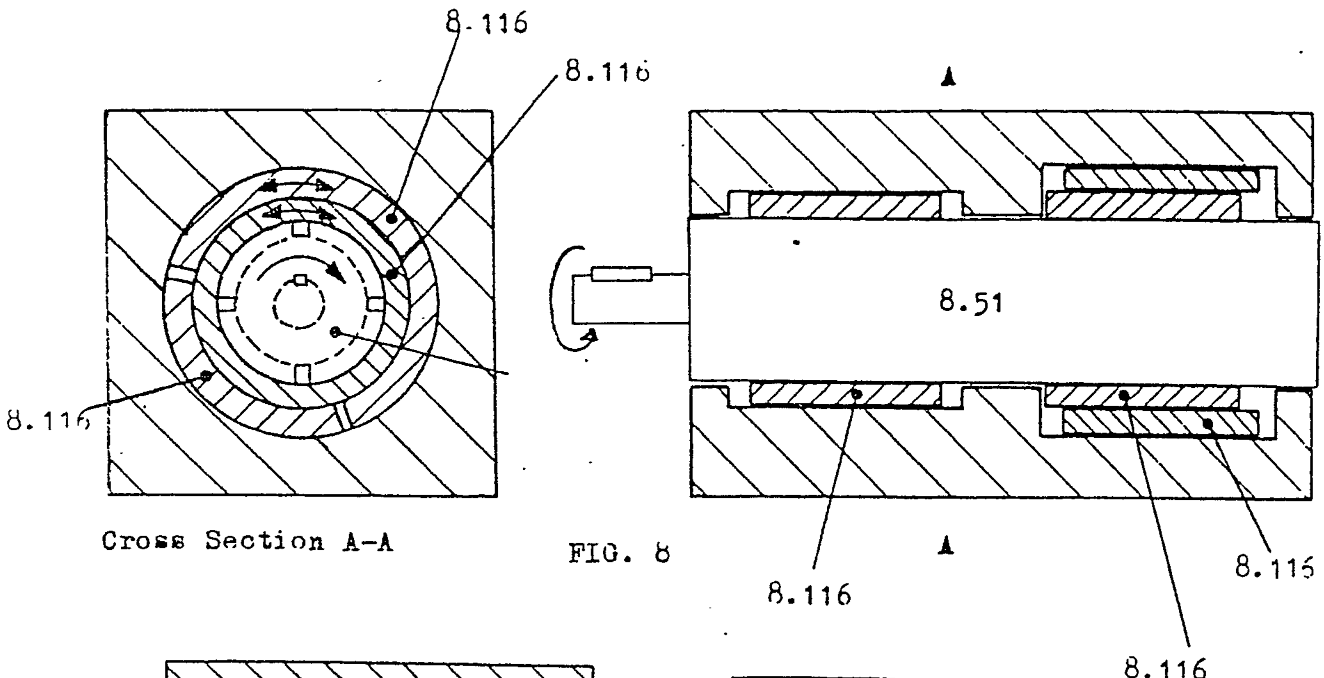


FIG. 7



Cross Section A-A

FIG. 8

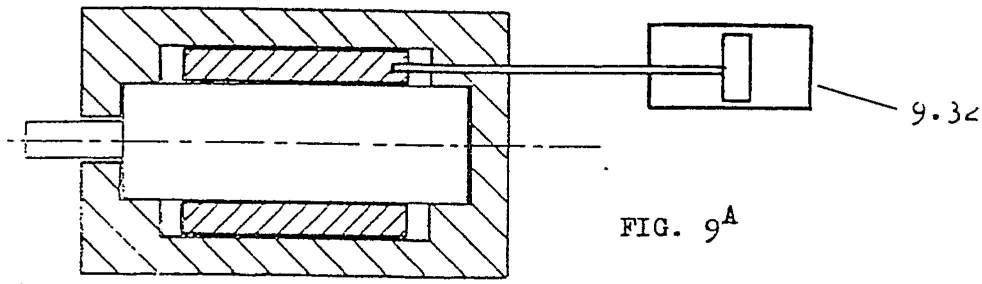


FIG. 9A

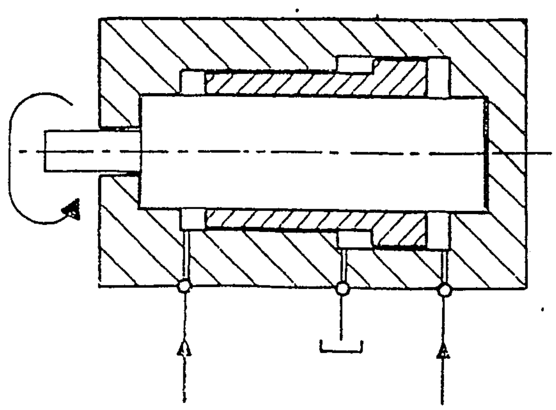


FIG. 9B

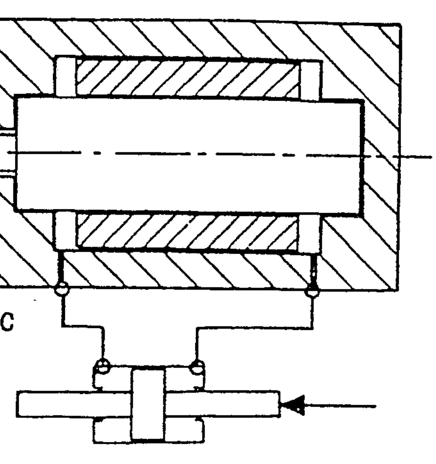


FIG. 9C

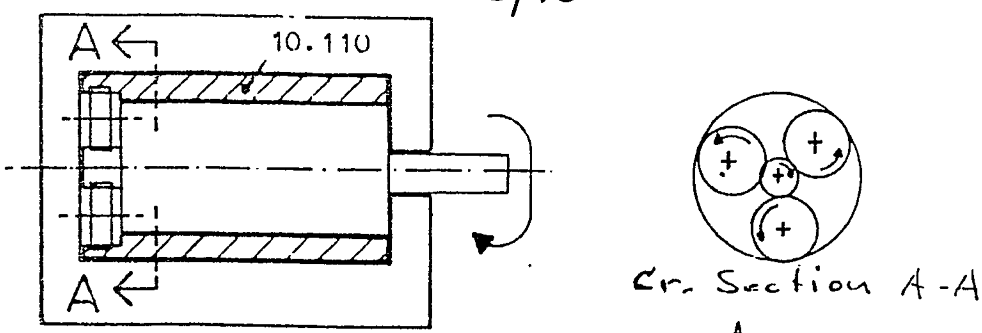


FIG. 10A

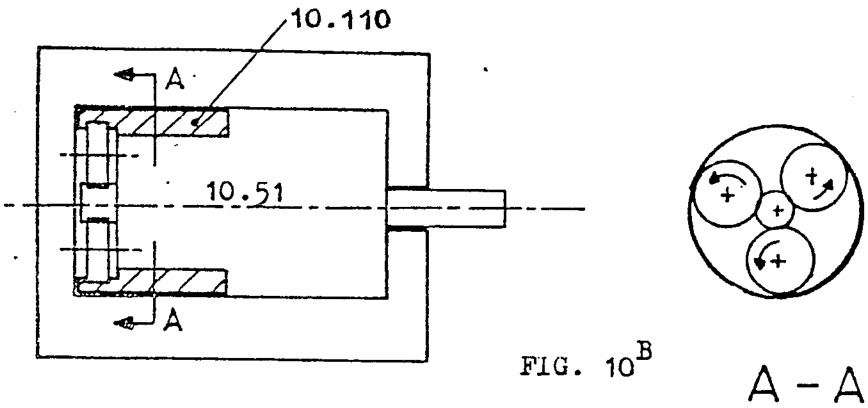


FIG. 10B

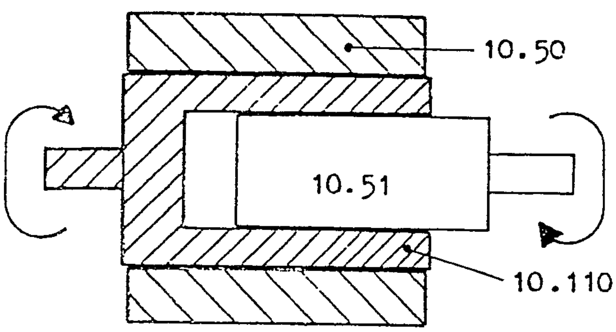


FIG. 10C

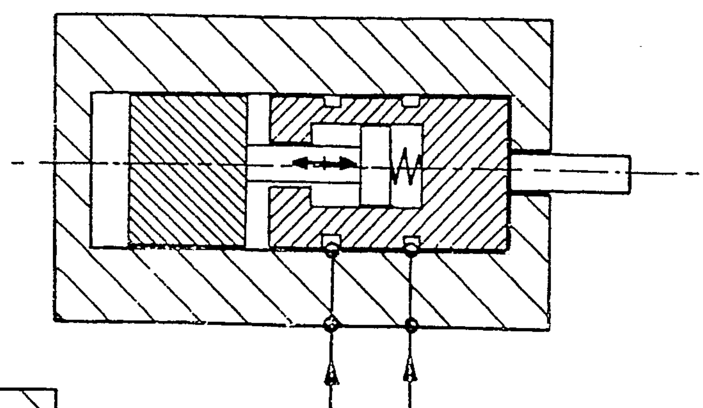


FIG. 11

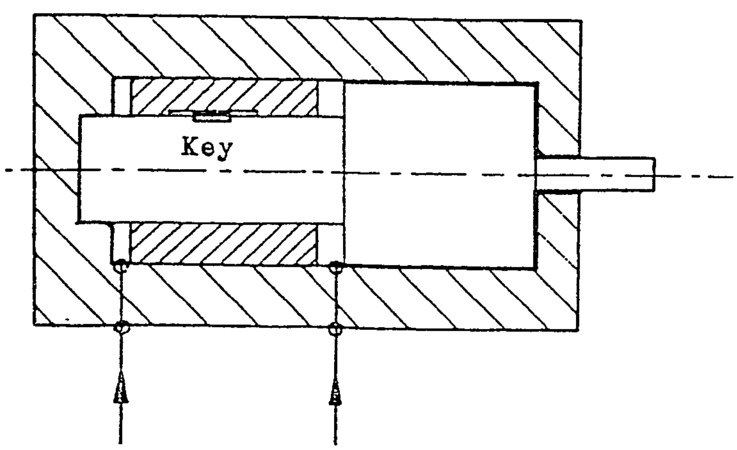


FIG 12

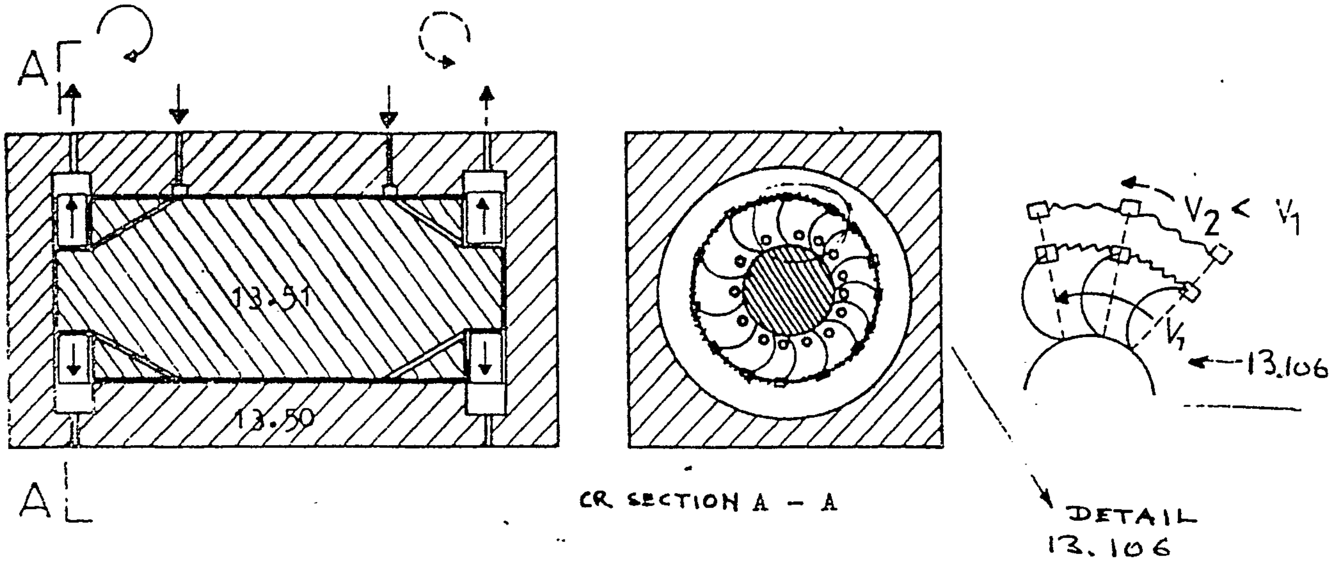


Fig. 13

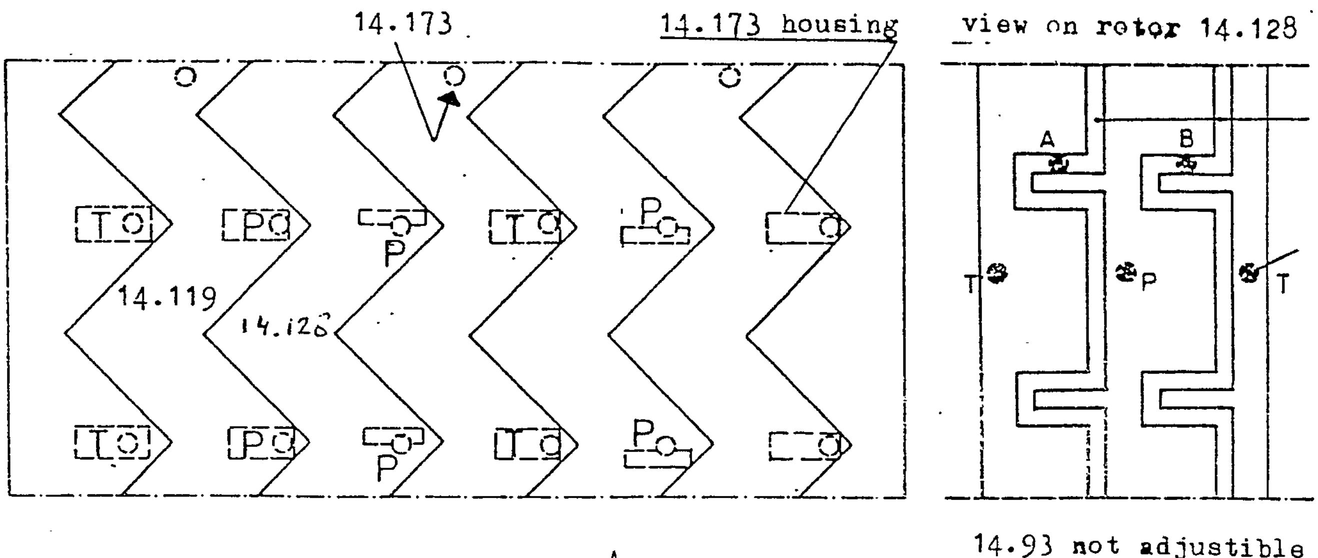
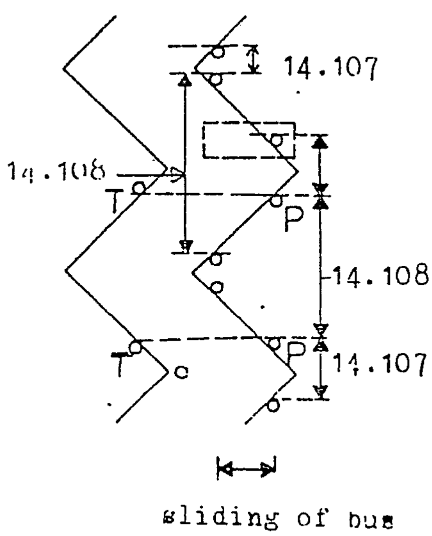


Fig. 14^A

Fig. 14B



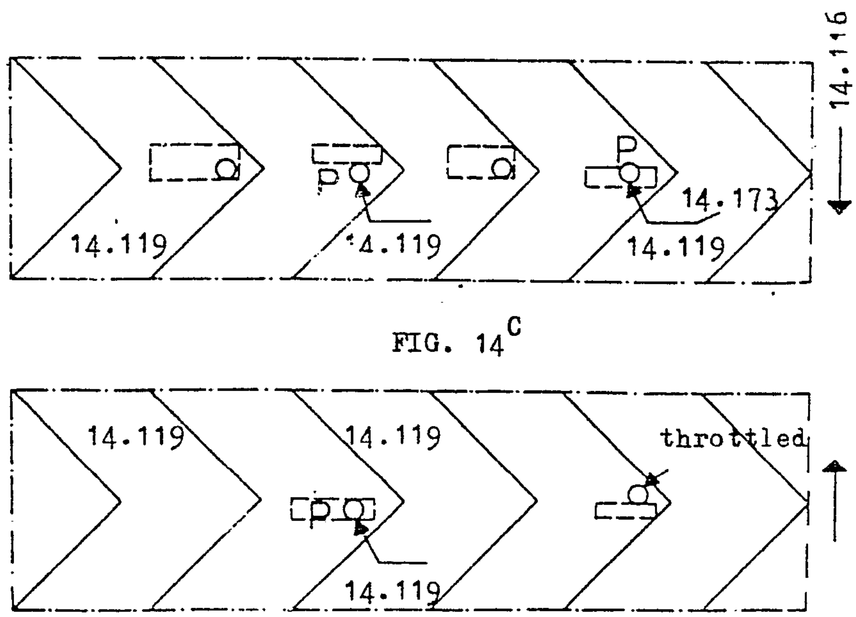


FIG. 14^C

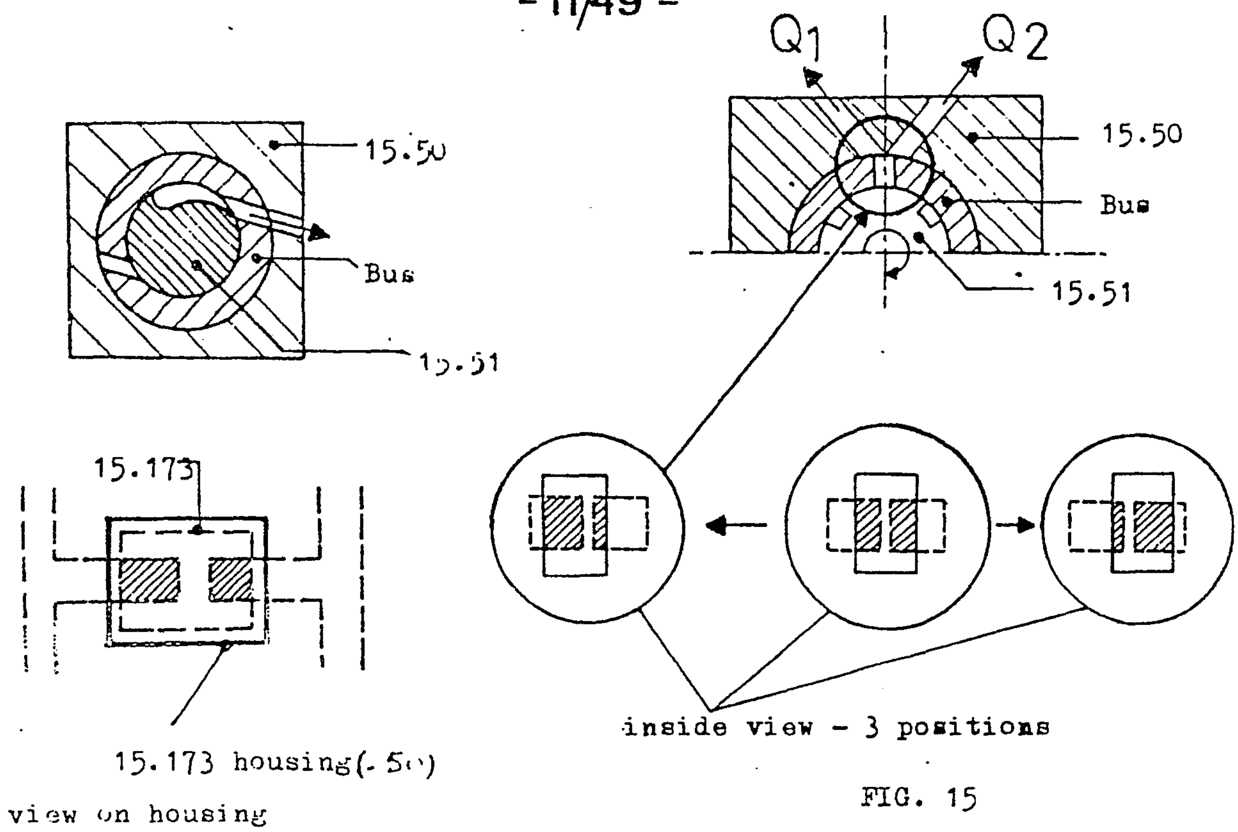
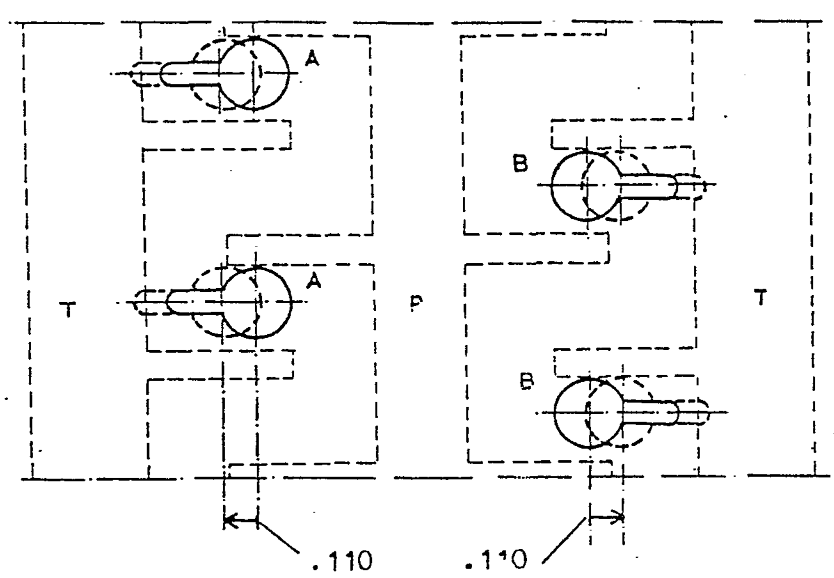


FIG. 15



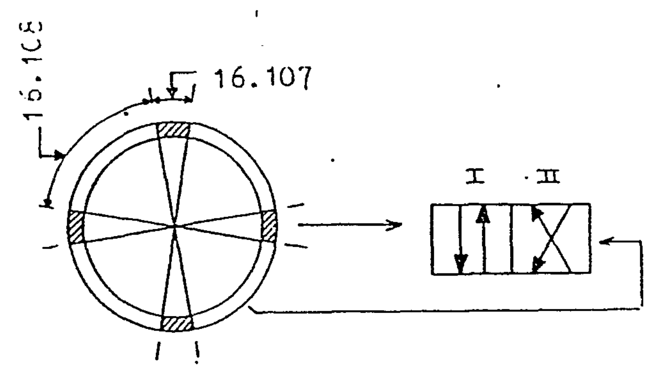


FIG. 16A

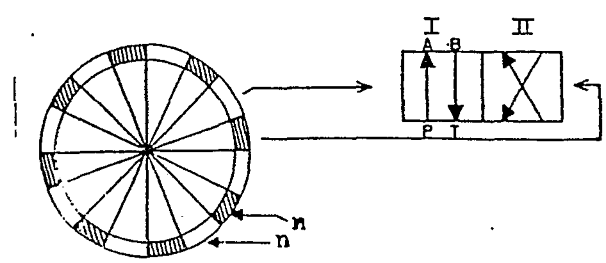


FIG. 16B

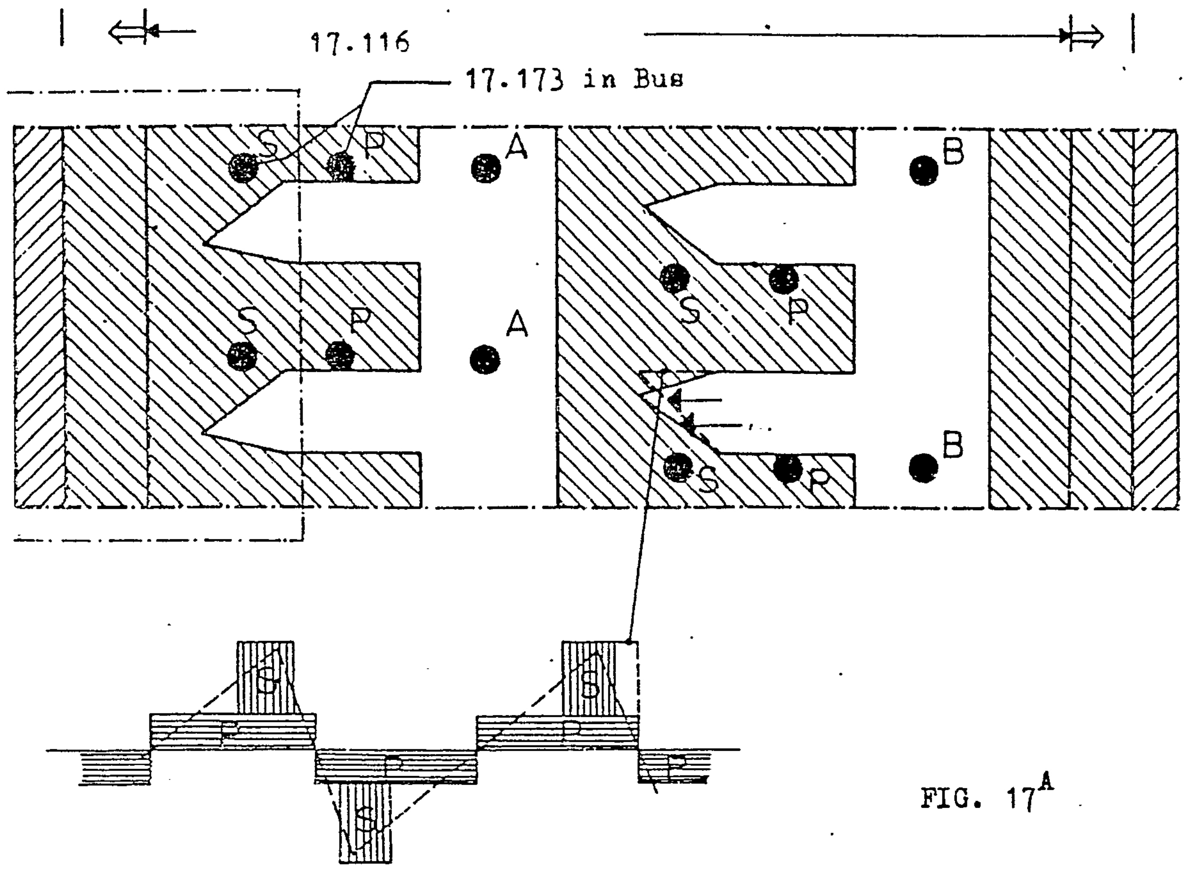


FIG. 17^A

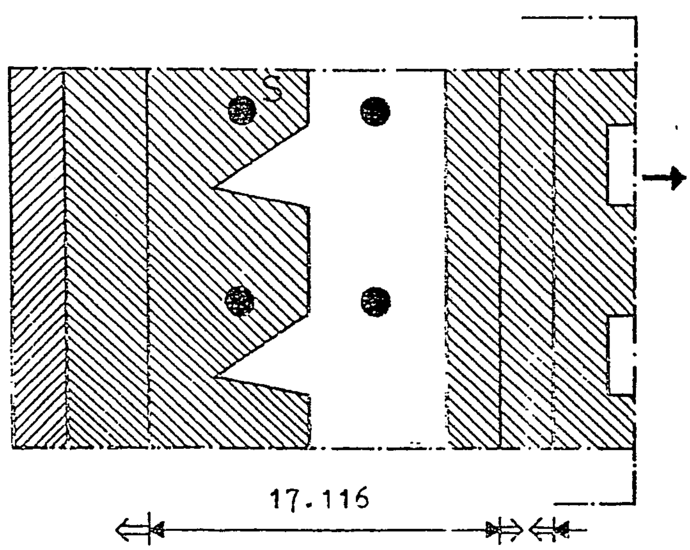


FIG. 17^B

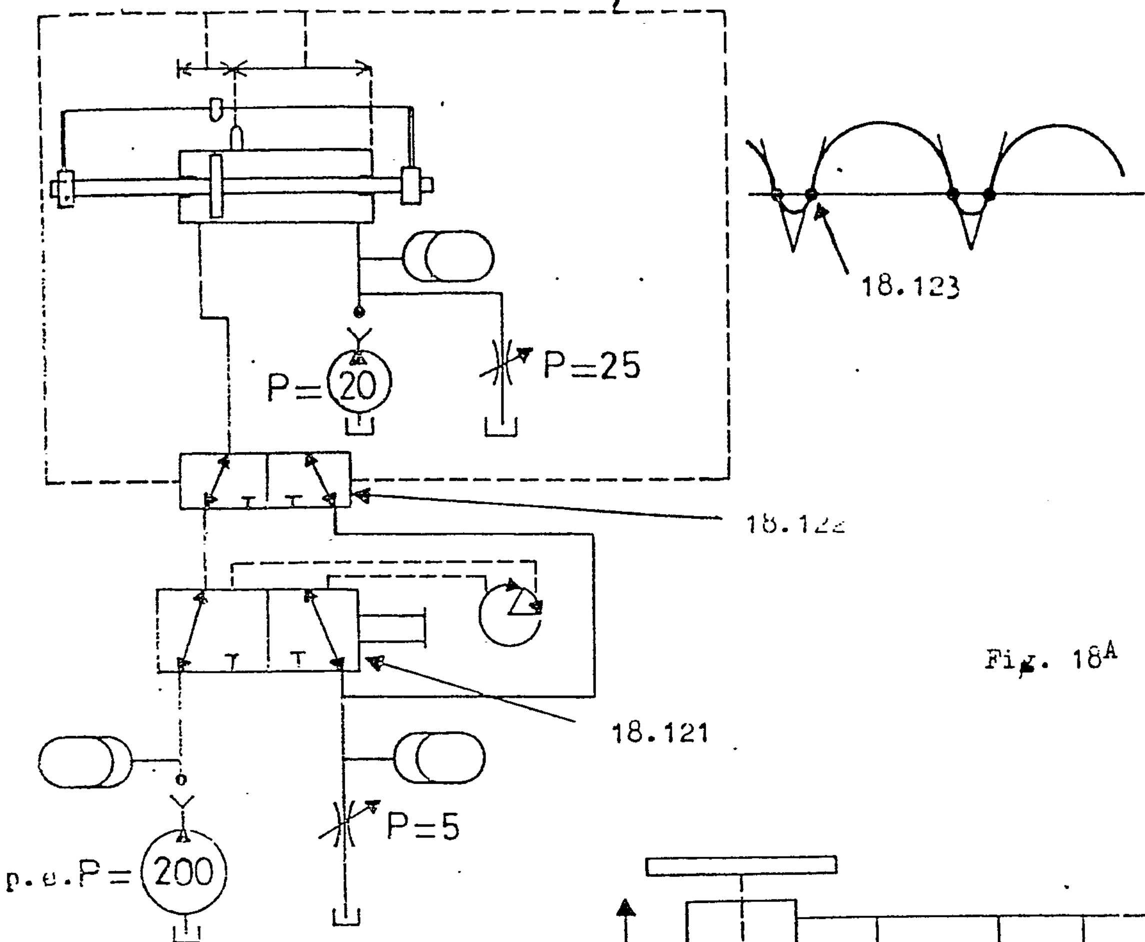


Fig. 18A

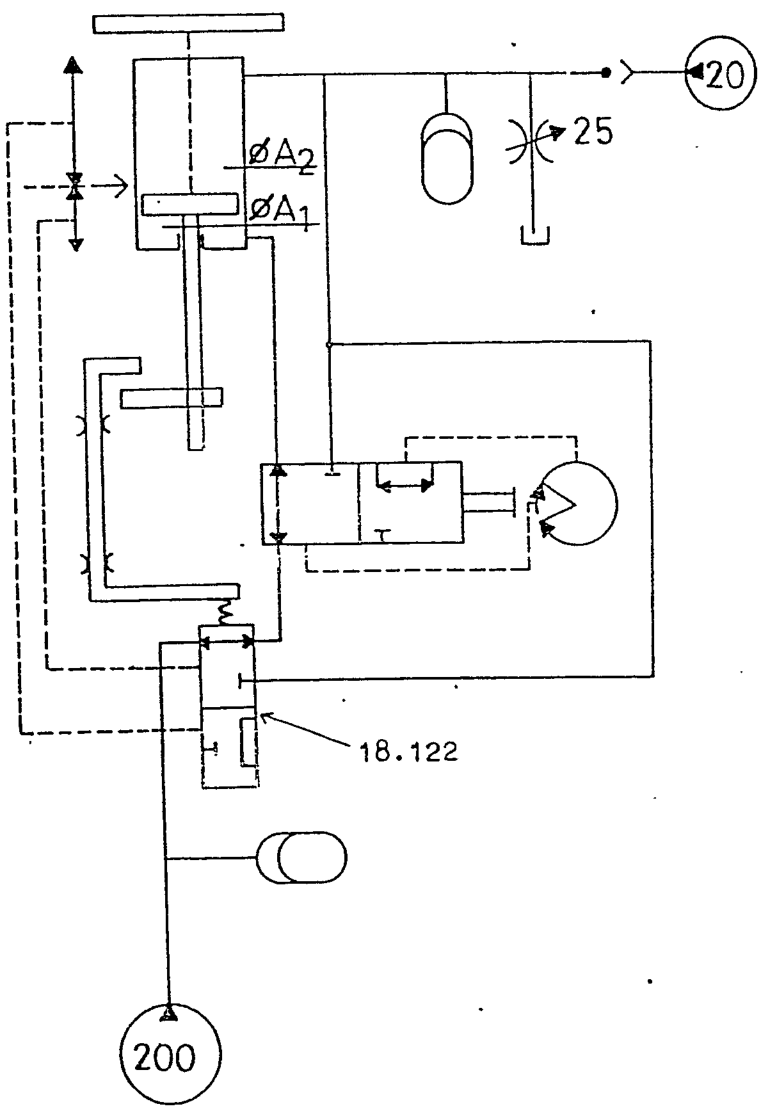


Fig. 18B

18.124

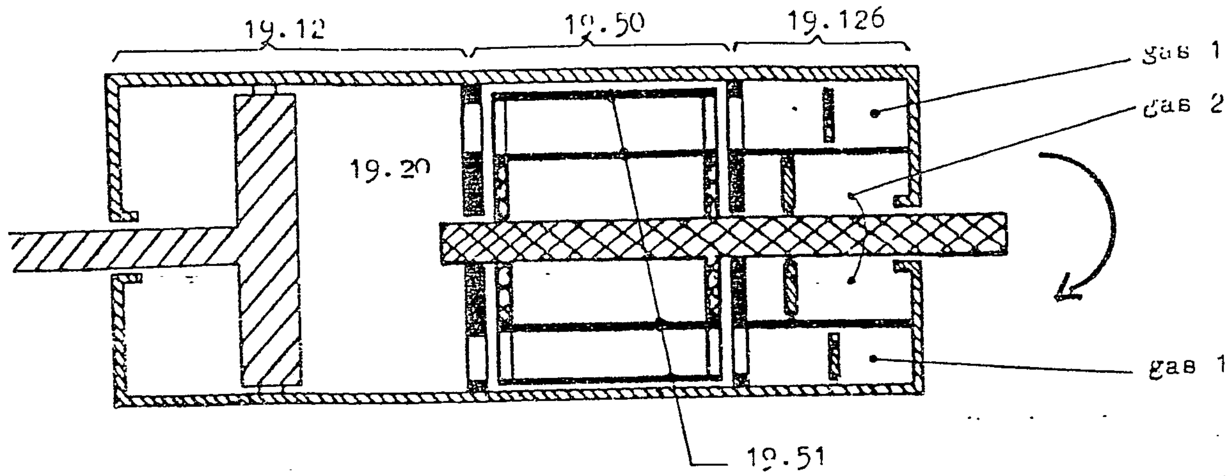
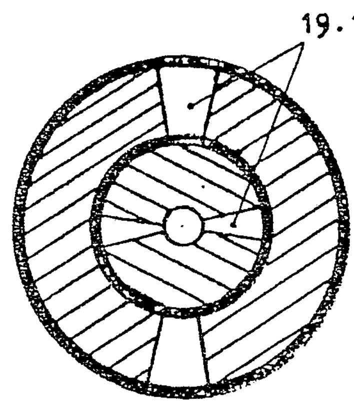
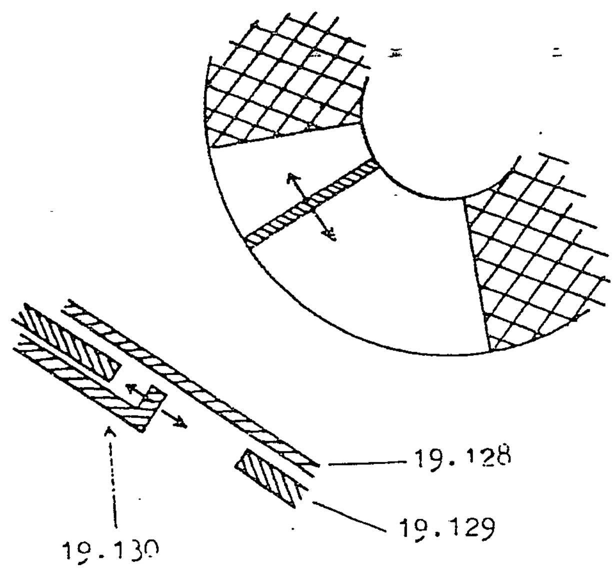


Fig. 19A





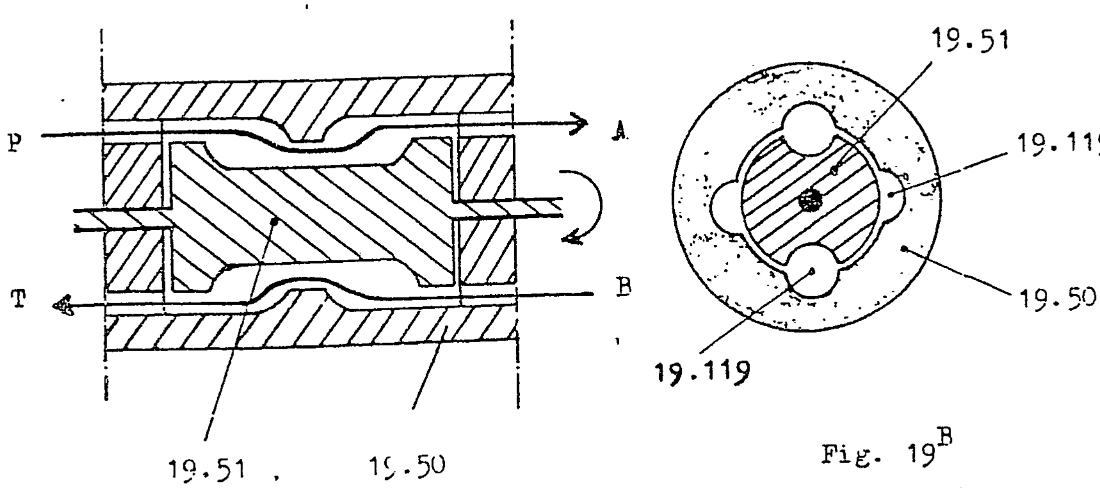


Fig. 19B

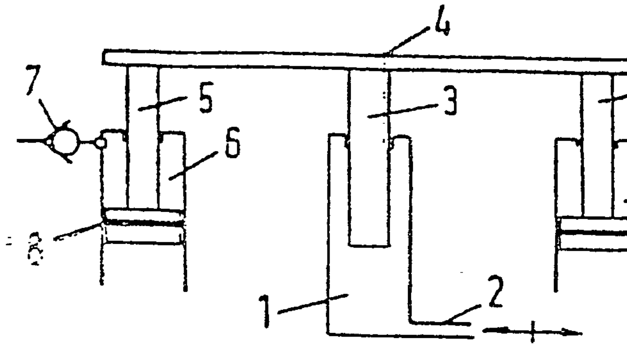


Fig. 101[A]

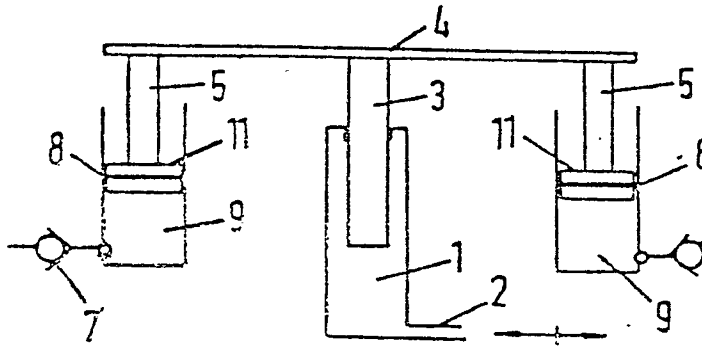


Fig. 101[B]

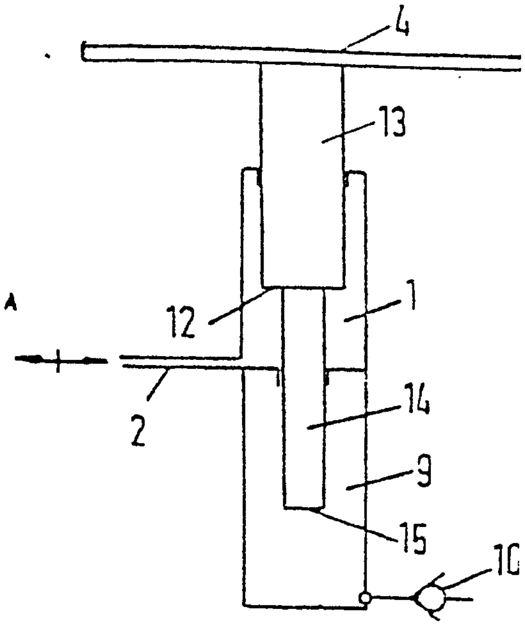


Fig. 102

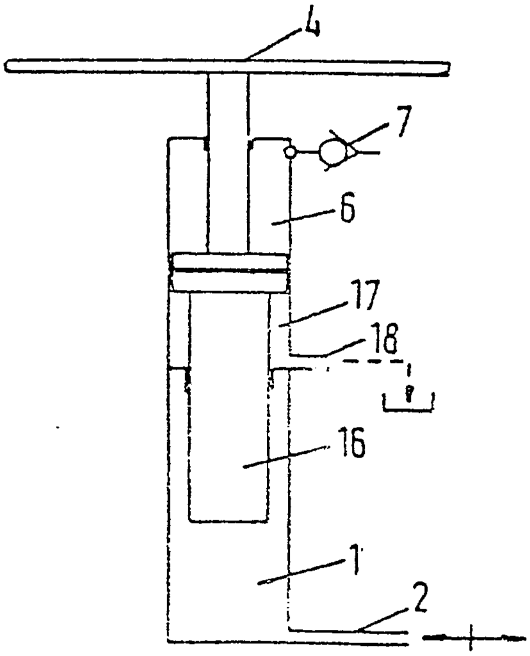


Fig. 103

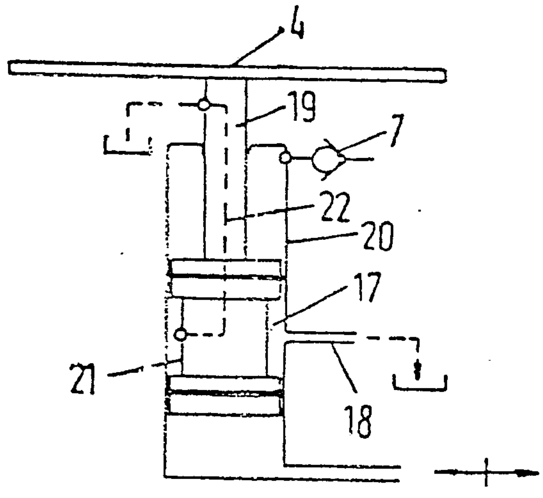


Fig. 104

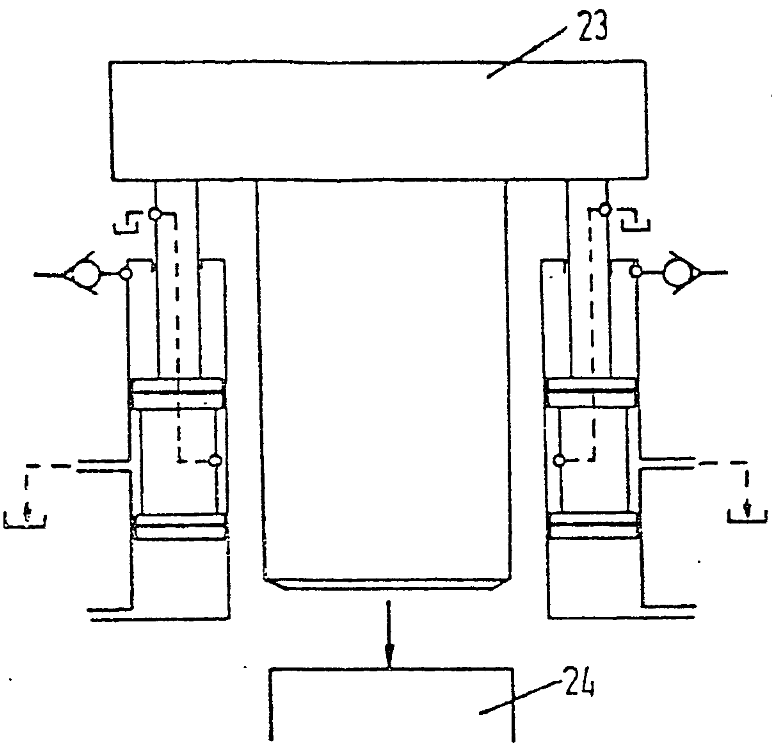


Fig. 105

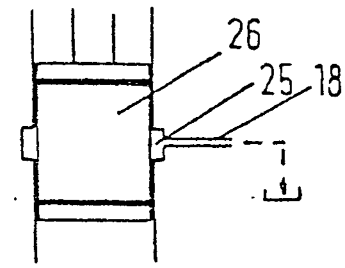


Fig. 106

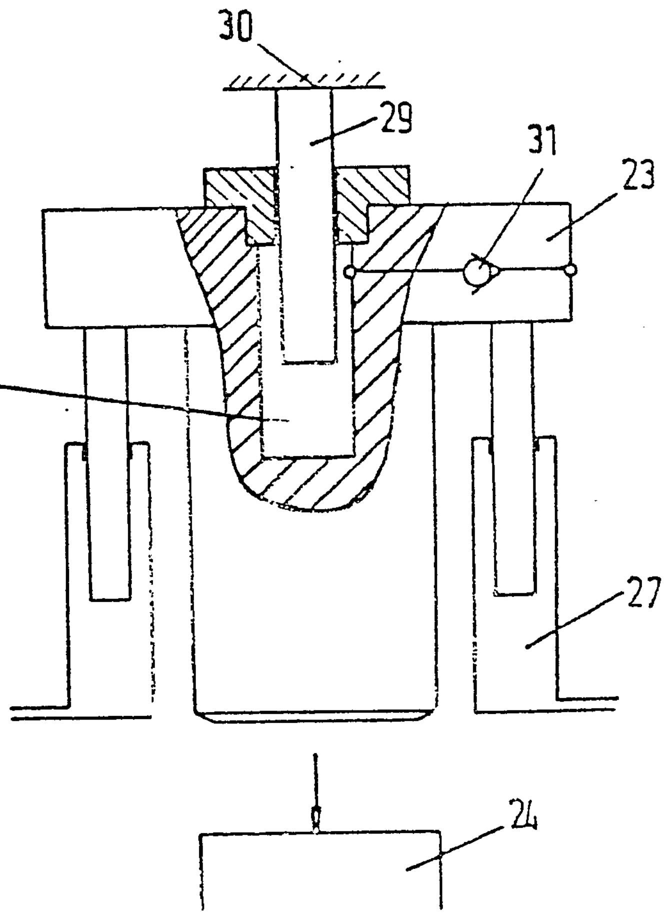


Fig. 107

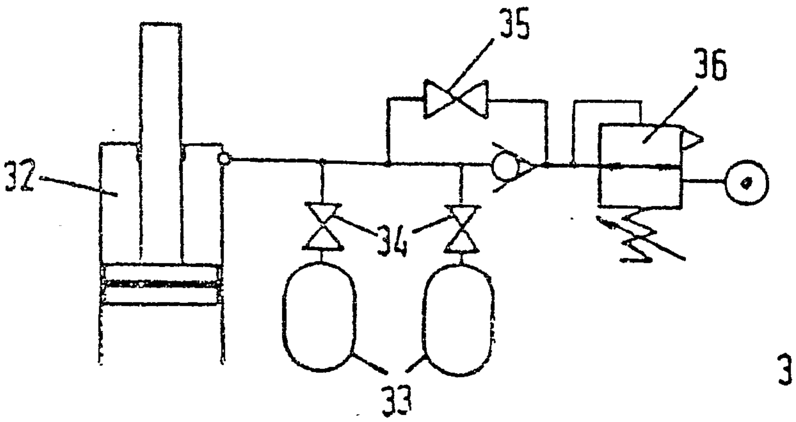


Fig. 108

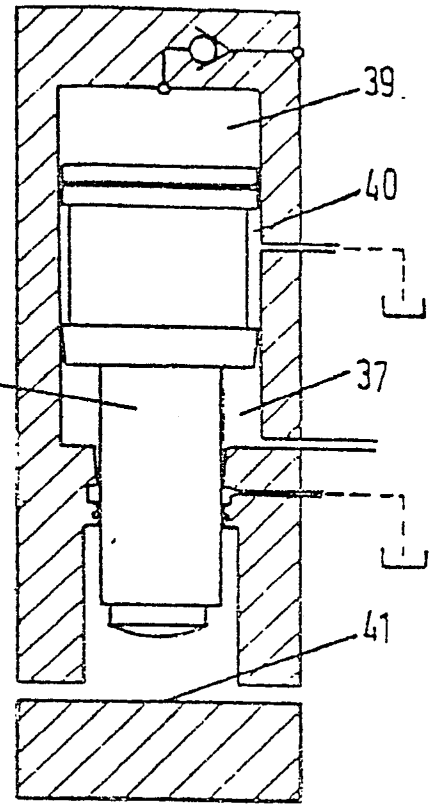


Fig. 109

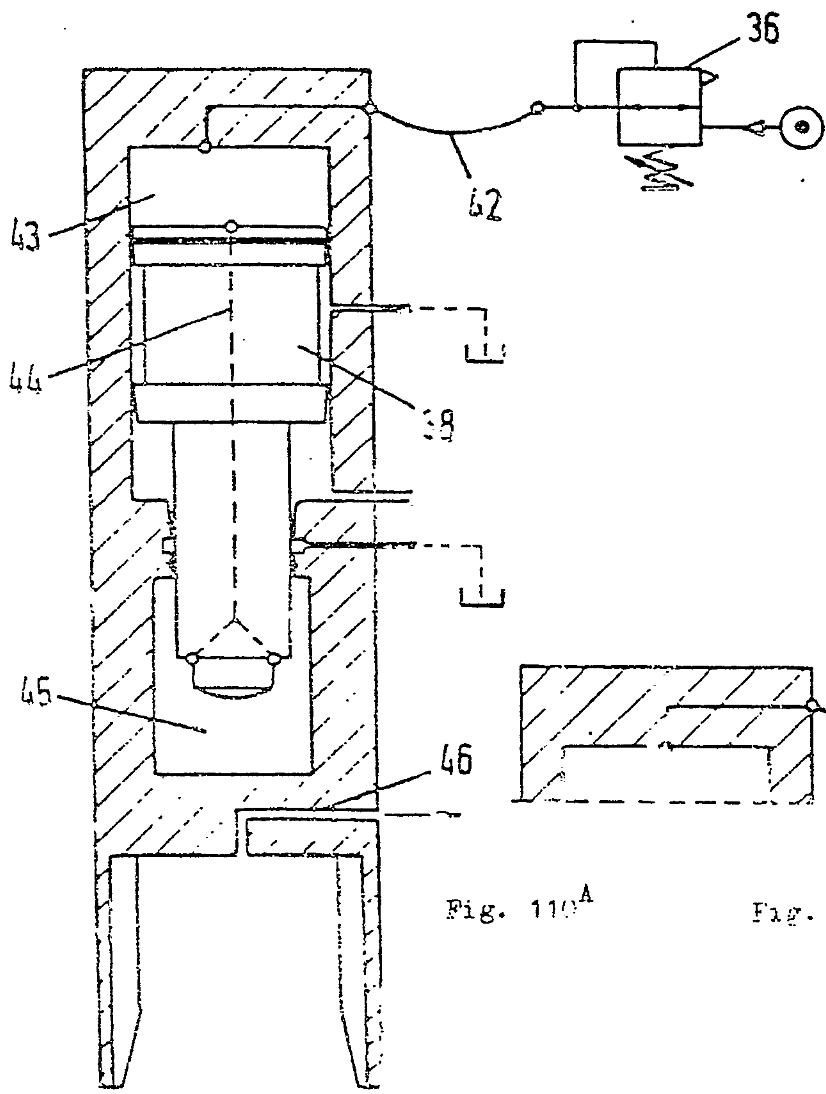


Fig. 110A

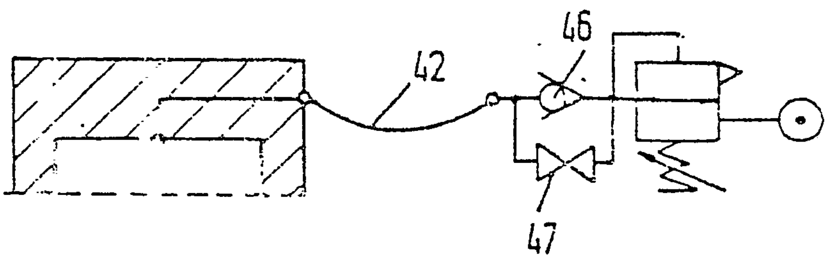


Fig. 110B

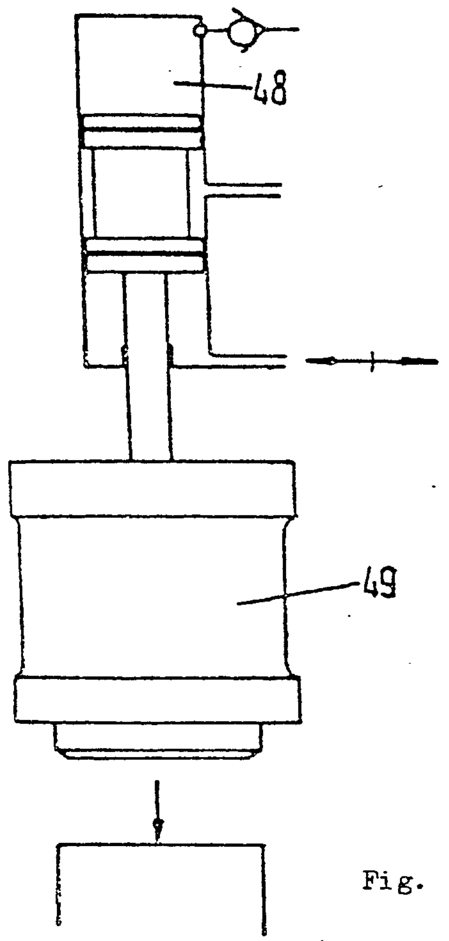


Fig. 111

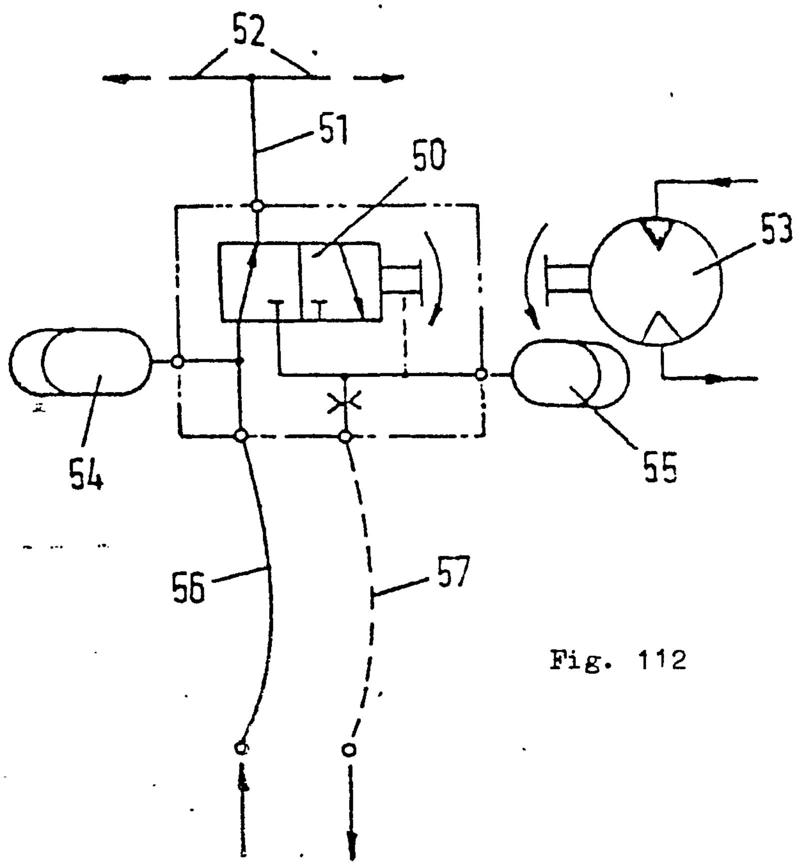


Fig. 112

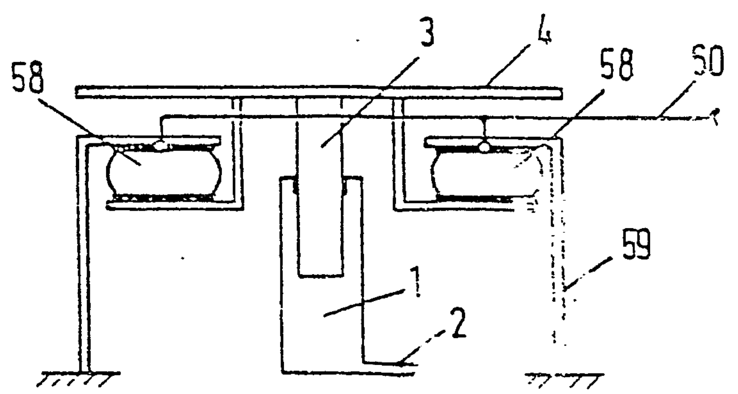


Fig. 113

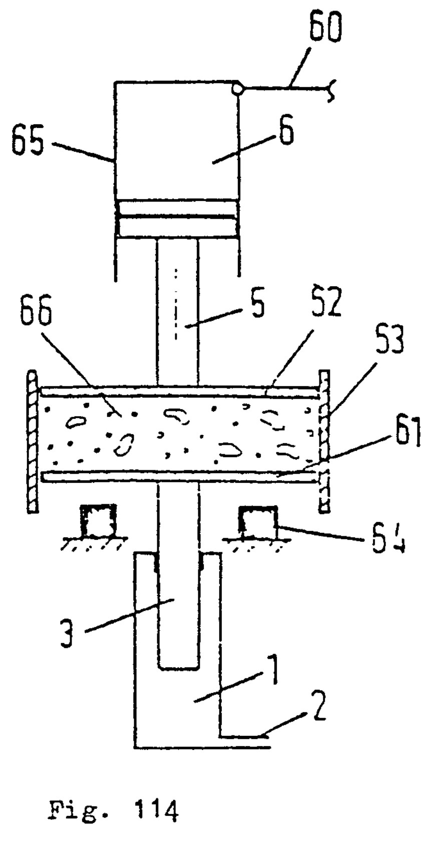
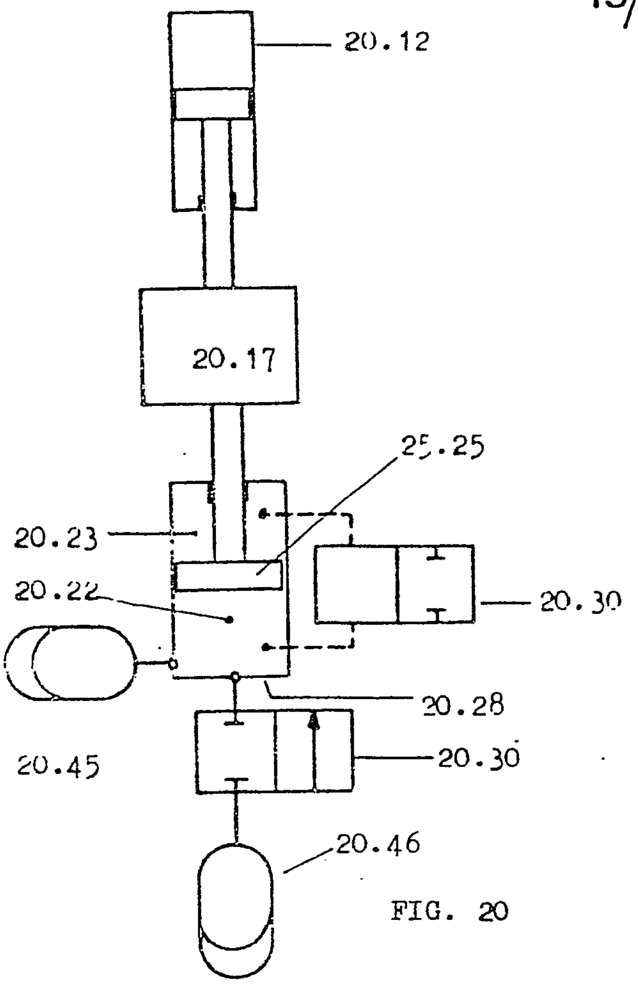


Fig. 114



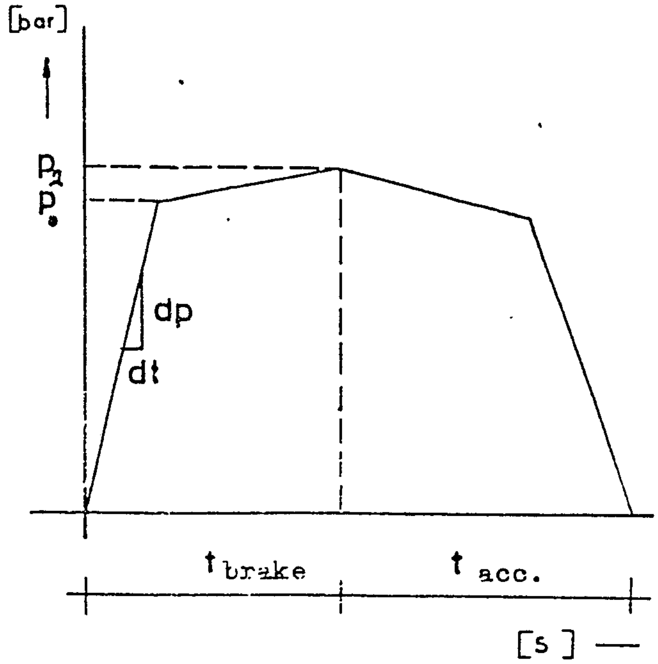


FIG. 20

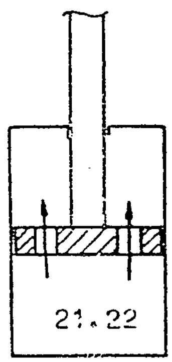


FIG. 21

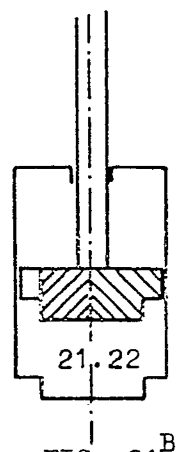
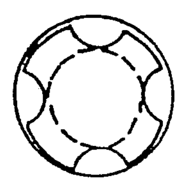


FIG. 21B



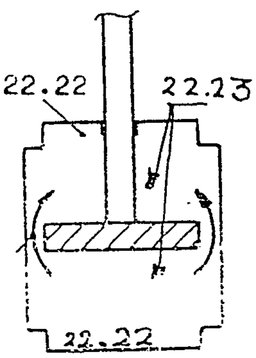


Fig. 22

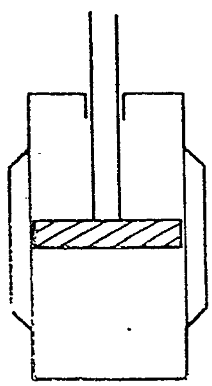
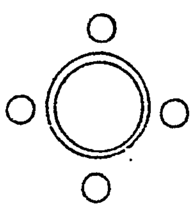


Fig. 22B



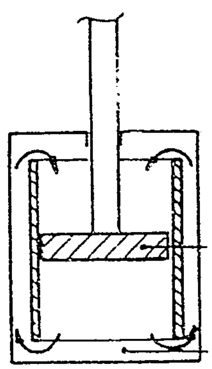


FIG. 23

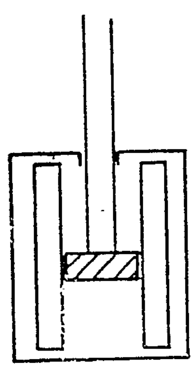
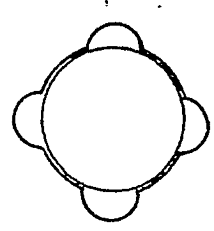


FIG. 23B



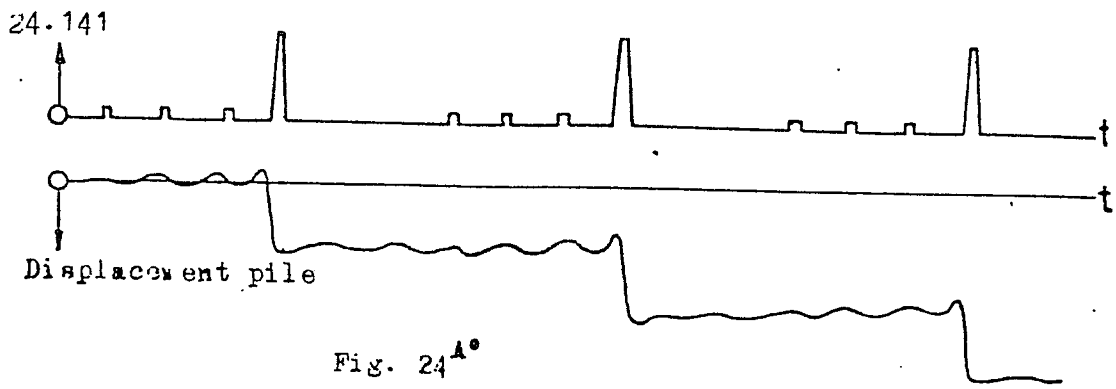


Fig. 24A°

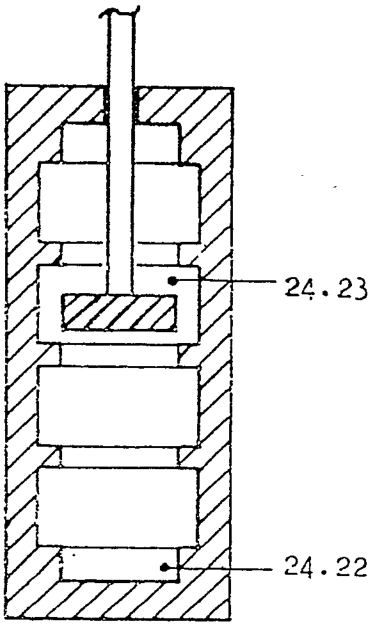


Fig. 24A

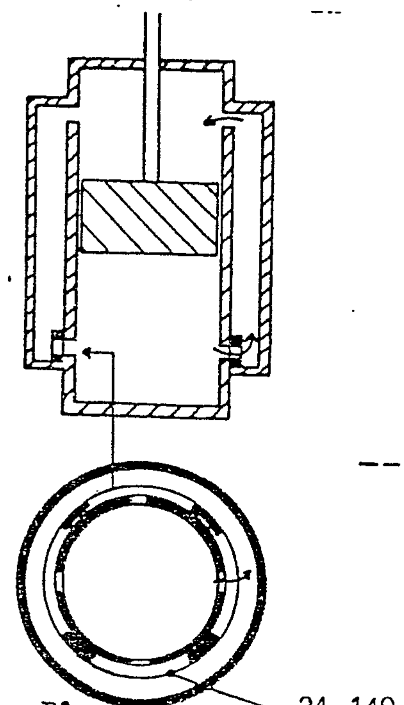


Fig. 24B°

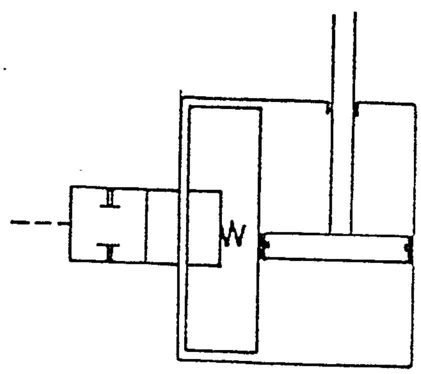


Fig. 24B

Fig. 24C°

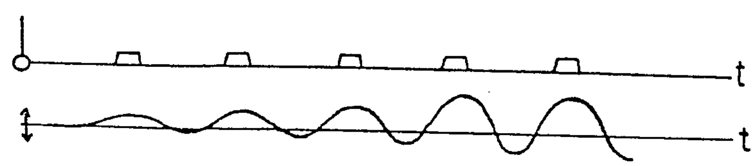
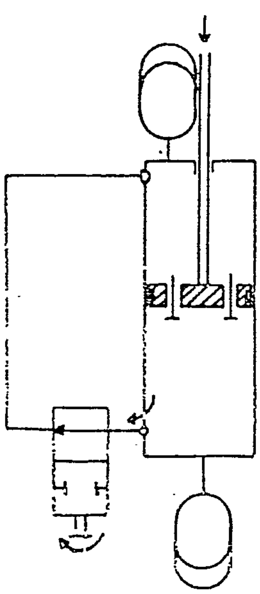


Fig. 24B



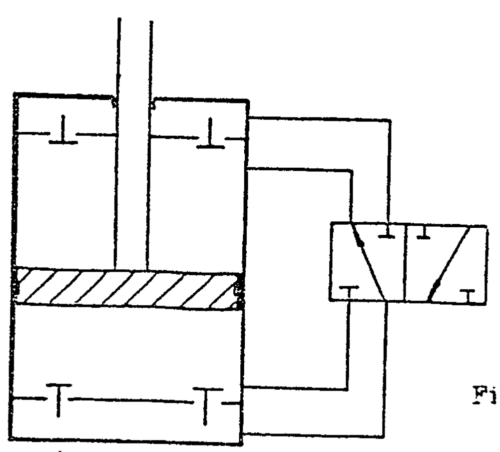


Fig. 24C

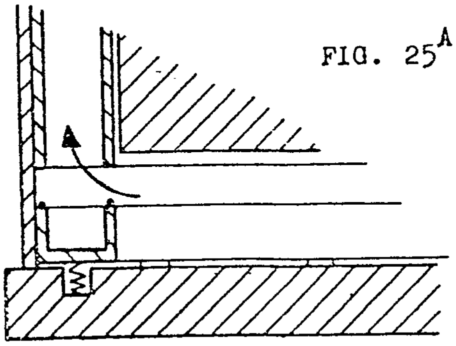


FIG. 25A

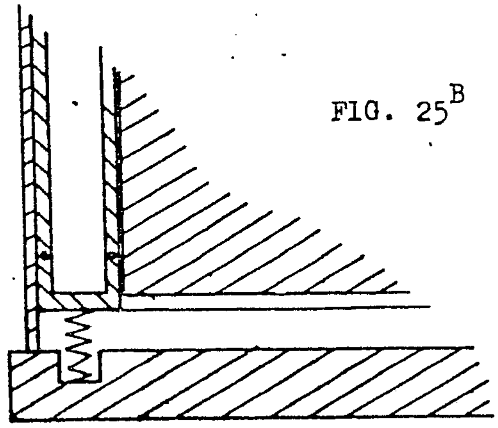


FIG. 25B

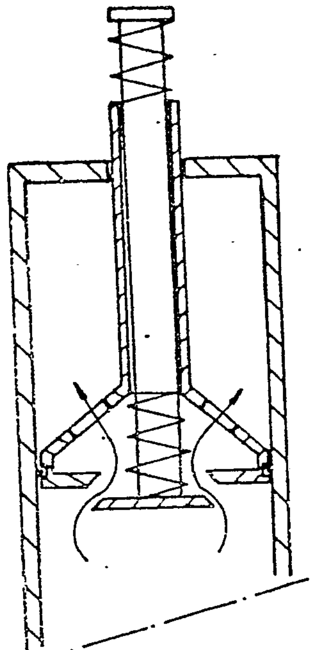


FIG.25C

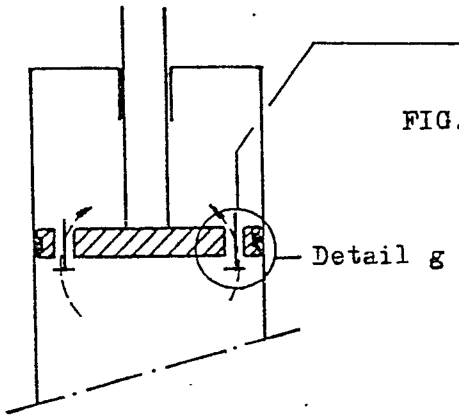


FIG.25E

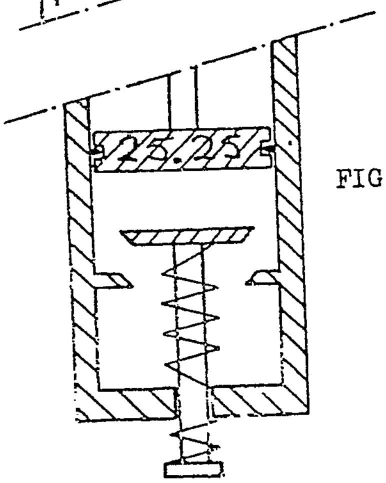


FIG.25D

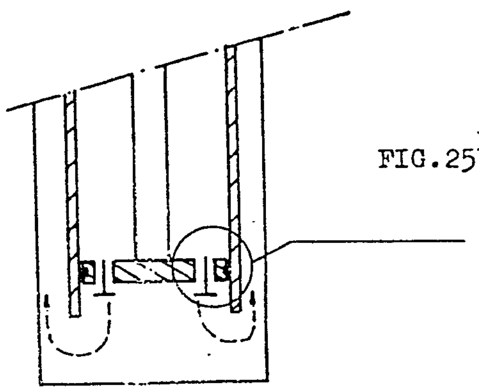


FIG.25F

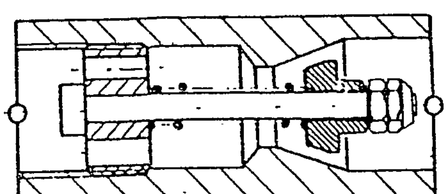


FIG.25G

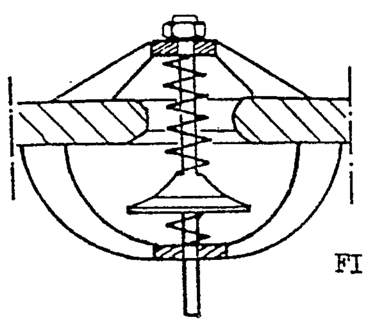


FIG.25H

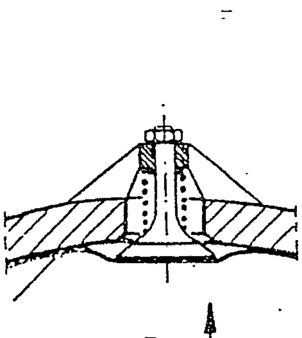


FIG.26D

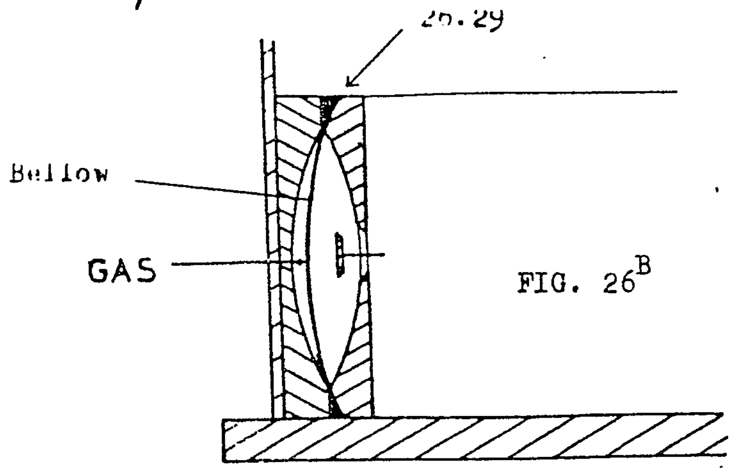


FIG. 26B

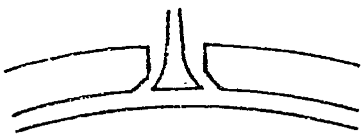


FIG.26E

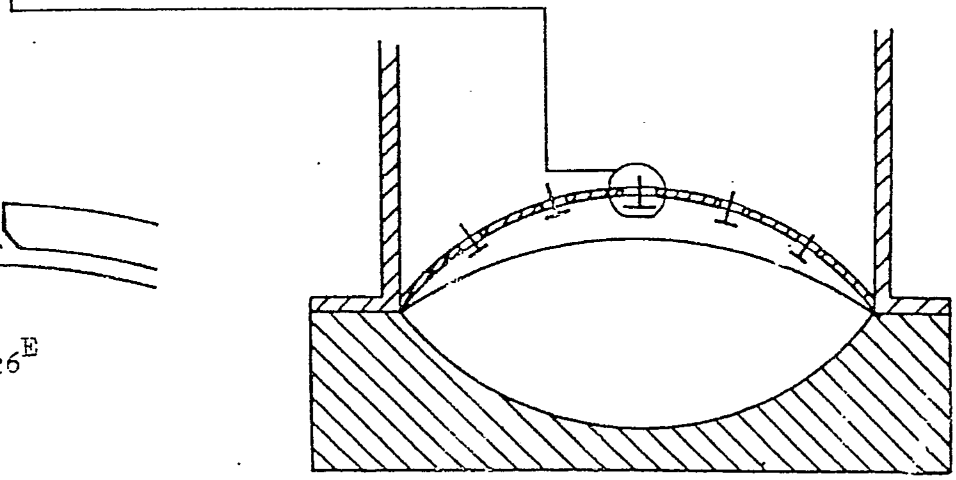


FIG. 26A

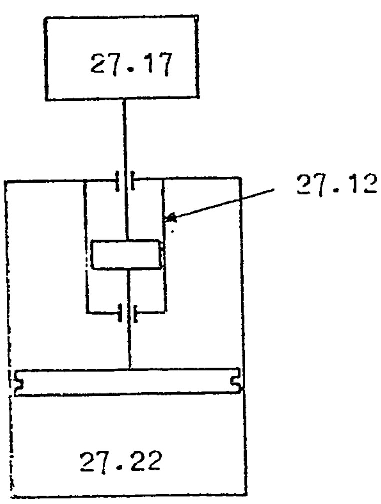


FIG. 27A

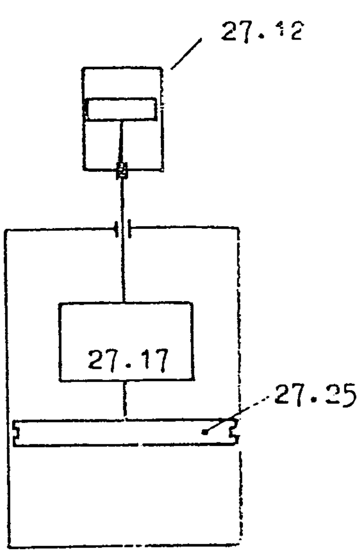


FIG. 27B

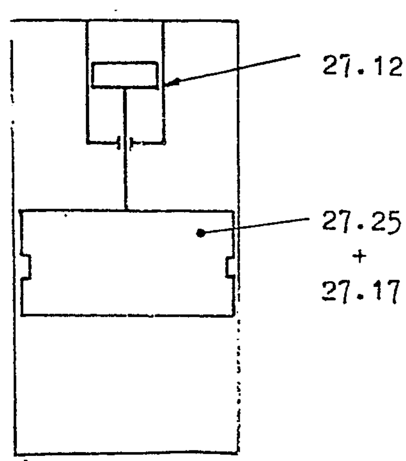


FIG. 27C

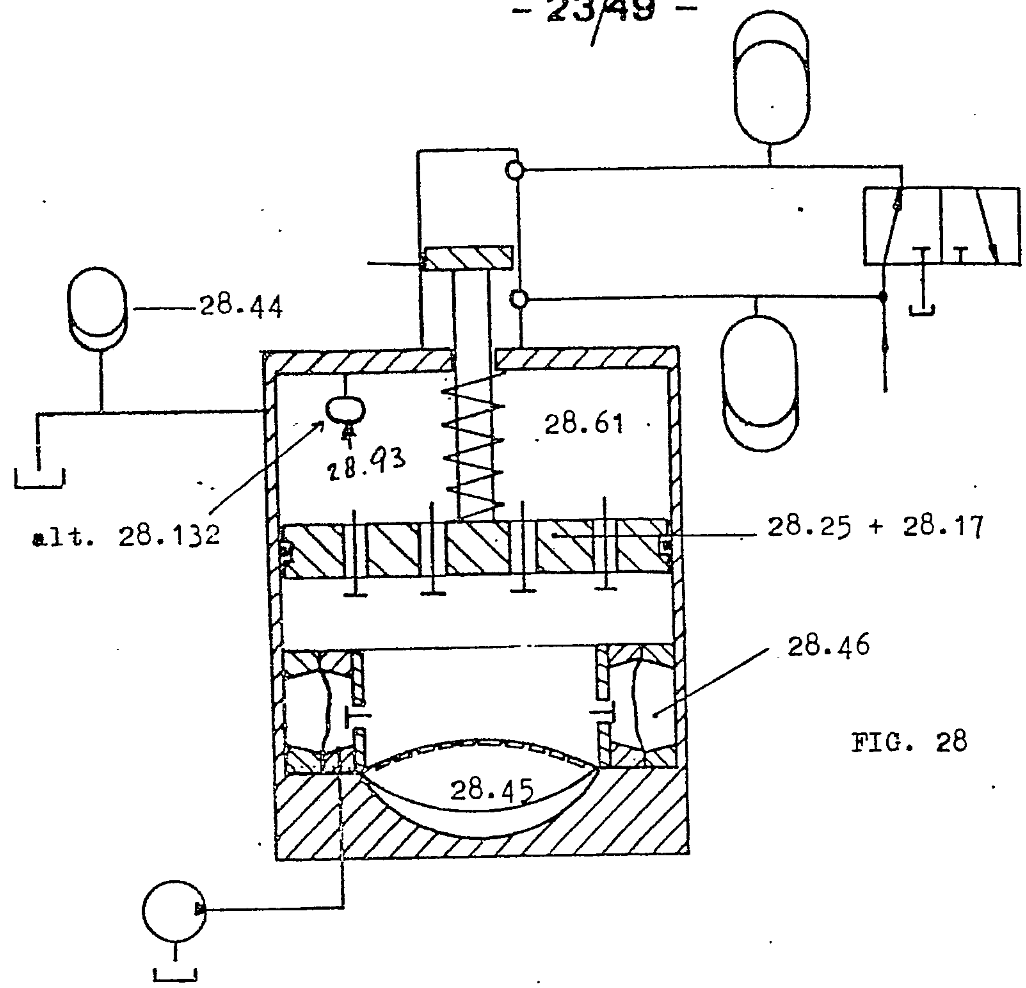


FIG. 28

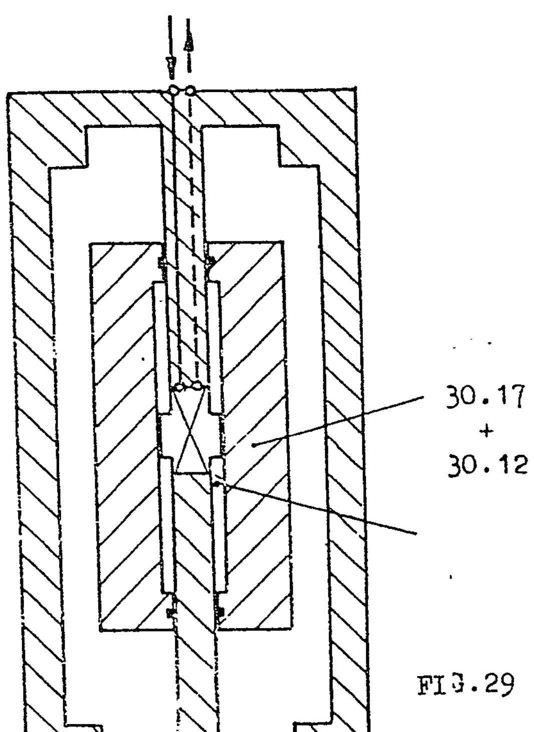


FIG.29

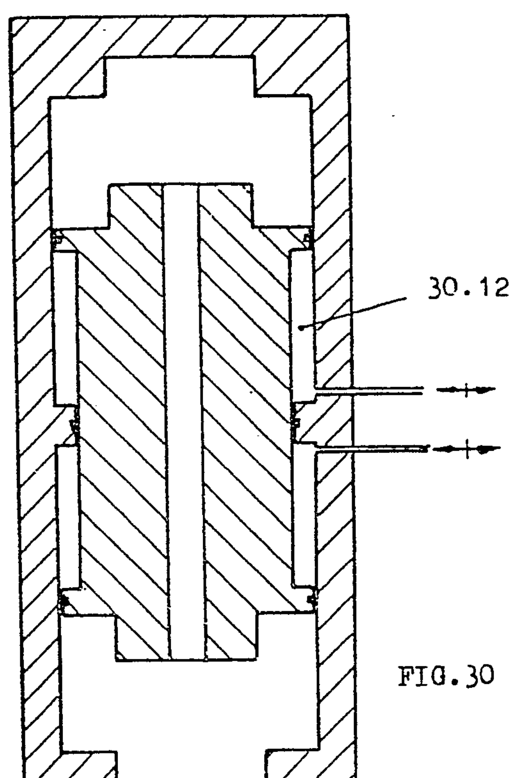


FIG.30

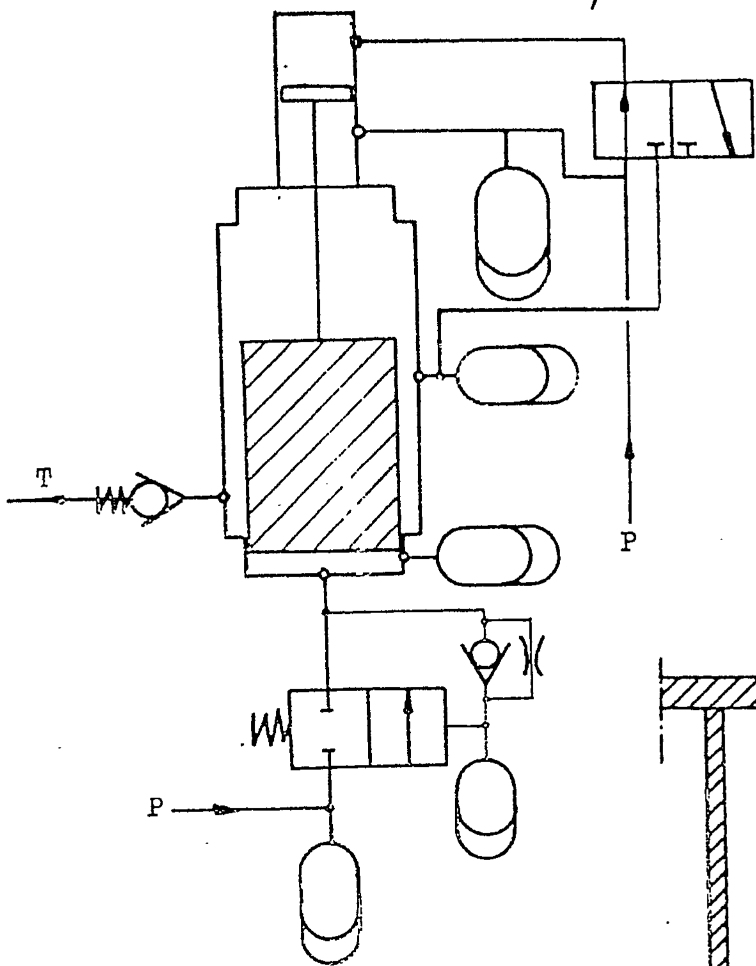


Fig. 31A

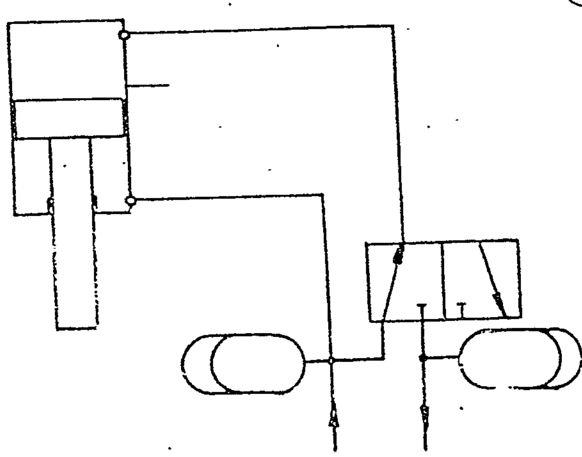
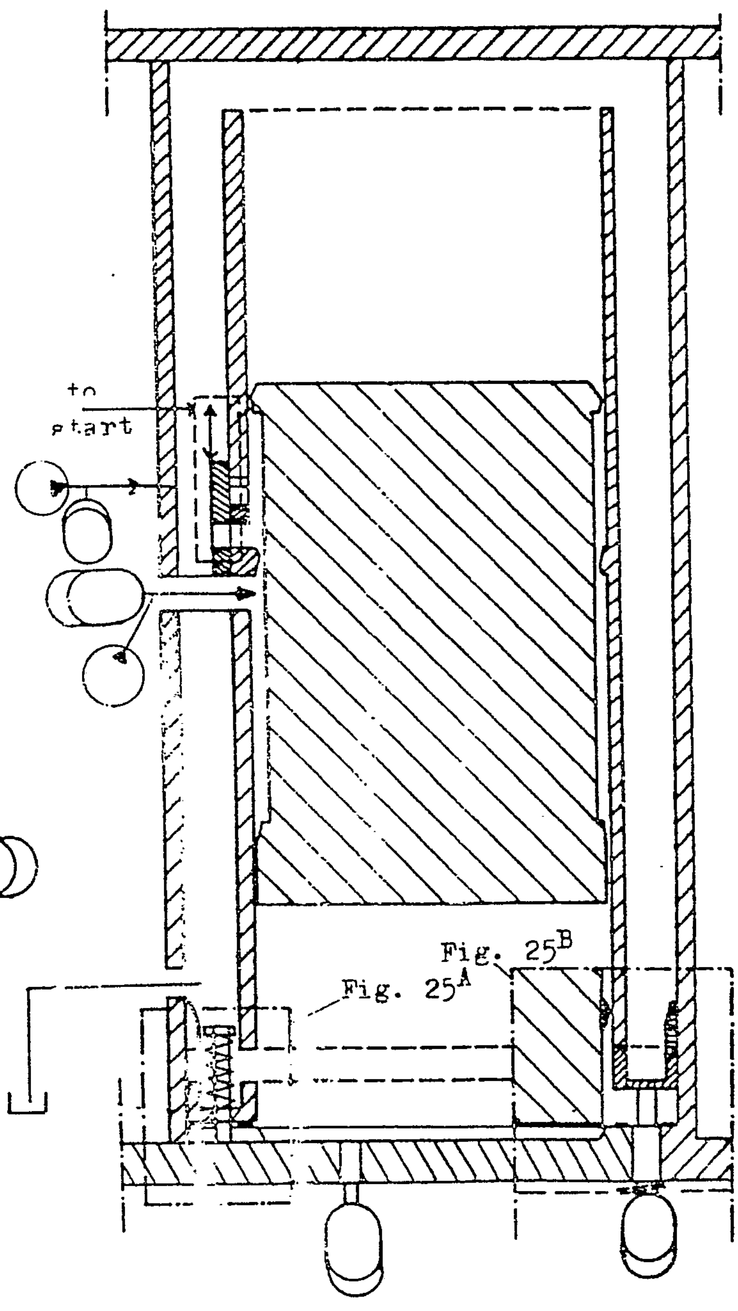


Fig.

Fig. 31B



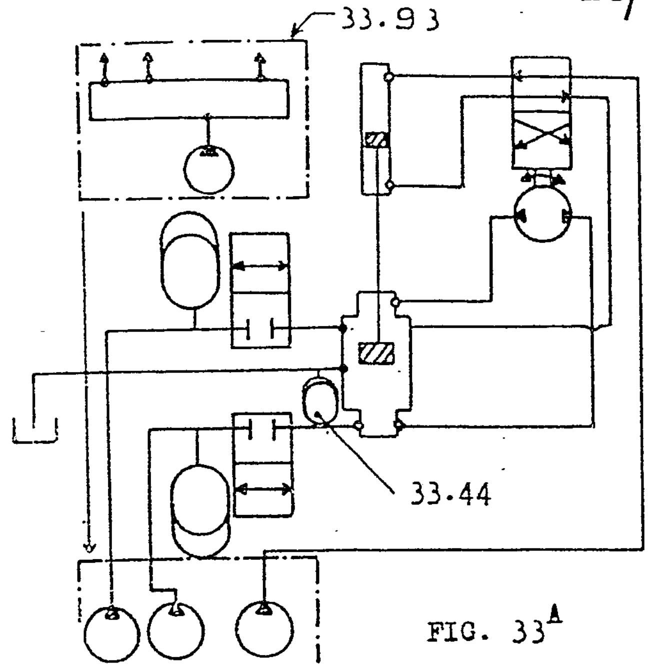


FIG. 33A

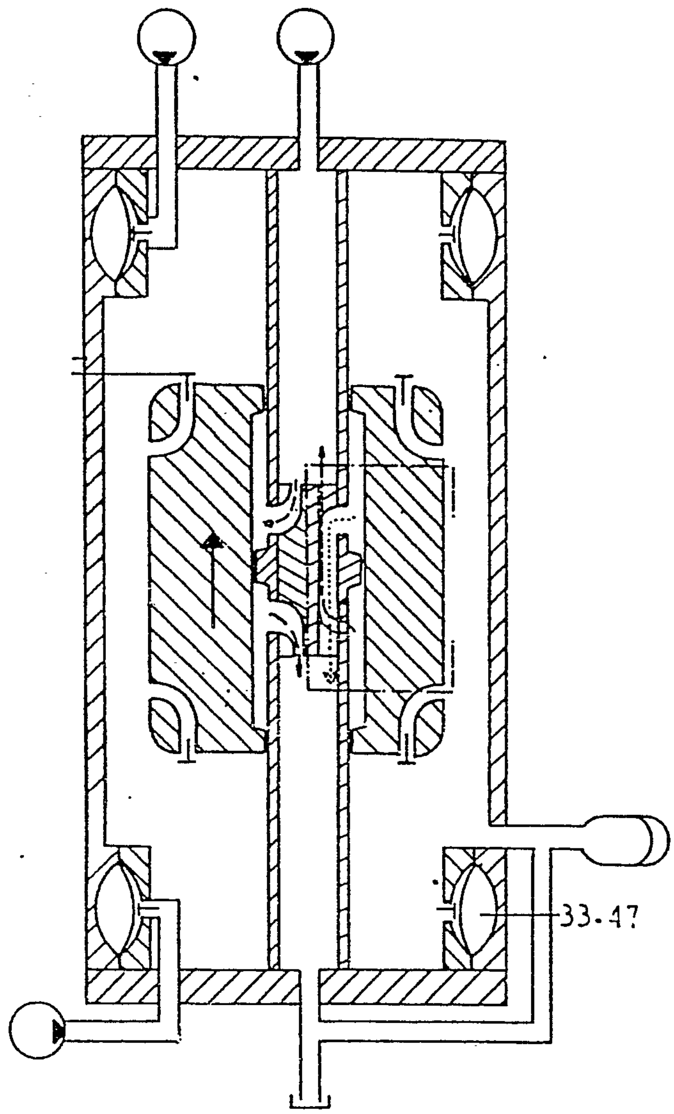


FIG. 33B

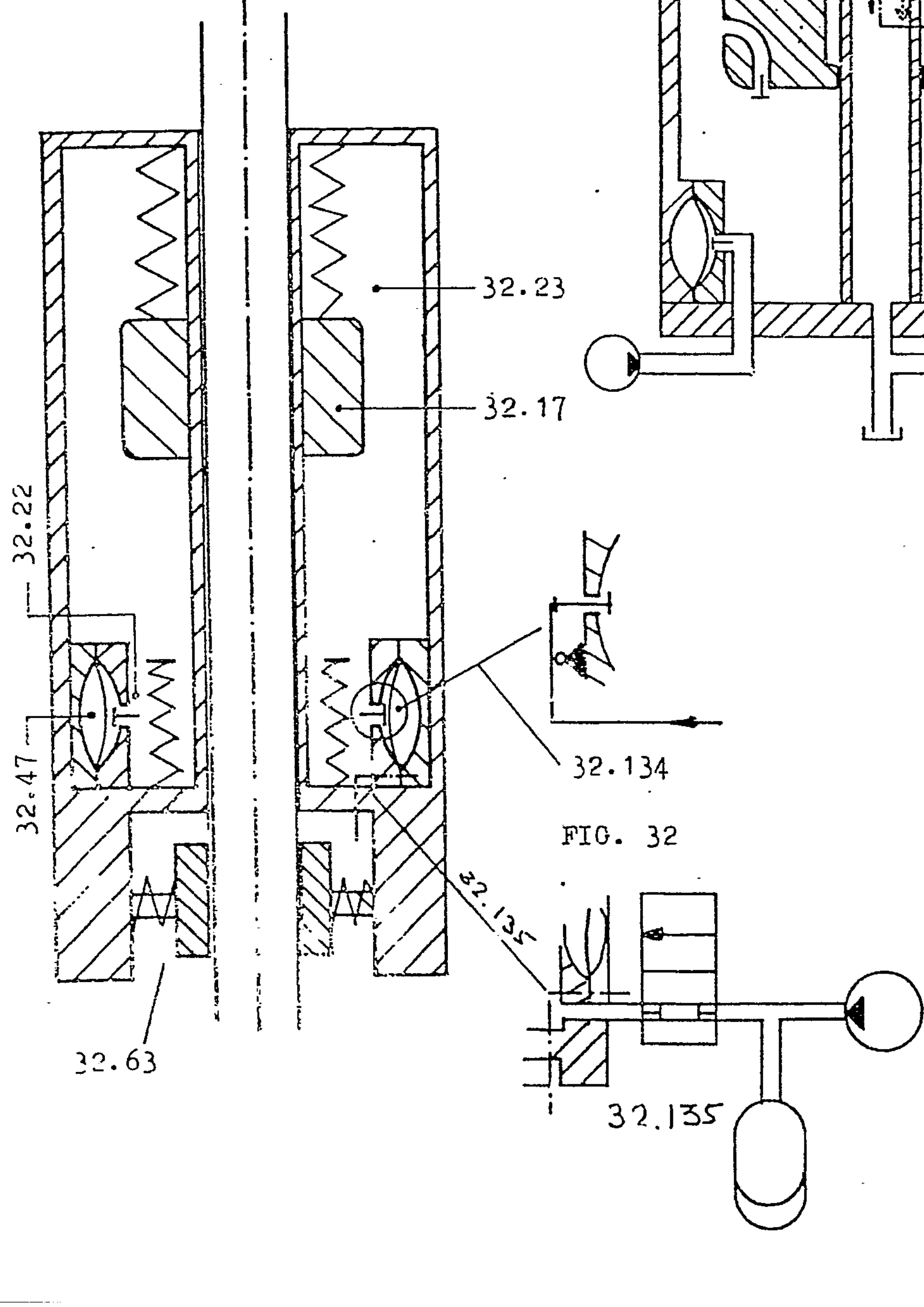


FIG. 32

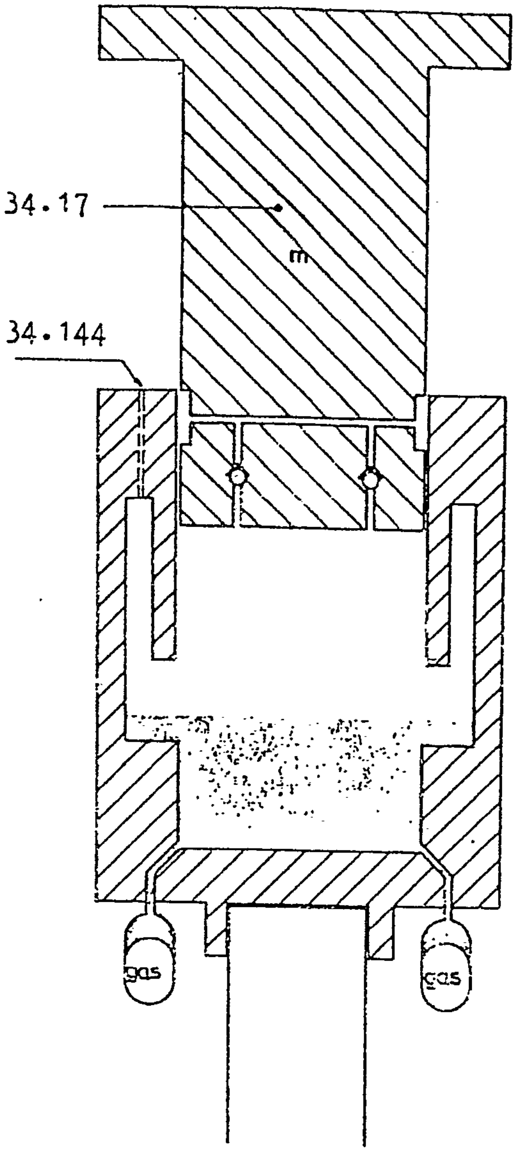


FIG. 34A

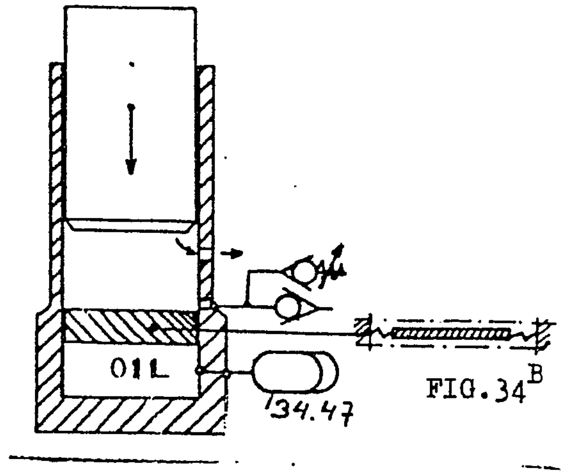


FIG. 34C

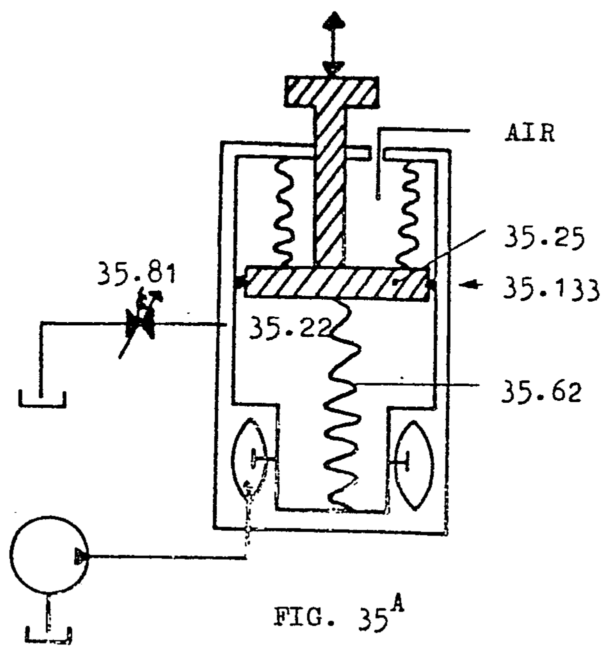


FIG. 35A

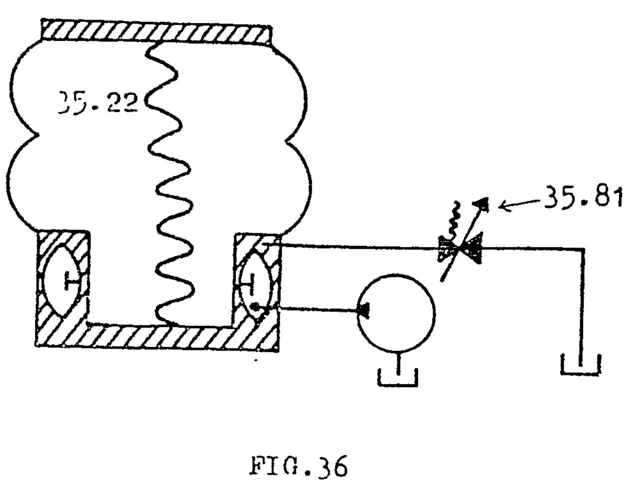


FIG. 36

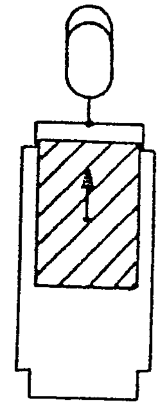


Fig 36

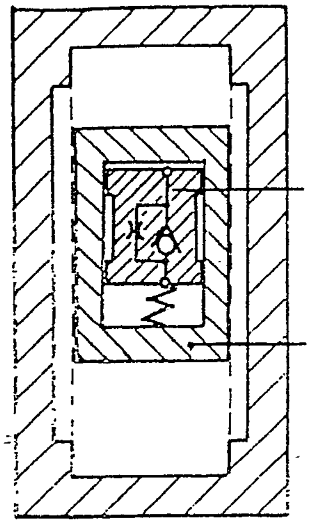


FIG. 37A

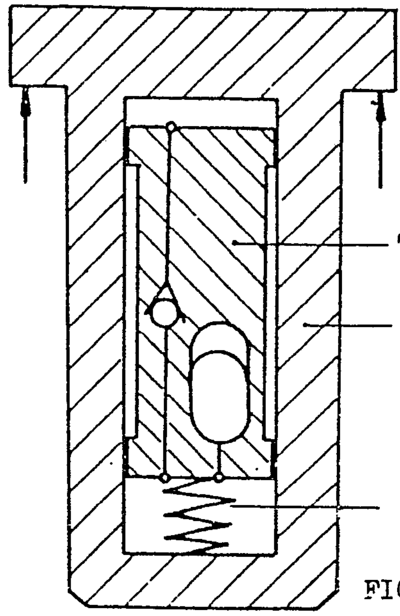


FIG. 37B

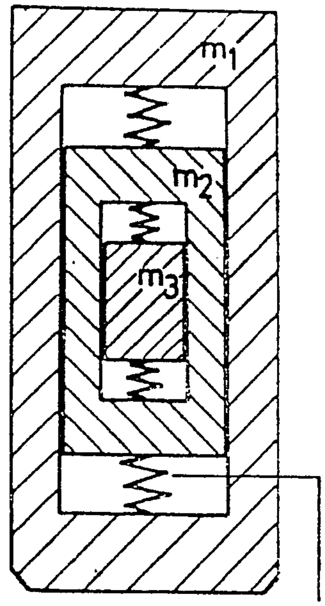


FIG. 37C

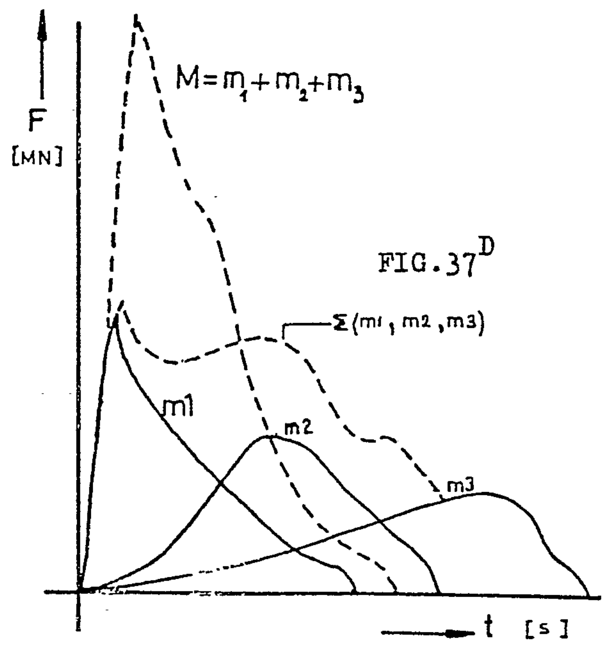


FIG. 37D

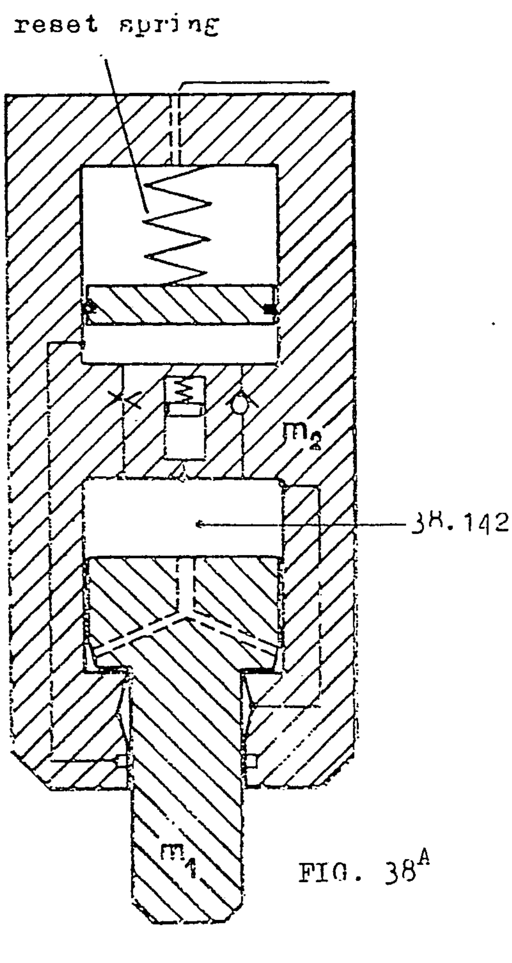


FIG. 38A

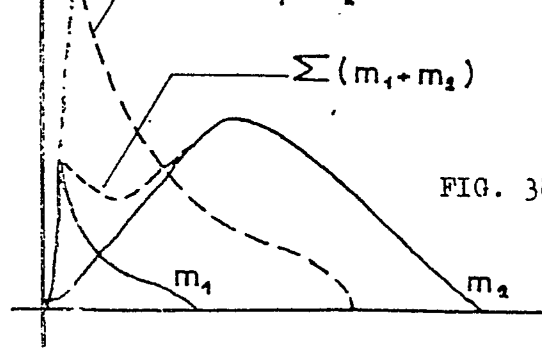


FIG. 38B

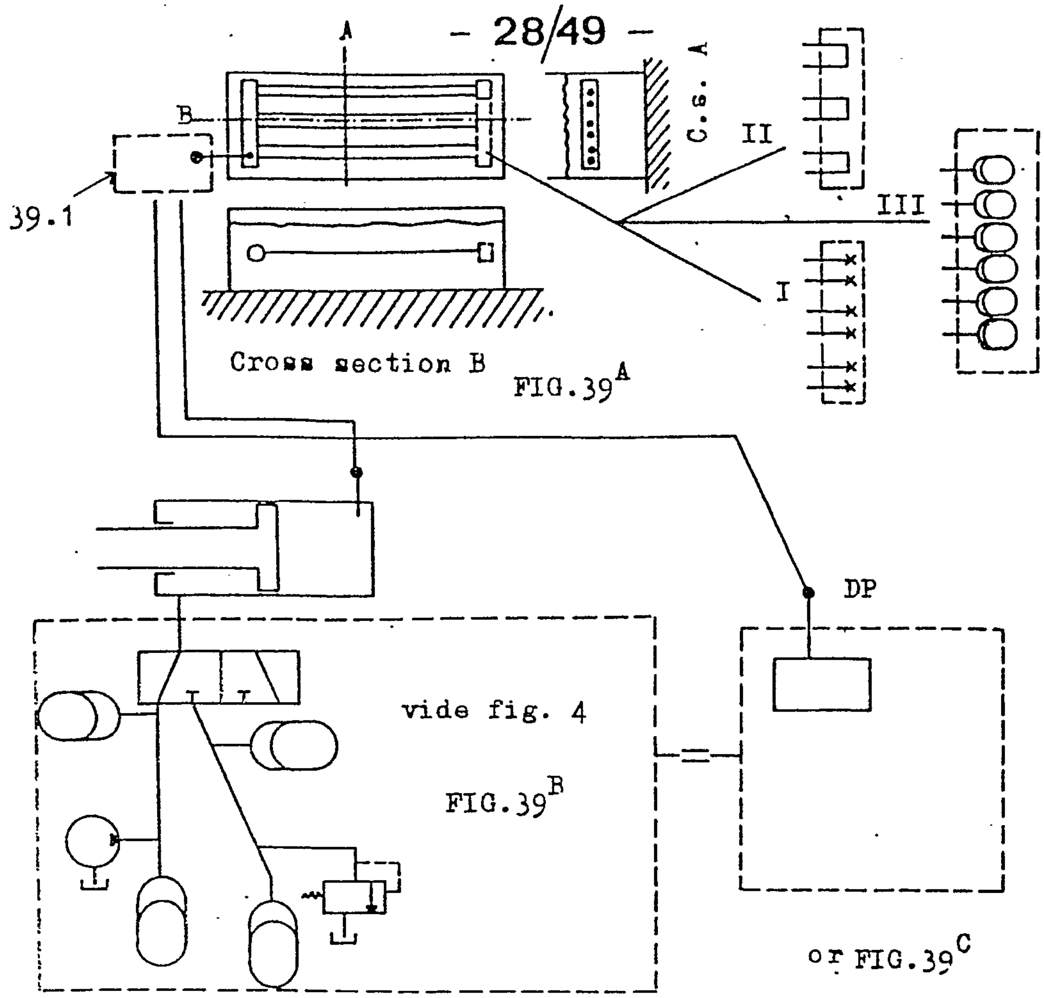


FIG.39A

FIG.39B

or FIG.39C

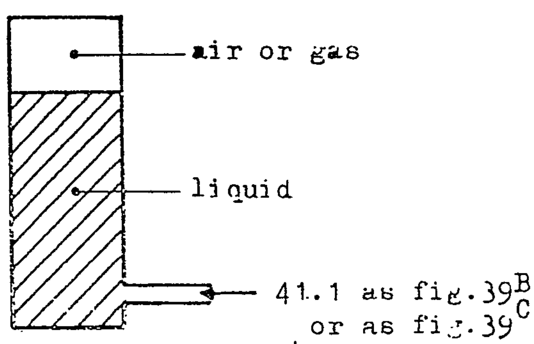


FIG.41A

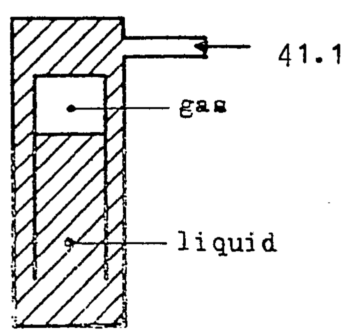


FIG.41B

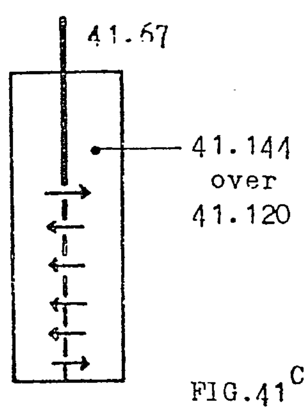


FIG.41C

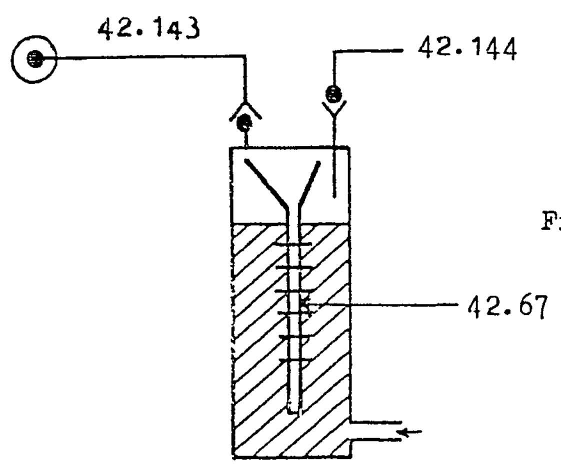


Fig. 42

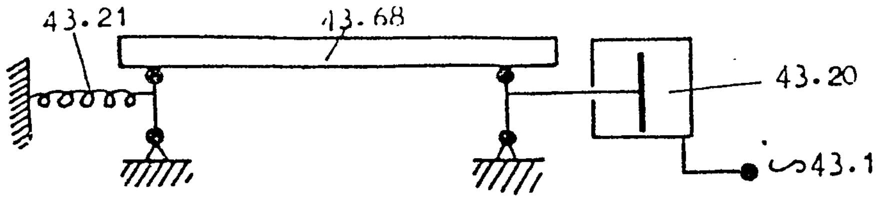


FIG. 43

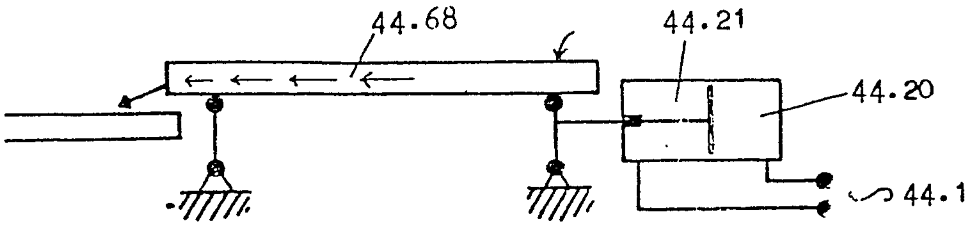


FIG. 44

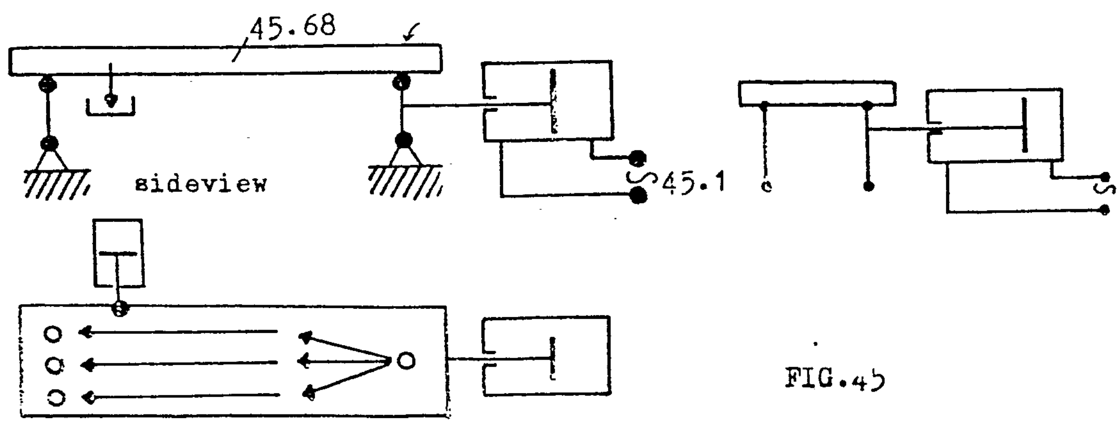


FIG.45

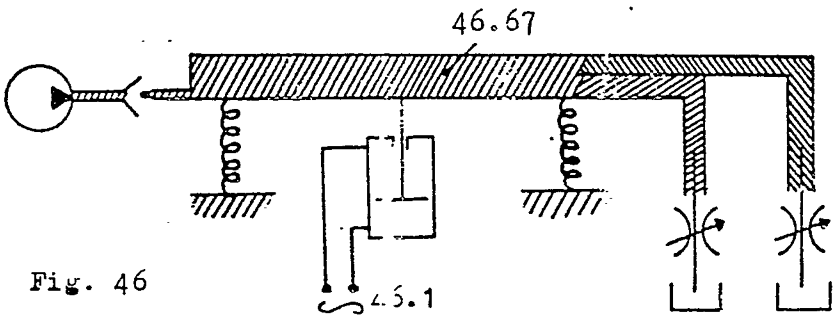


Fig. 46

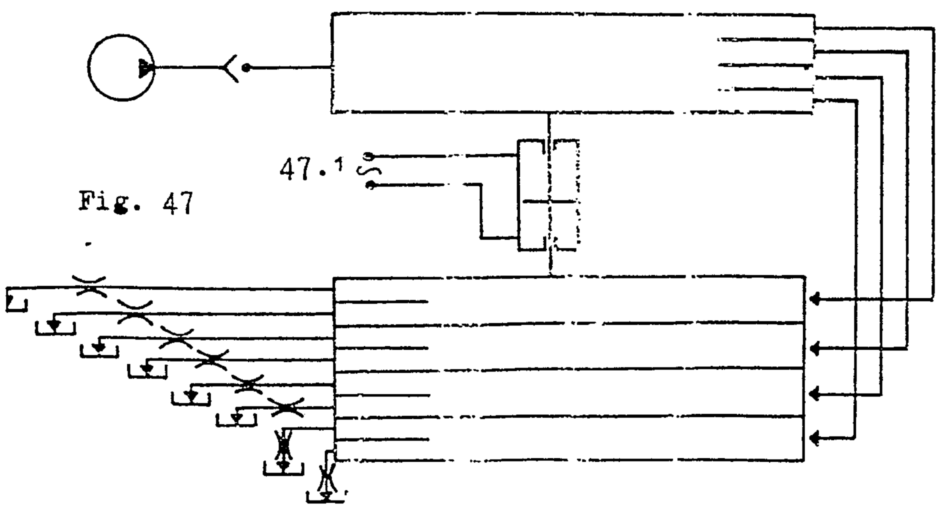


Fig. 47

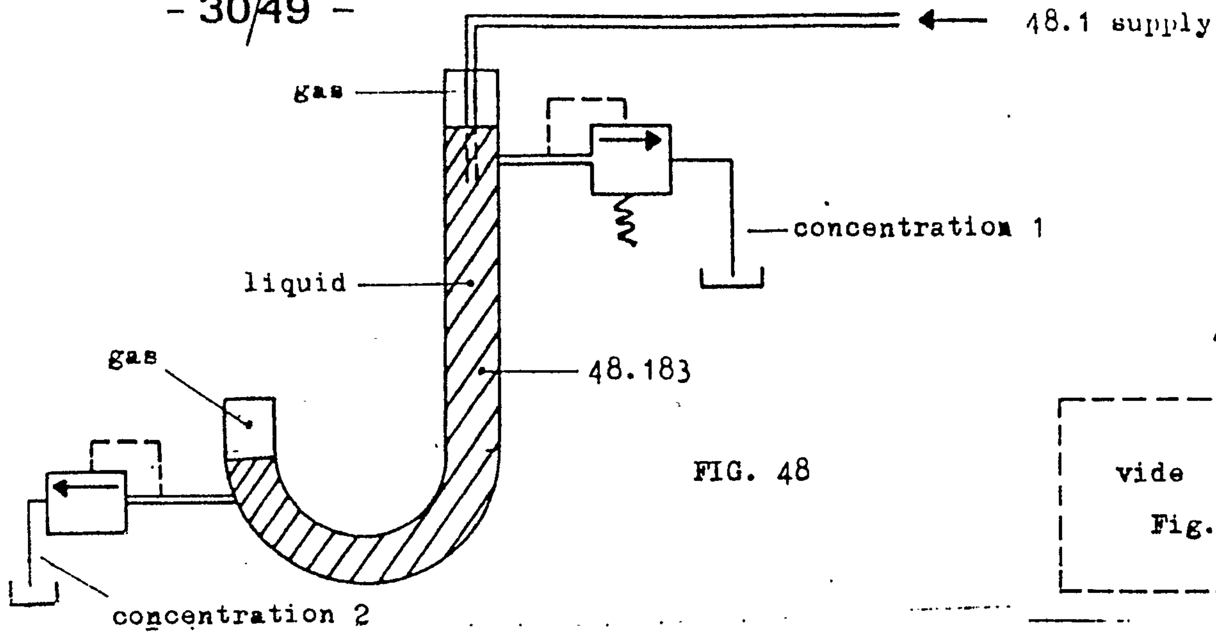


FIG. 48

vide

Fig. 4

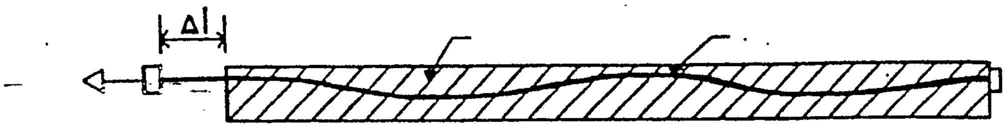
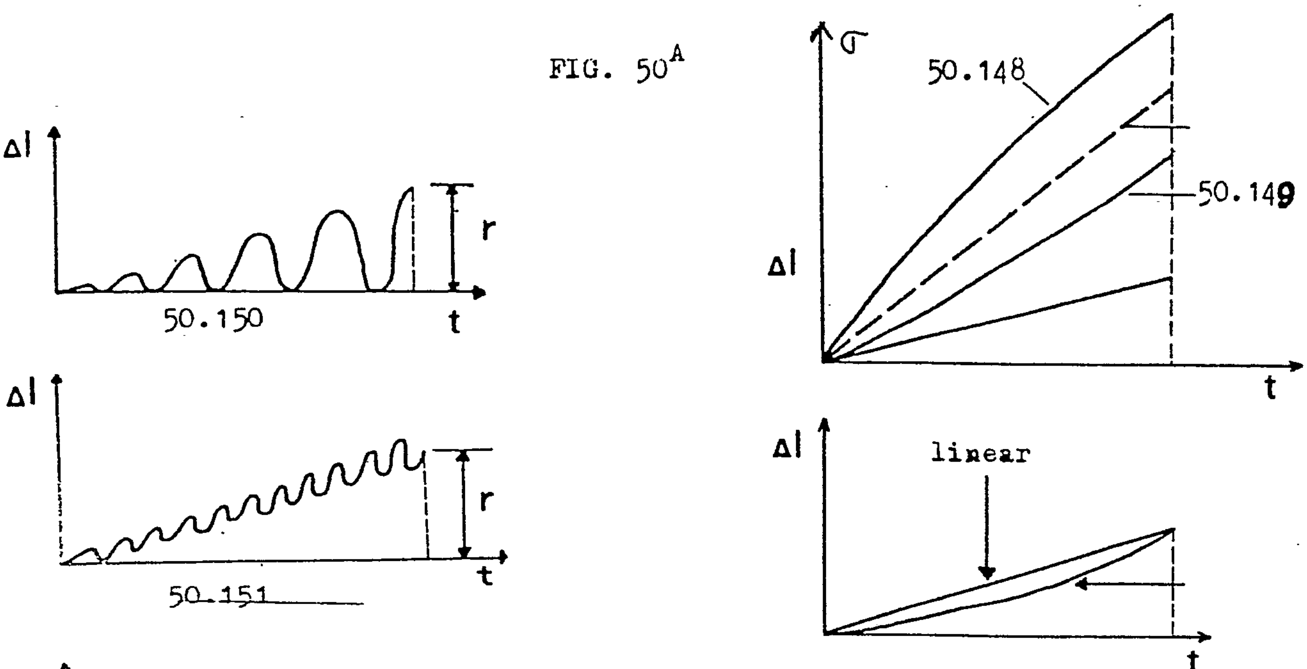


FIG. 50[A]



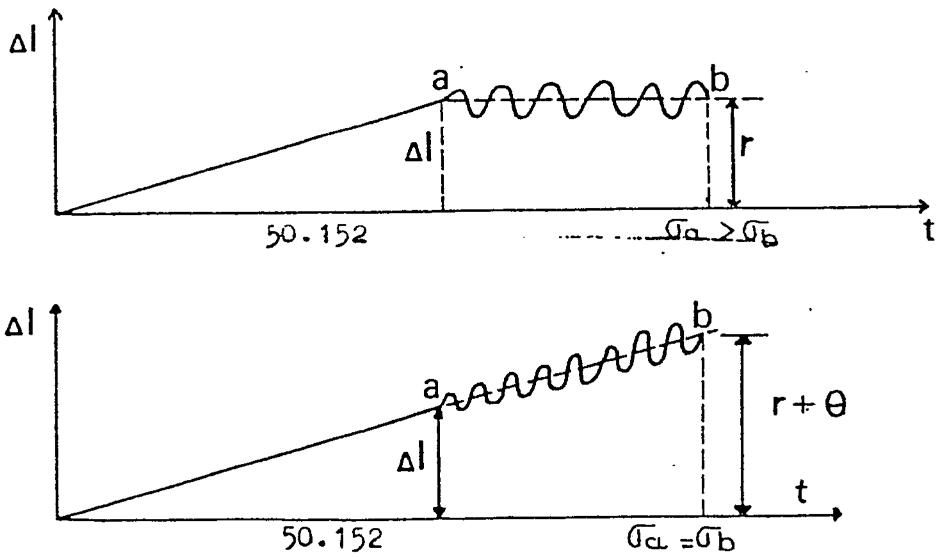
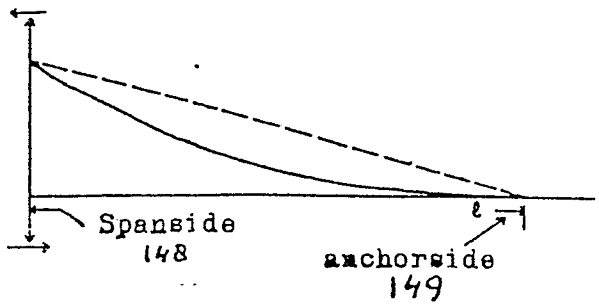
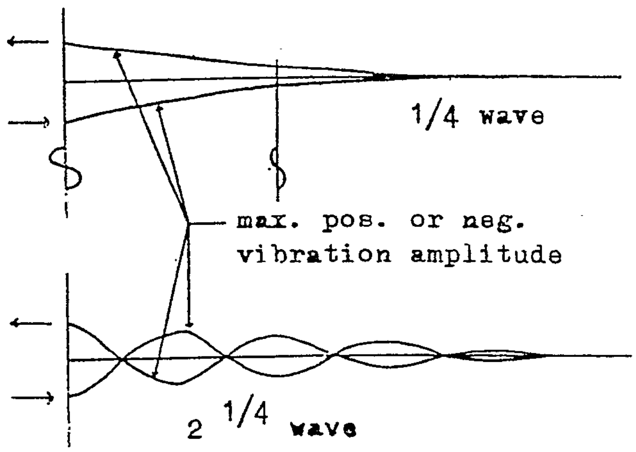


FIG 50[B]

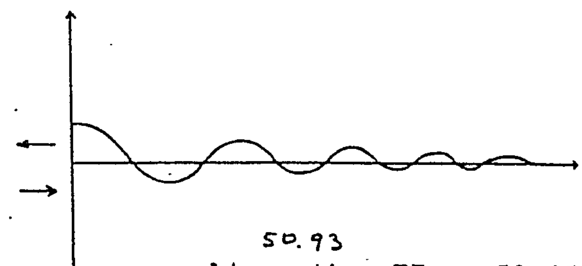
Fig. 50^C



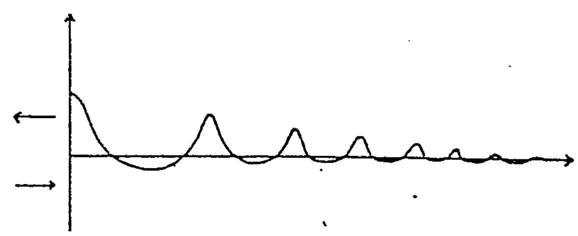
I = 50.153



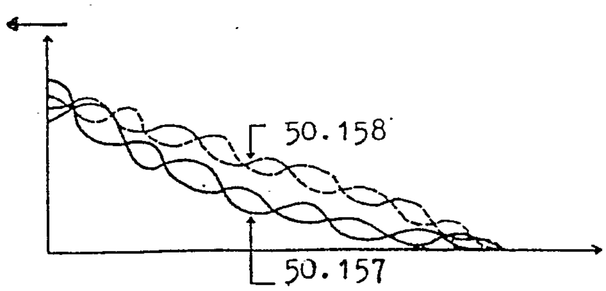
II = 50.154



50.93
alternative IIa = 50.155



50.93 alternative IIb = 50.156



III = I + II

FIG. 51A

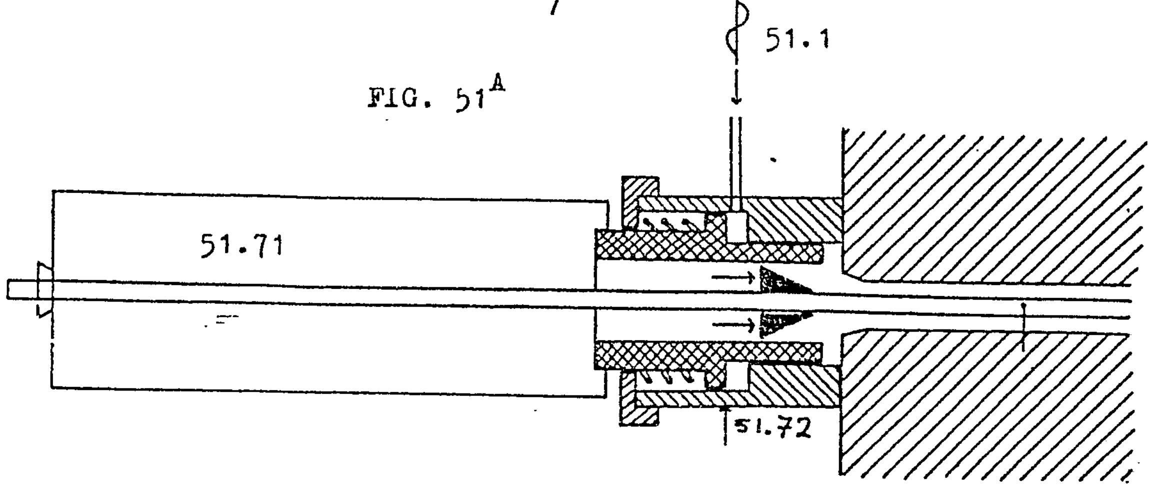
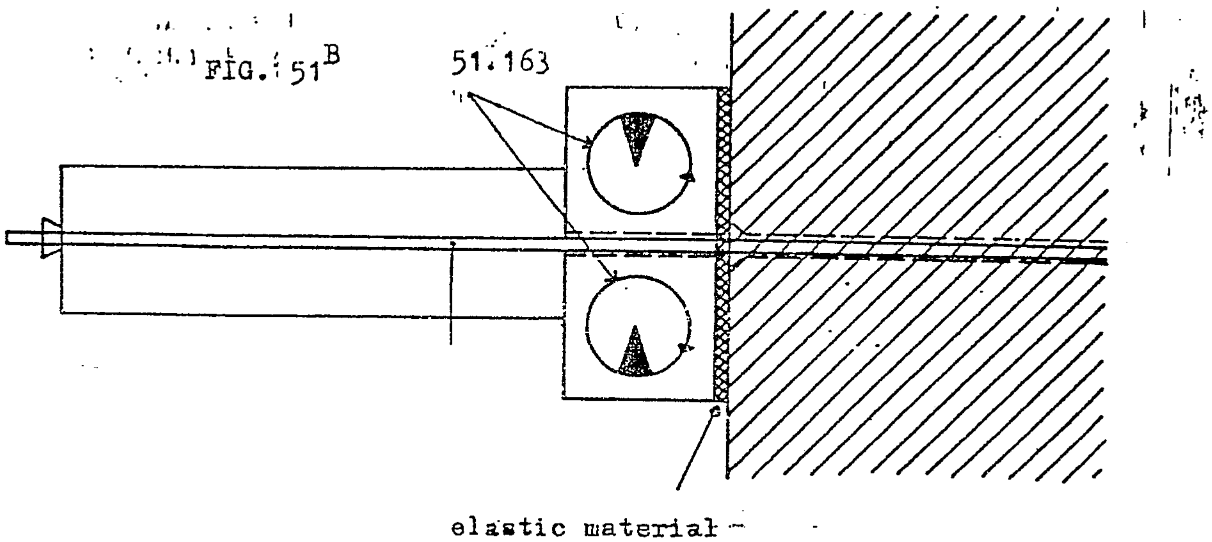


FIG. 51B



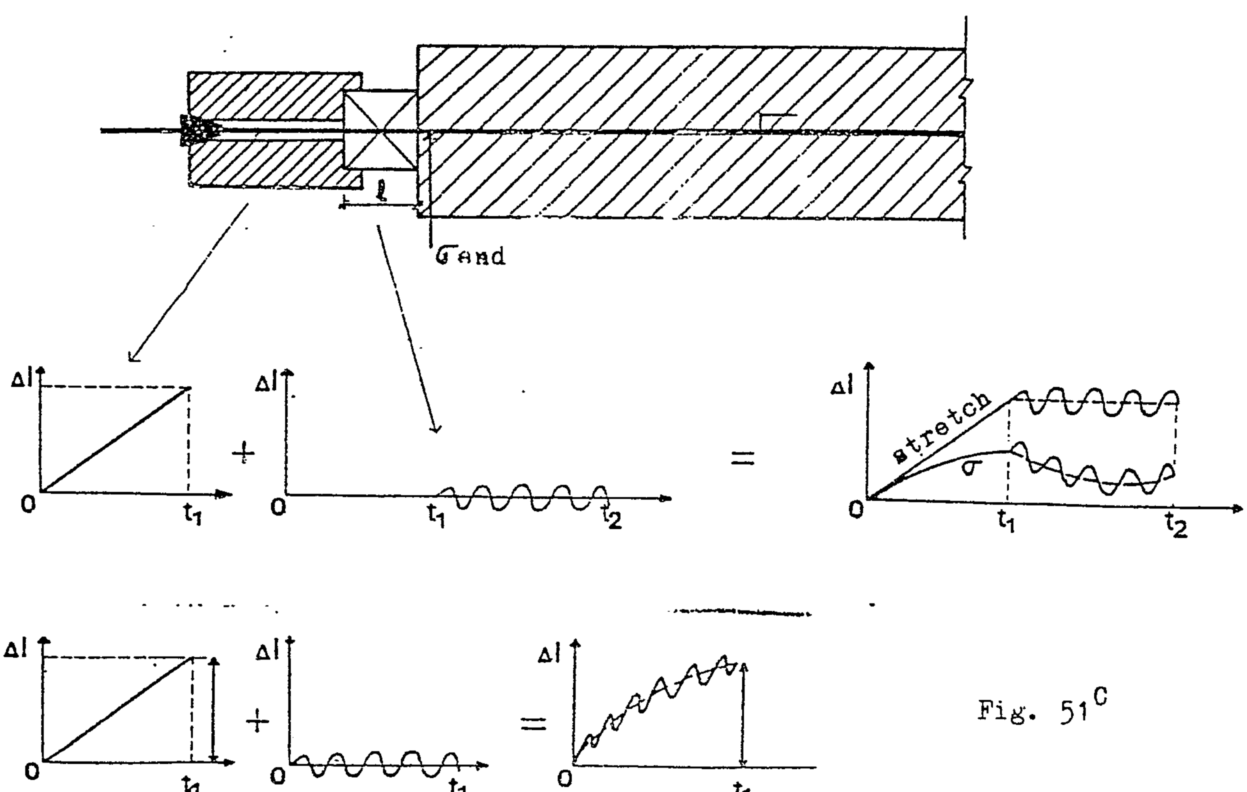
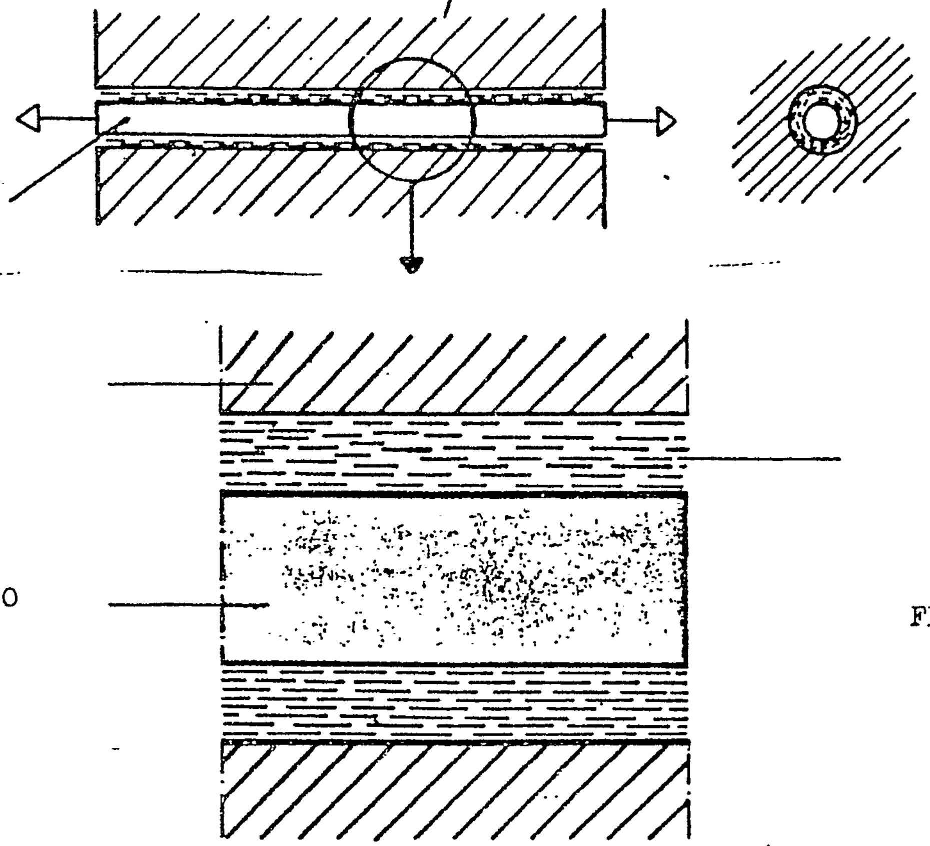


Fig. 51C

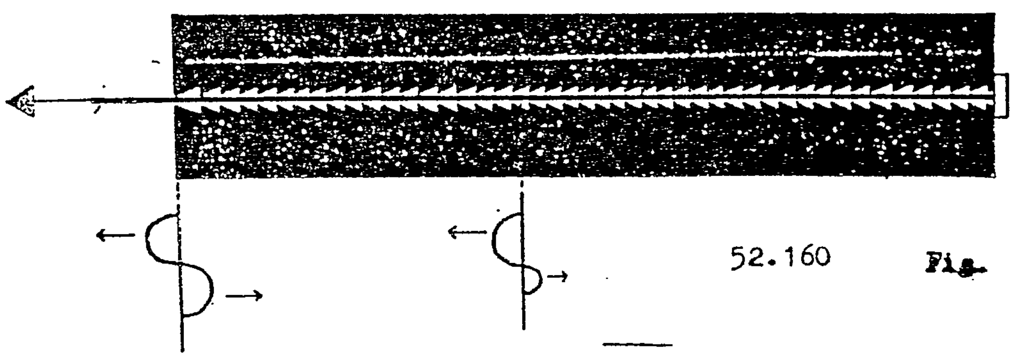
51.161 (incl. 51.162)

52.70



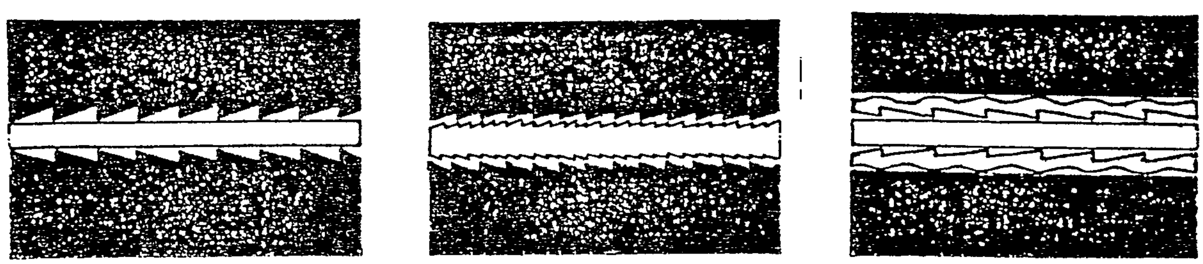
52.70

FIG. 52[A]



52.160

Fig. 52[B]



52.160

52 160

52.160 (70

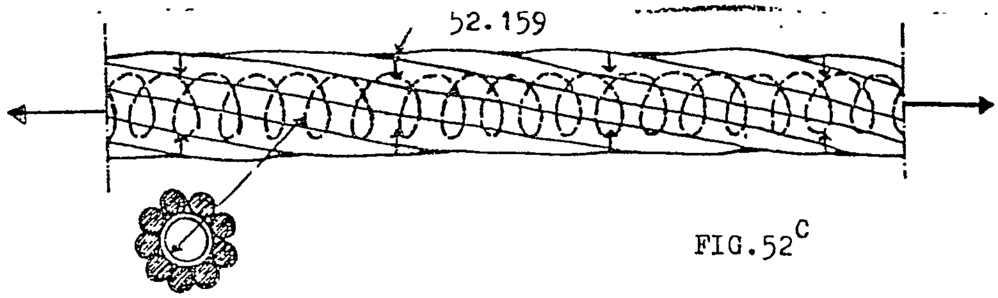


FIG.52[C]

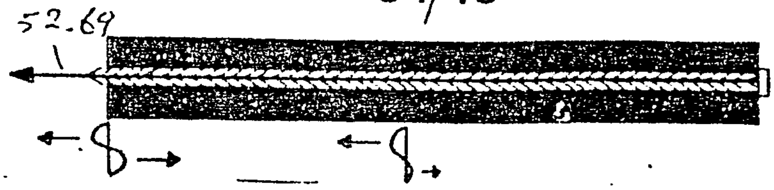
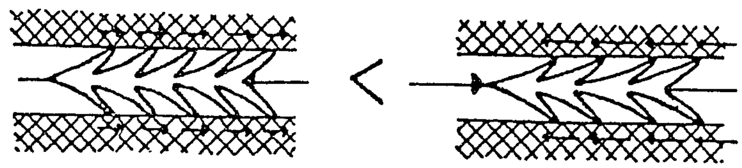
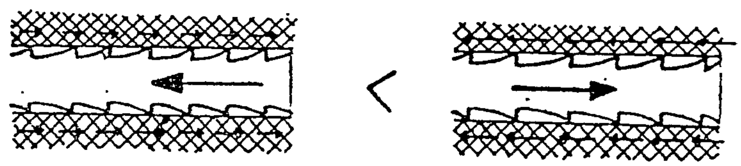


FIG. 52^C



ear of corn



52.69

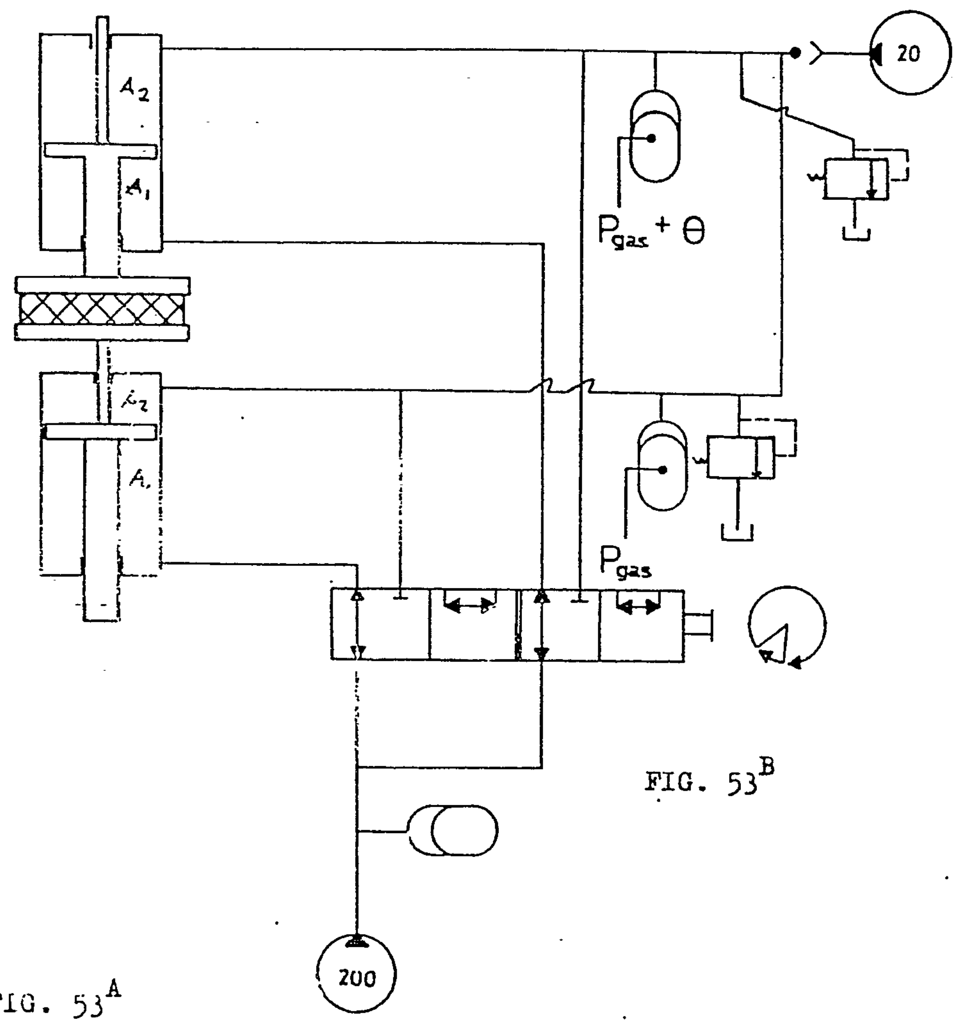


FIG. 53^B

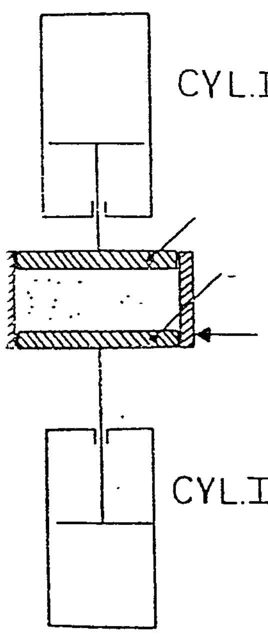


FIG. 53^A

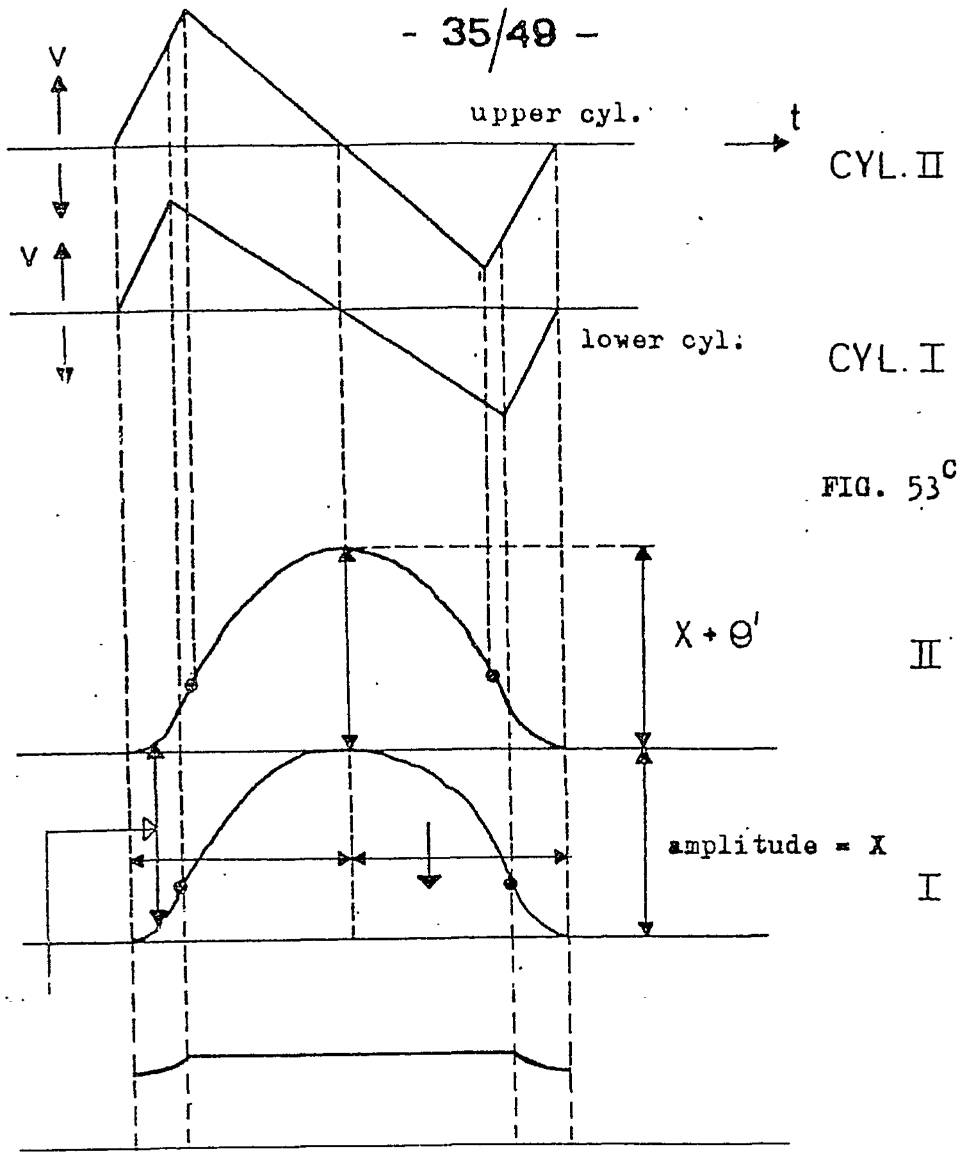


FIG. 53C

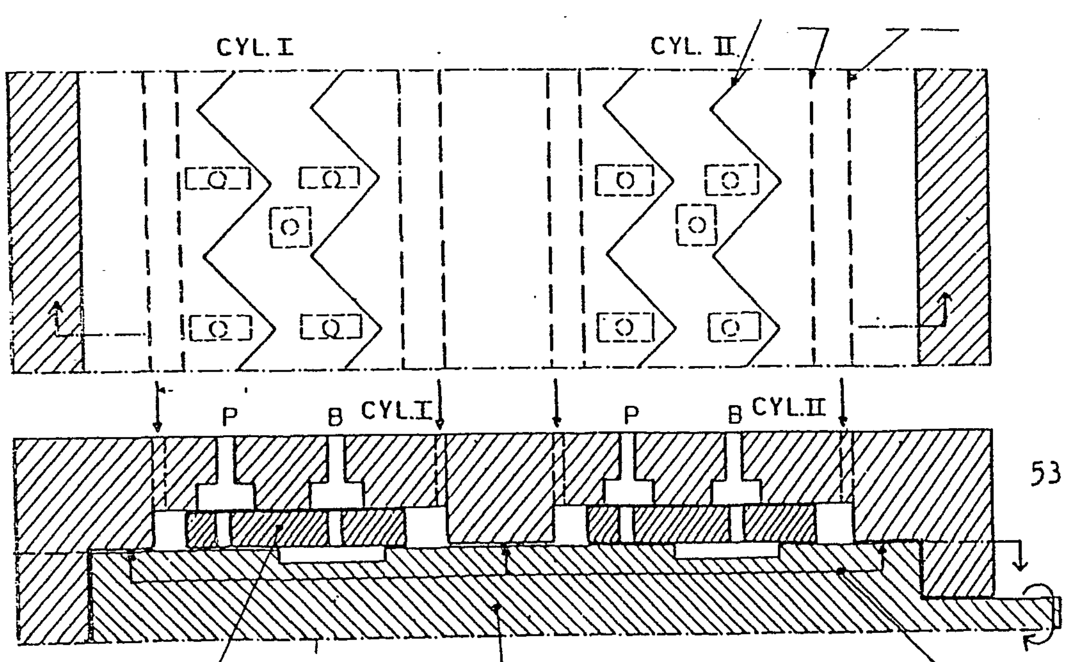


FIG. 53D

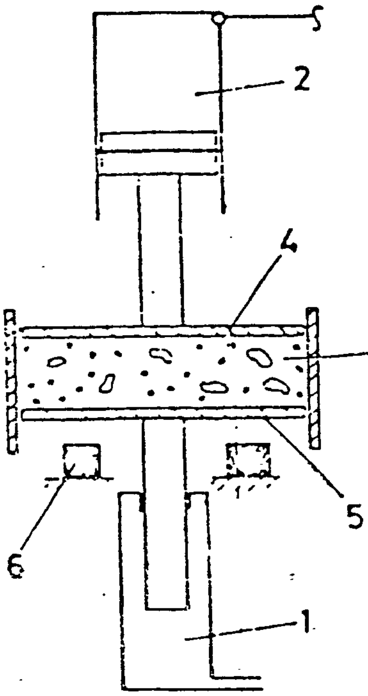


Fig. 201

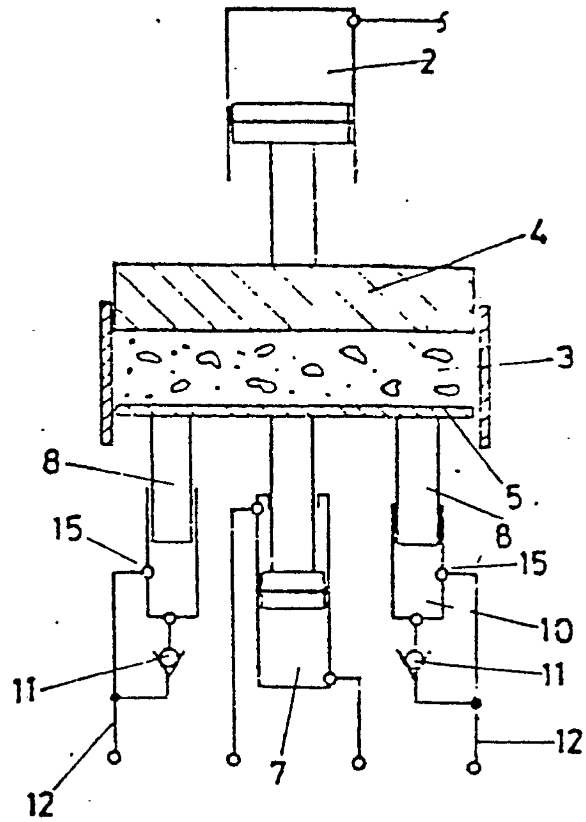


Fig. 202

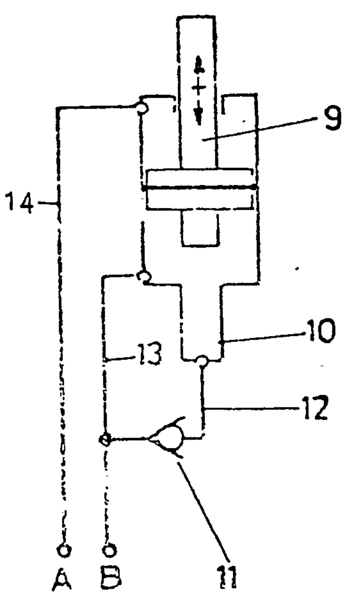


Fig. 203

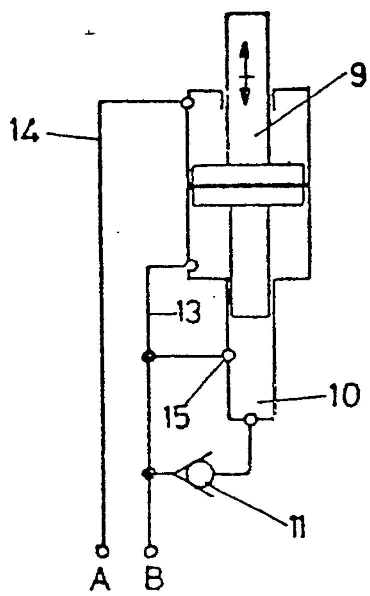


Fig. 204

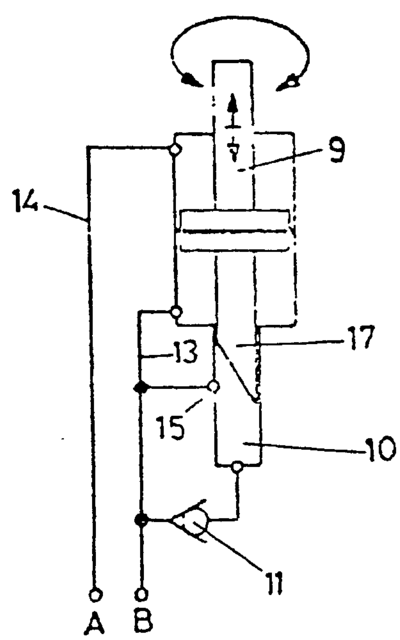


Fig. 205

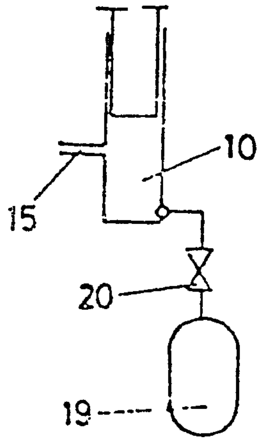


Fig.206A

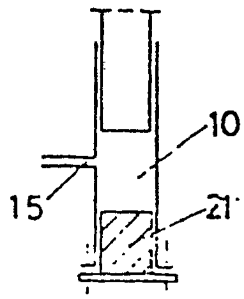


Fig.206B

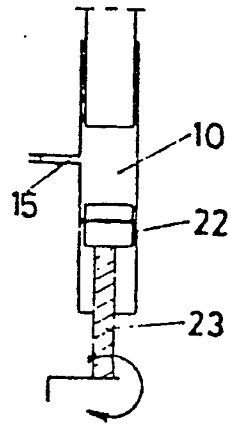


Fig.206C

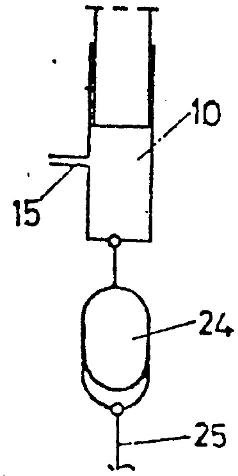


Fig.206D

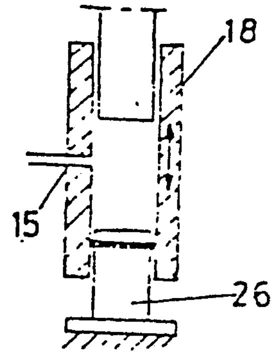


Fig.206E

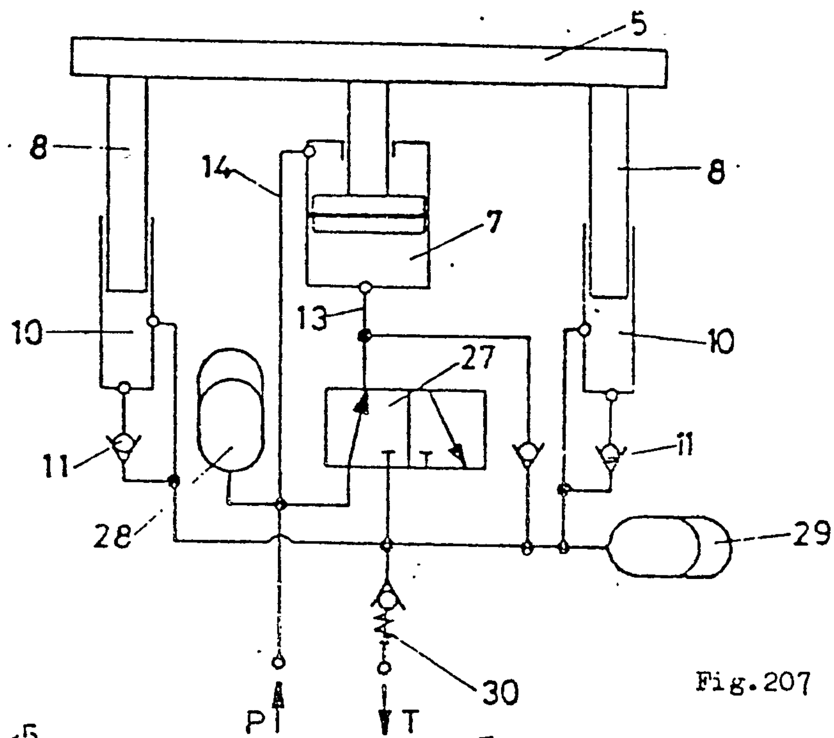


Fig.207

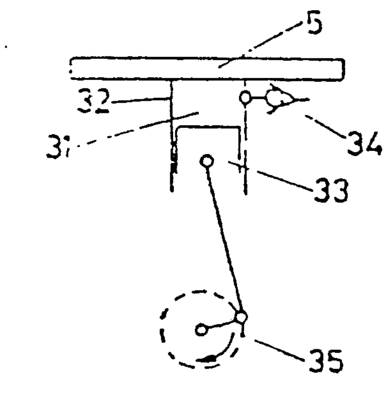


Fig.208A

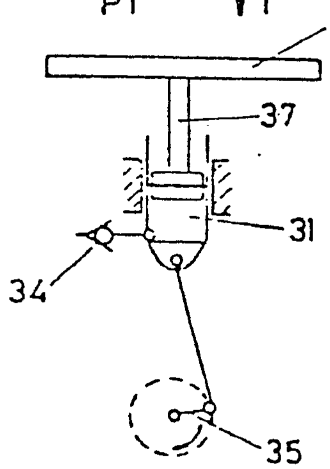


Fig.208B

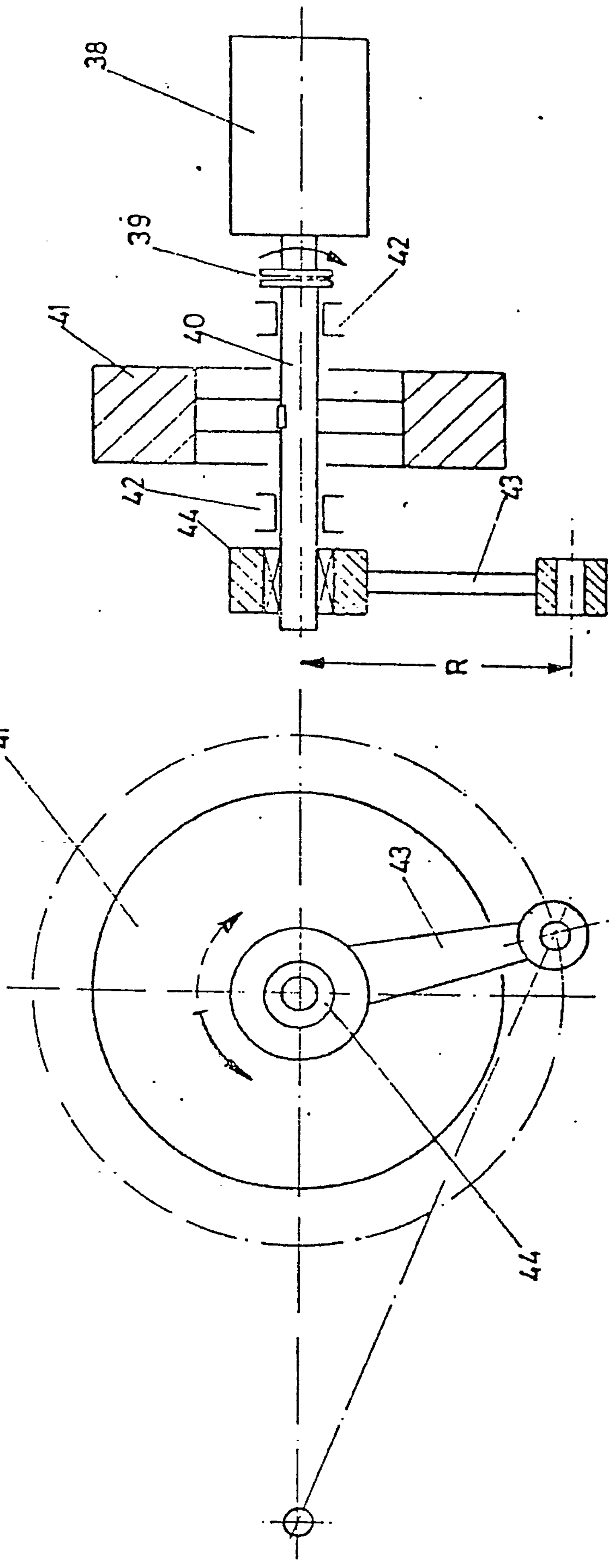


Fig. 209

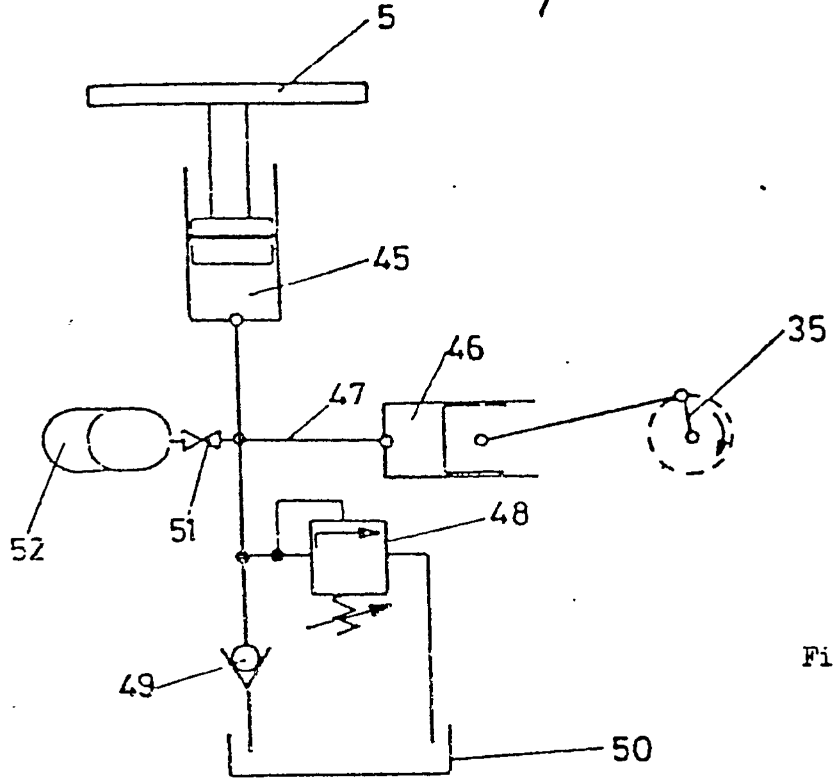


Fig. 210

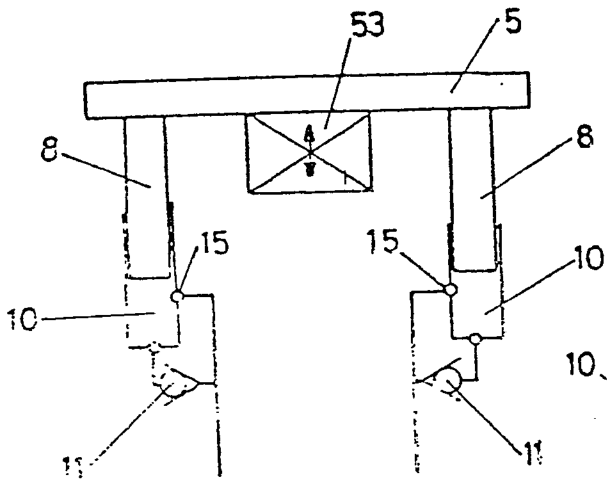


Fig. 211

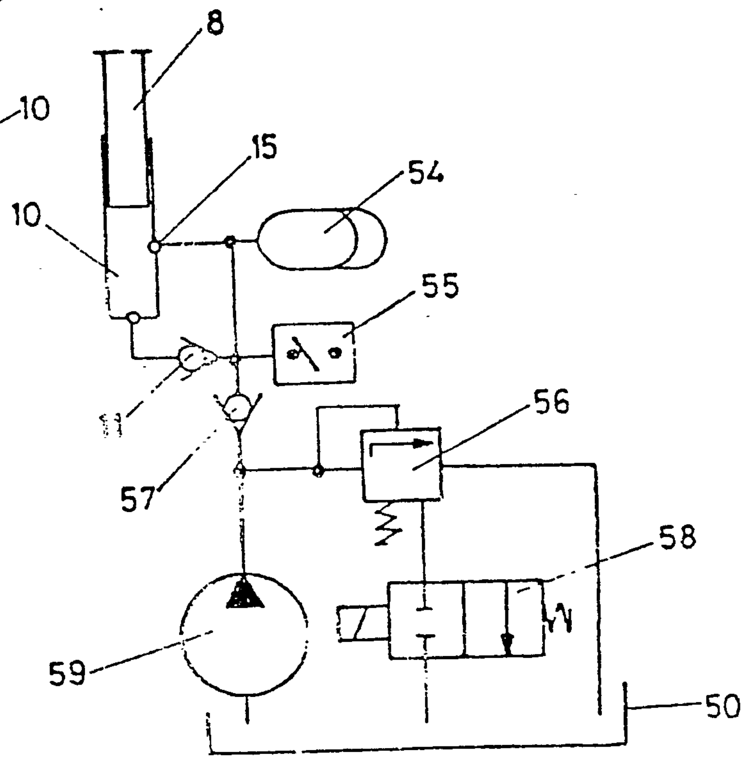


Fig. 212

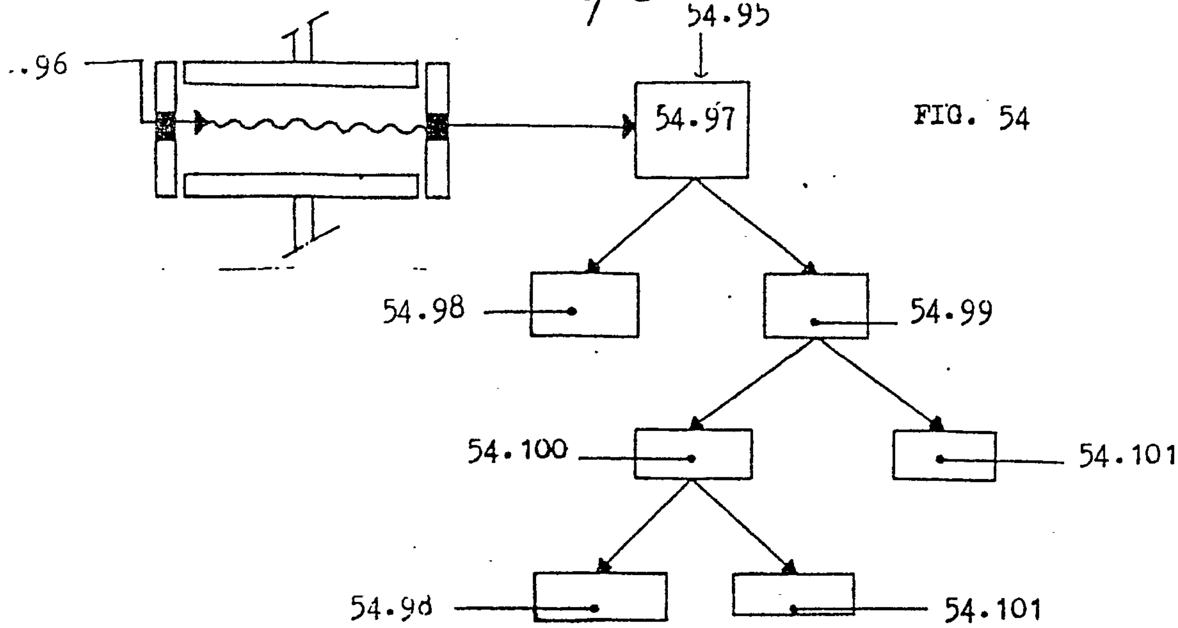


FIG. 54

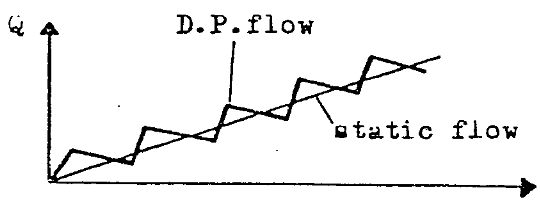


FIG. 55A

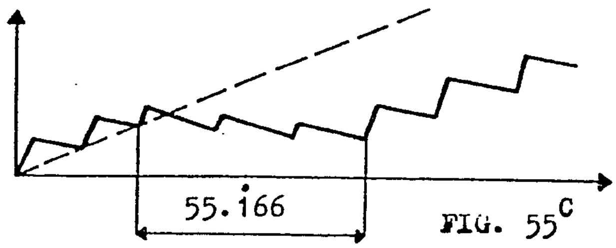


FIG. 55C

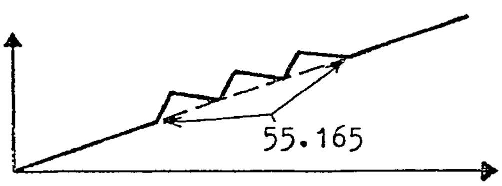


FIG. 55B

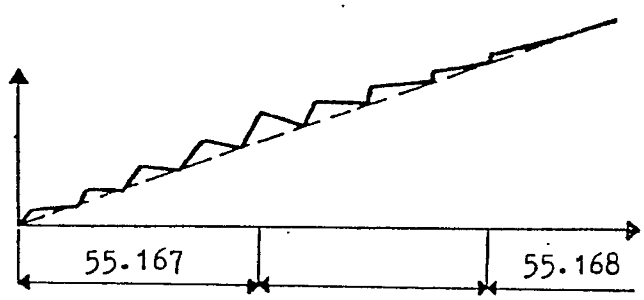


FIG. 55D

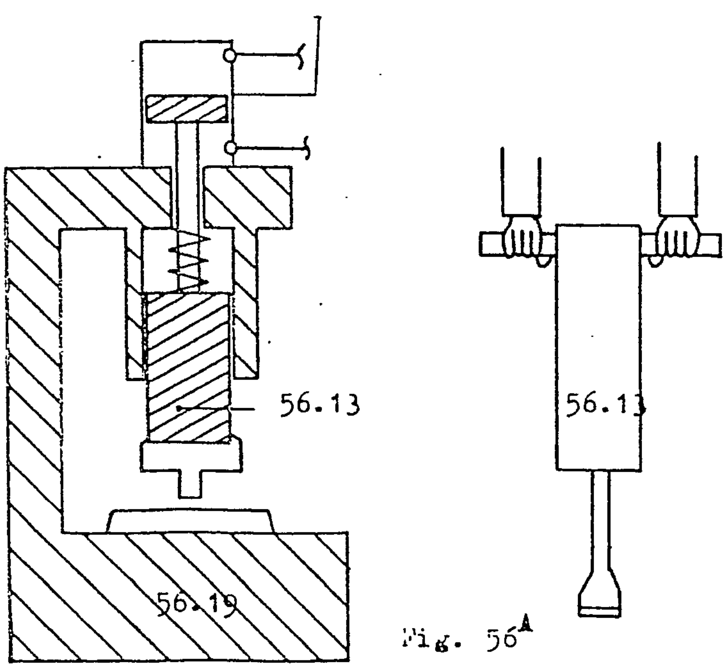


Fig. 56A

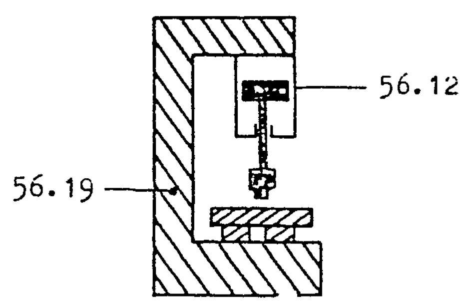


Fig. 56B

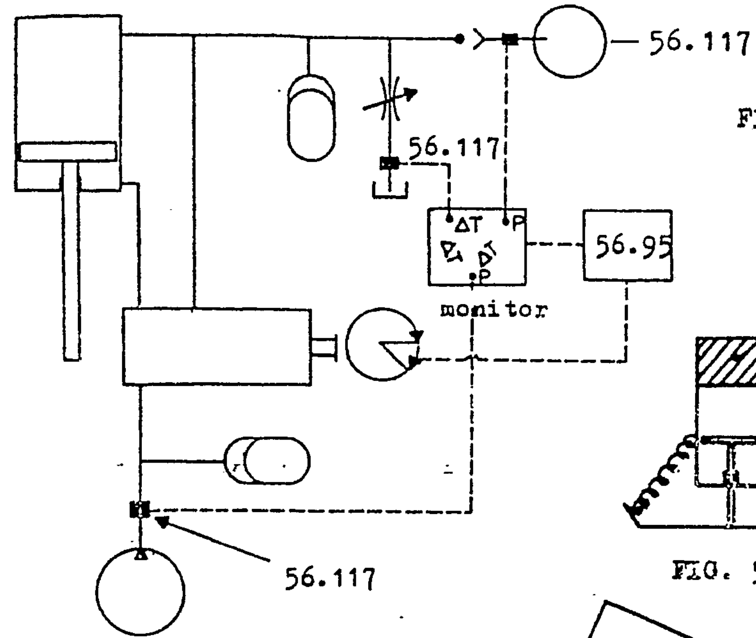


FIG. 56D

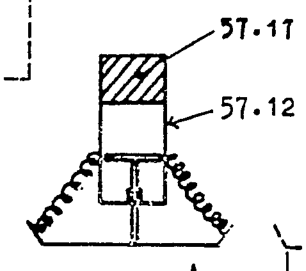


FIG. 57A

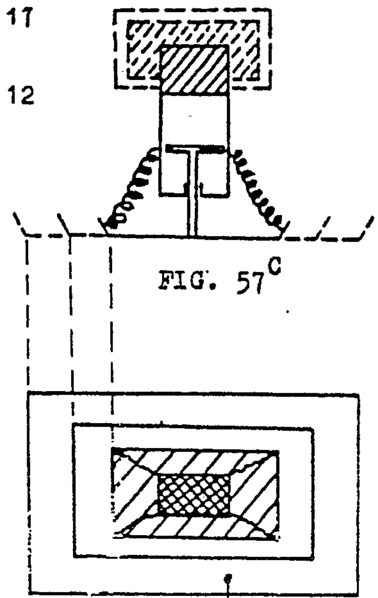
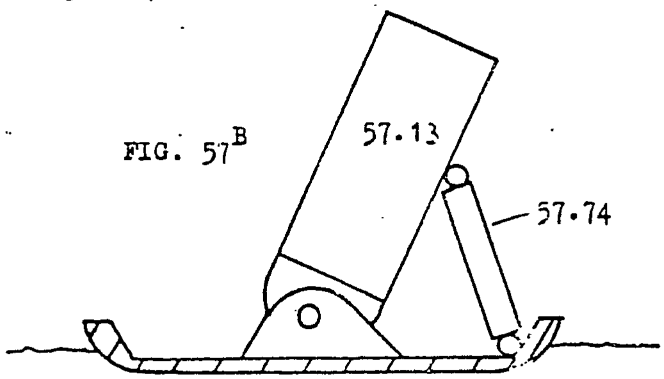


FIG. 57C

FIG. 57B



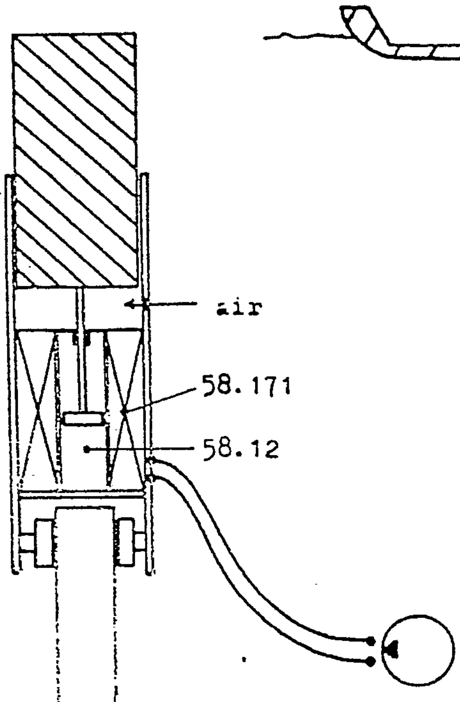


FIG. 58A

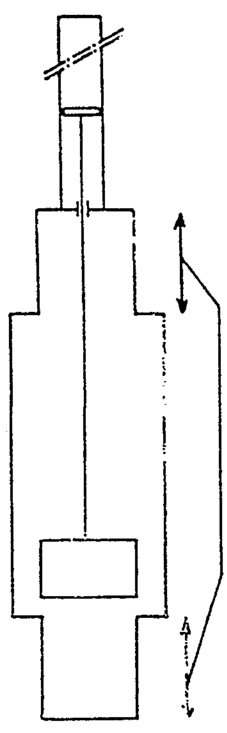


FIG. 58B (59A)

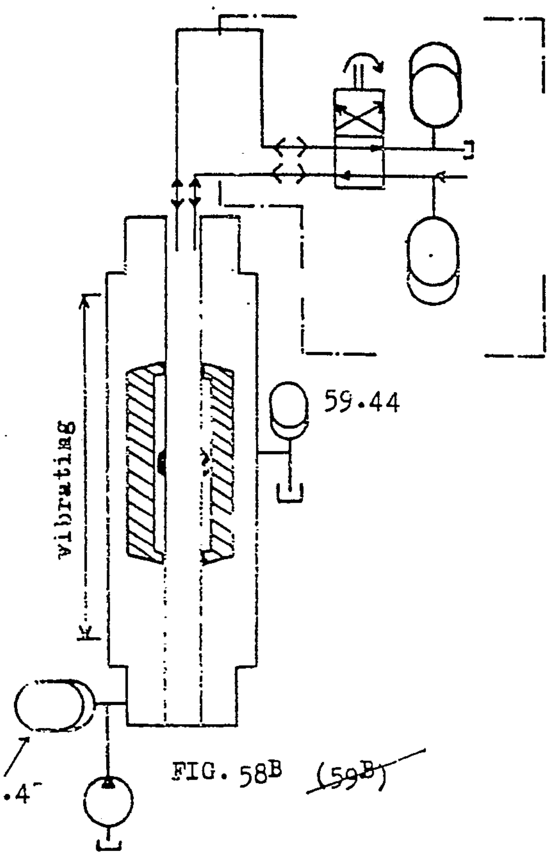


FIG. 58B (59B)

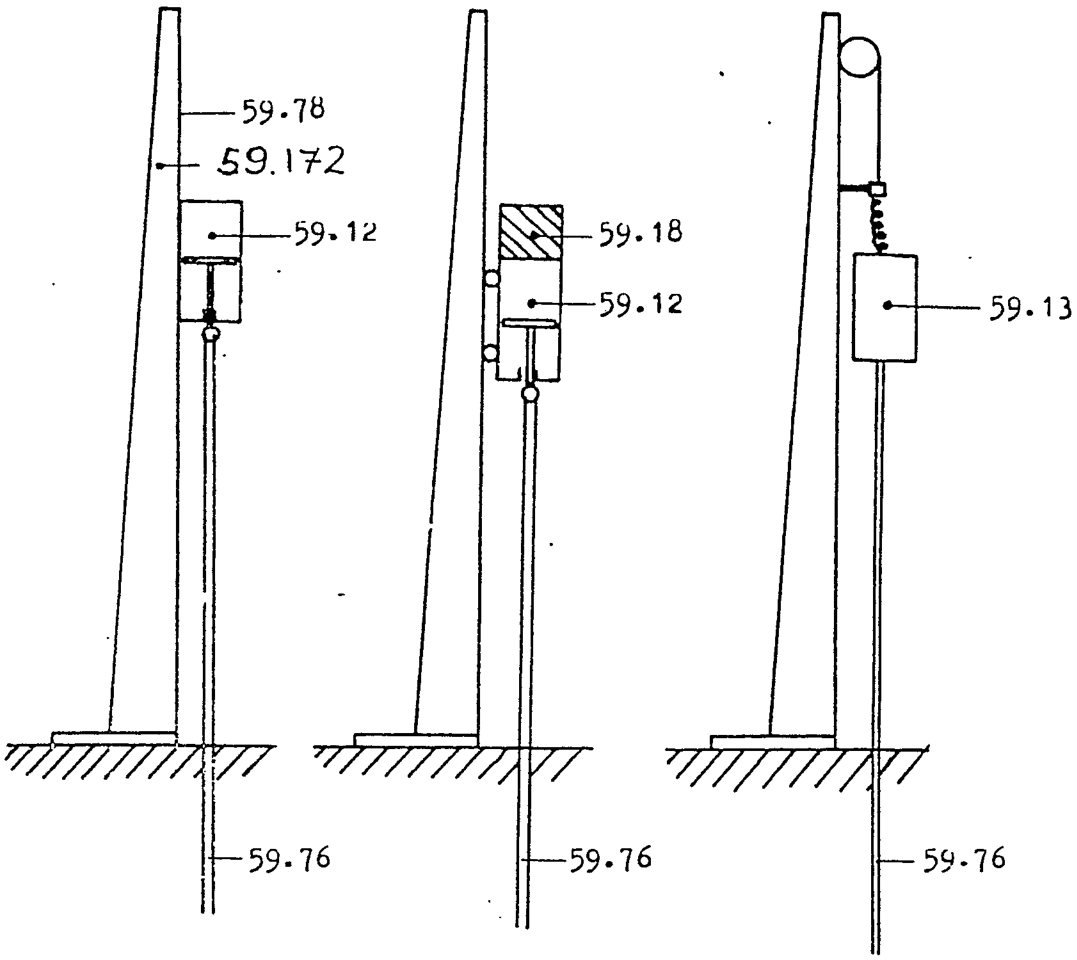


Fig. 59A

Fig. 59B

Fig. 59C

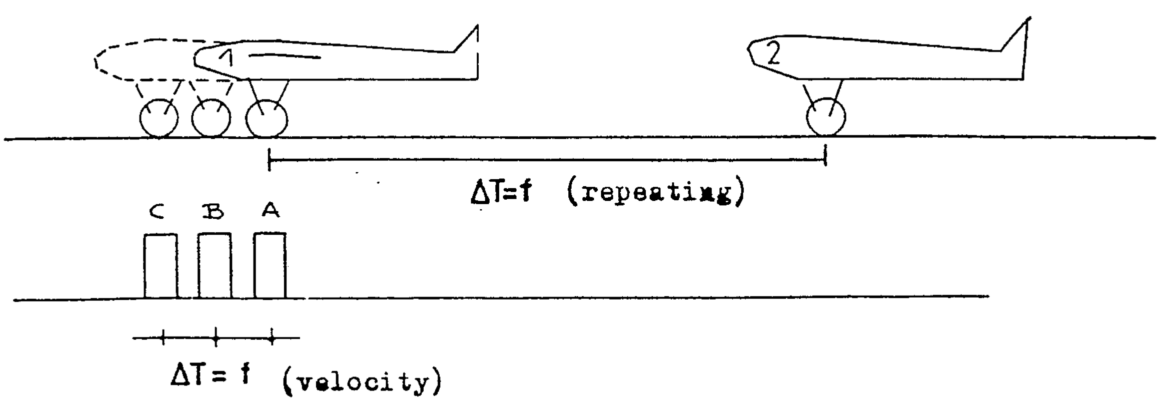


Fig. 63

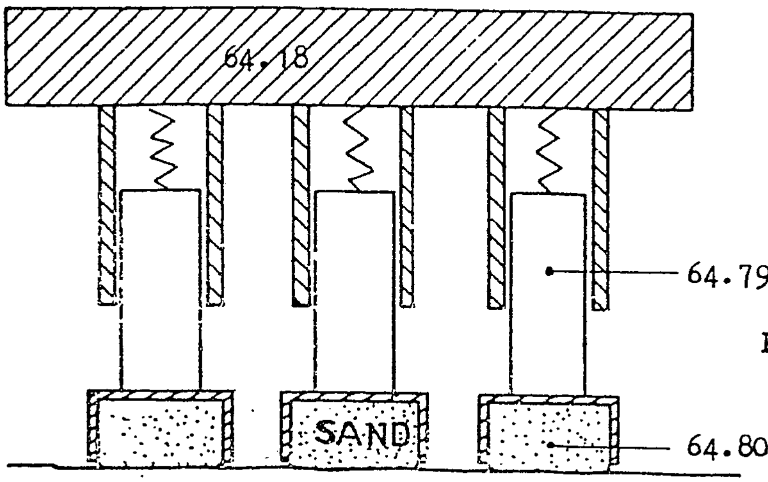


FIG. 64A

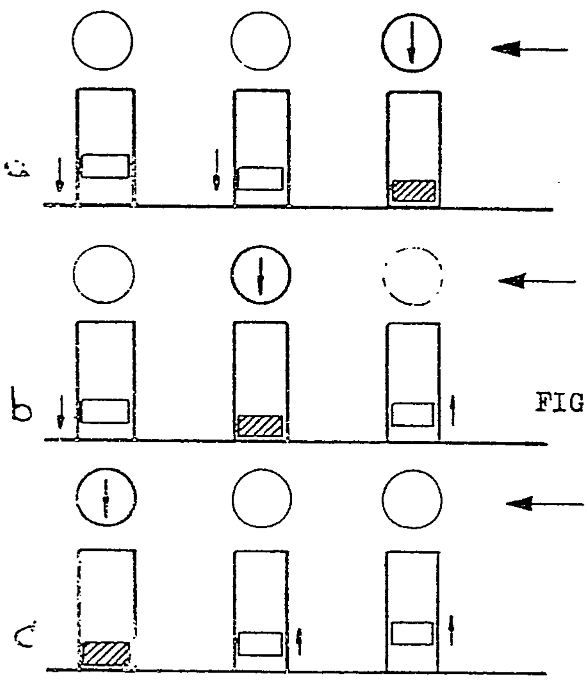


FIG.64C

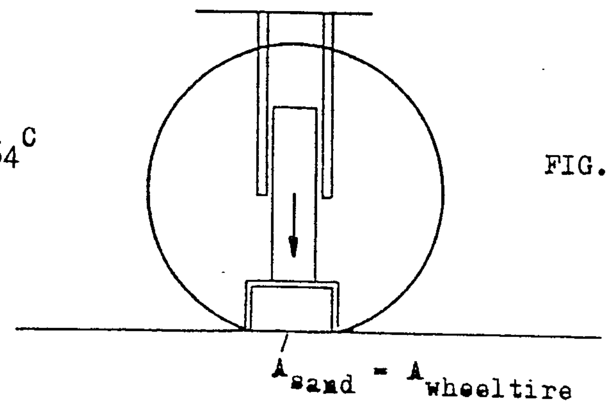


FIG.64B

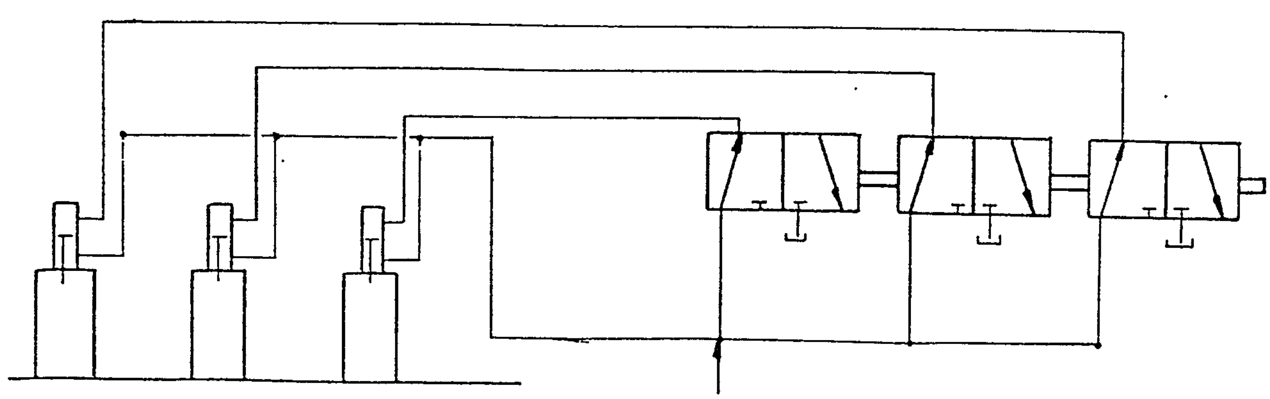


FIG. 64D

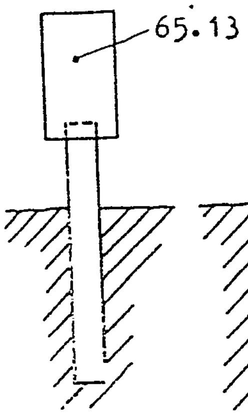


Fig.65A

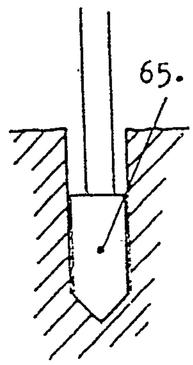


Fig.65B

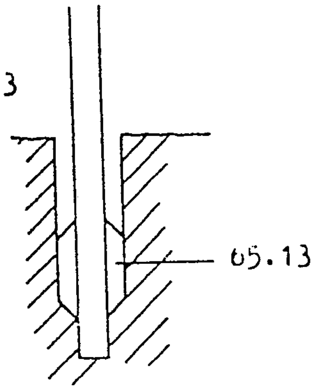


Fig.65C

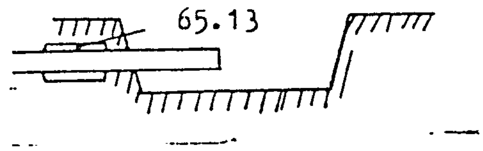


Fig.65D

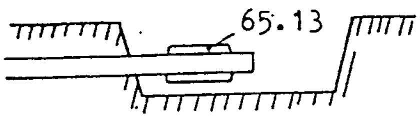


Fig.65E

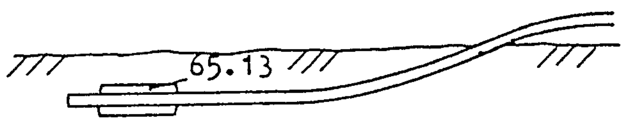


Fig.65F

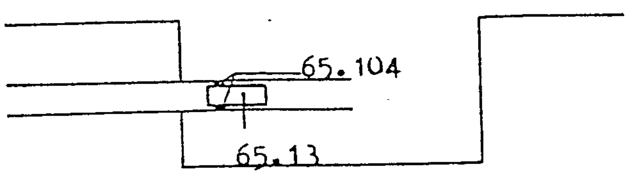
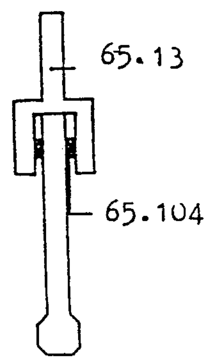


Fig.65G



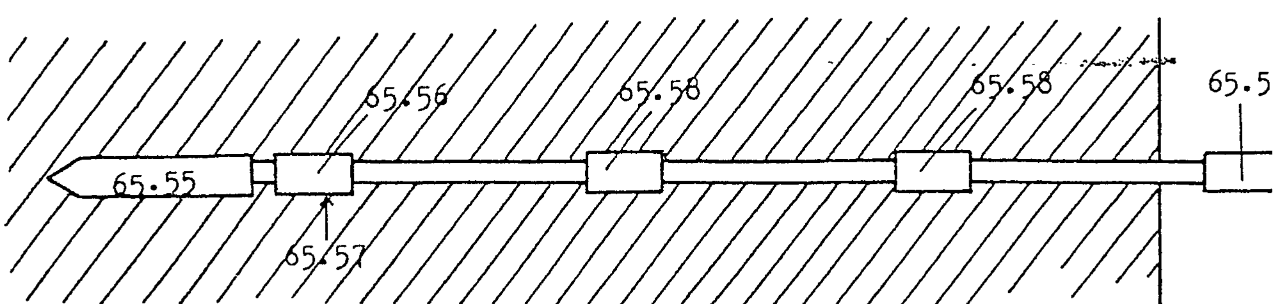


Fig. 65

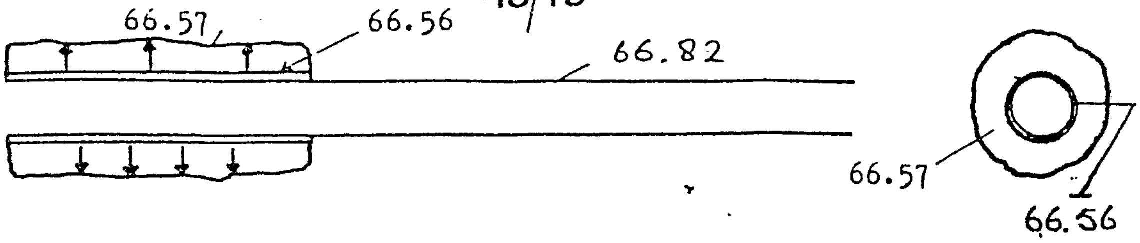


Fig.66A

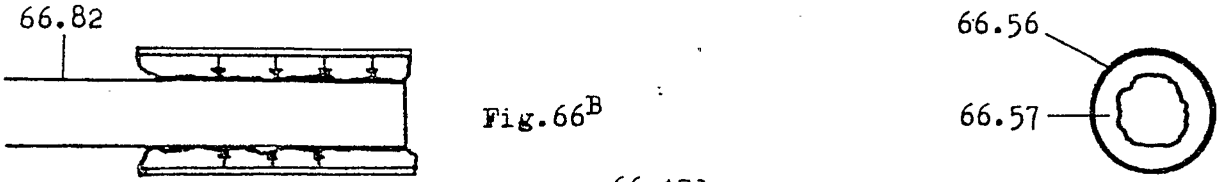


Fig.66B

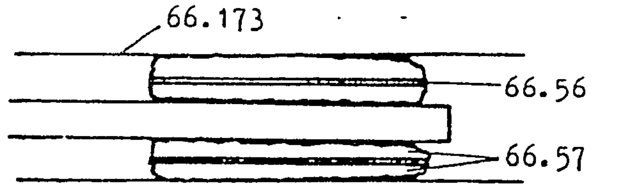


Fig.66C

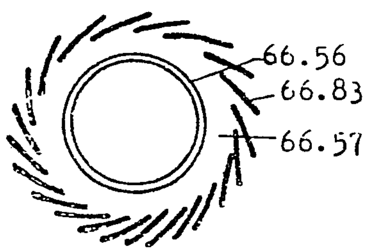


Fig.66D

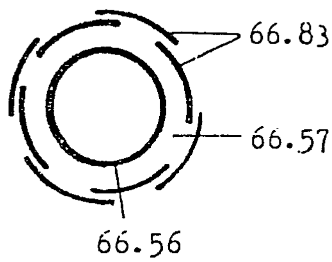


Fig.66E

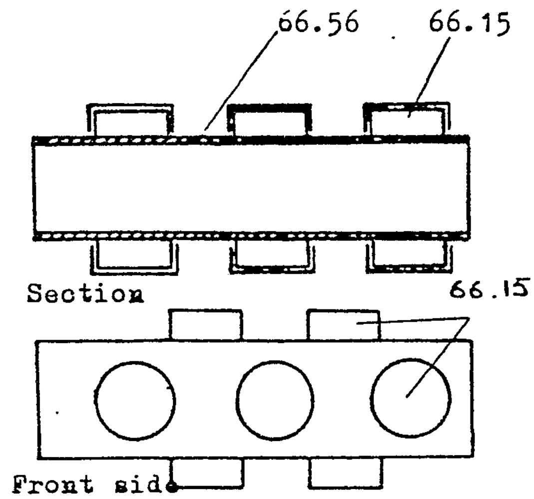


Fig.66G

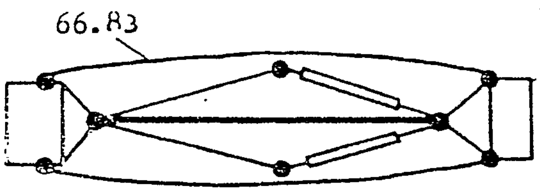


Fig.66F

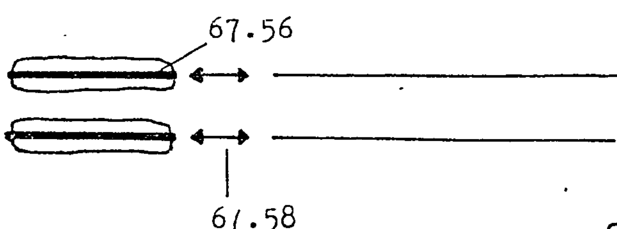


Fig.67A

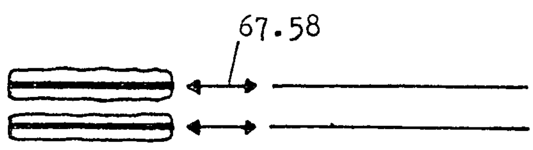


Fig.67B

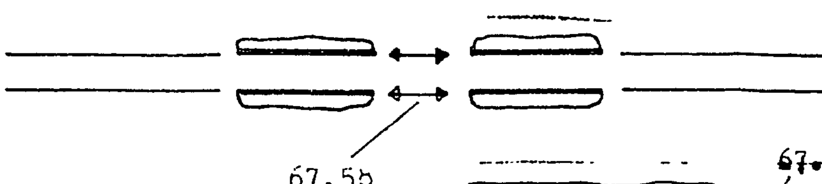


Fig.67C

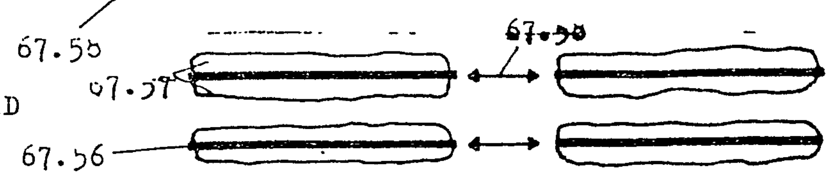


Fig.67D

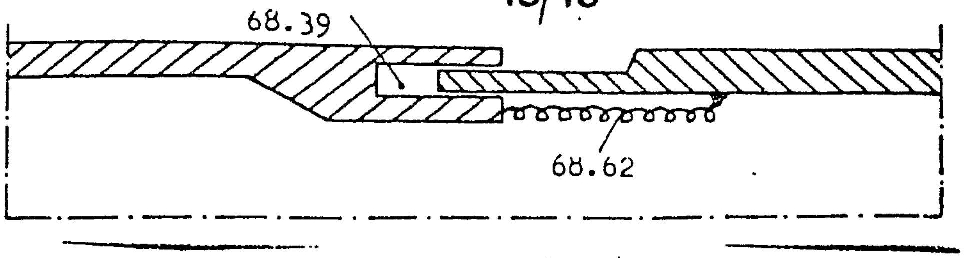


FIG. 68A
68.58

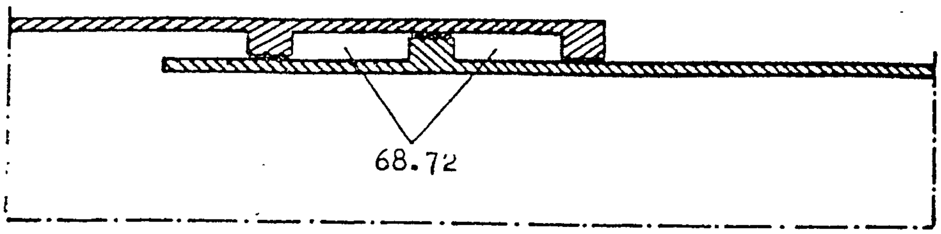


FIG. 68B
68.58

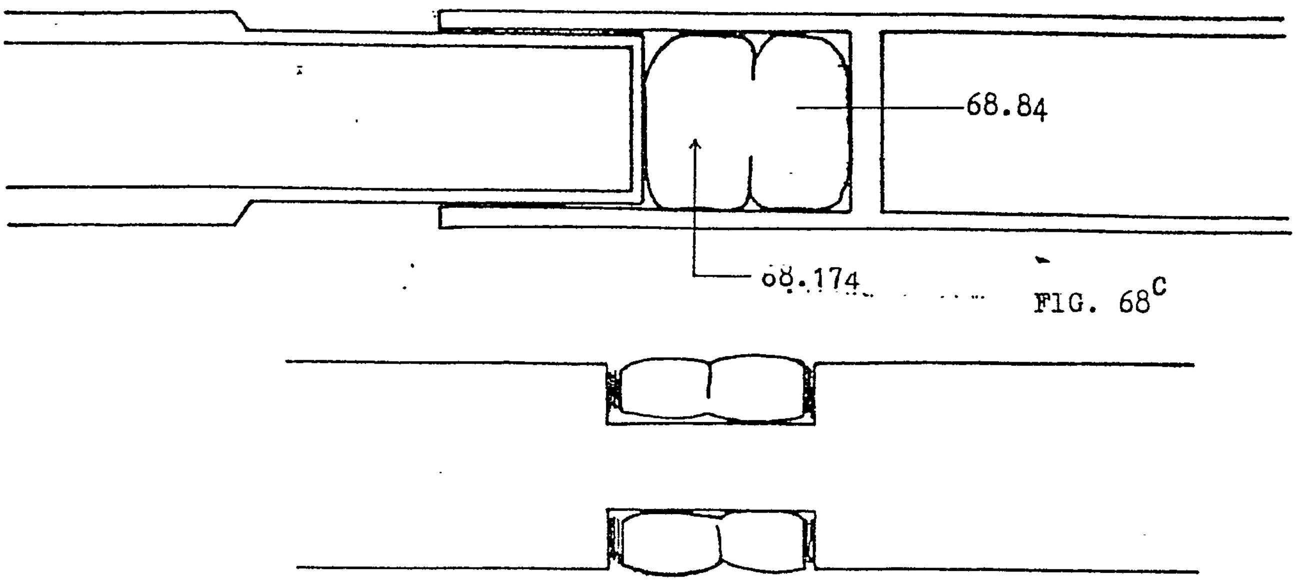


FIG. 68C

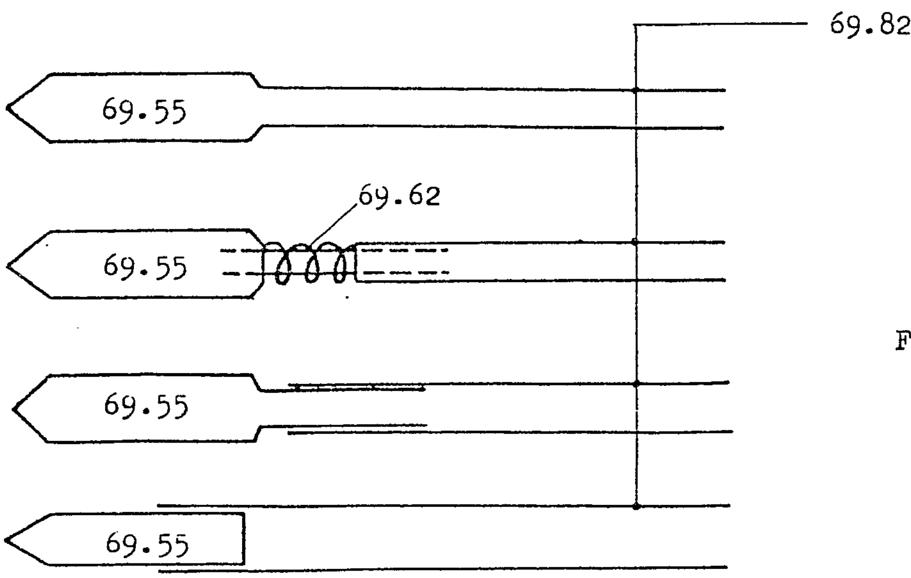


FIG. 69

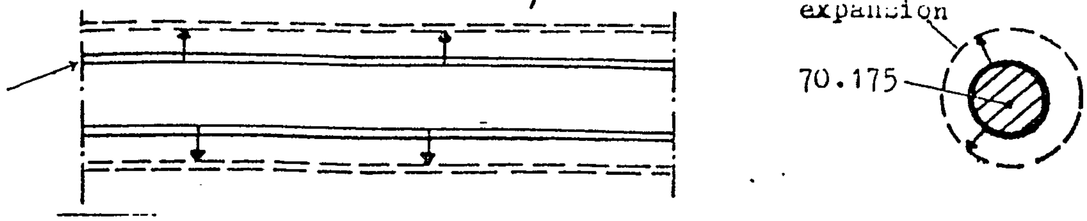


FIG. 70^A

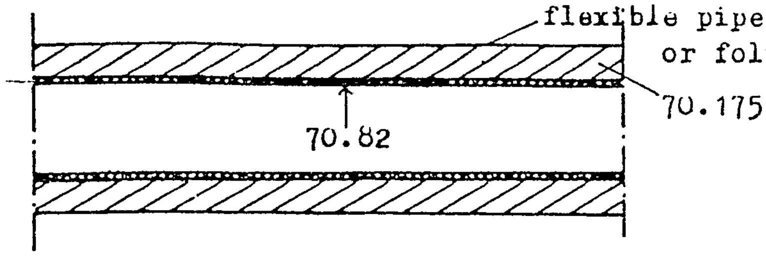


FIG. 70^B

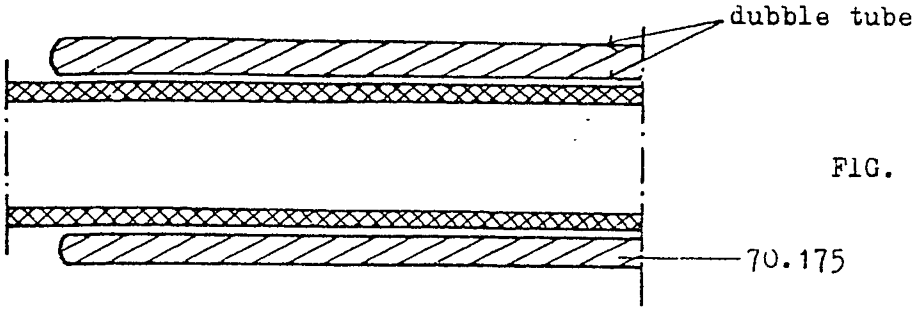


FIG. 70^C

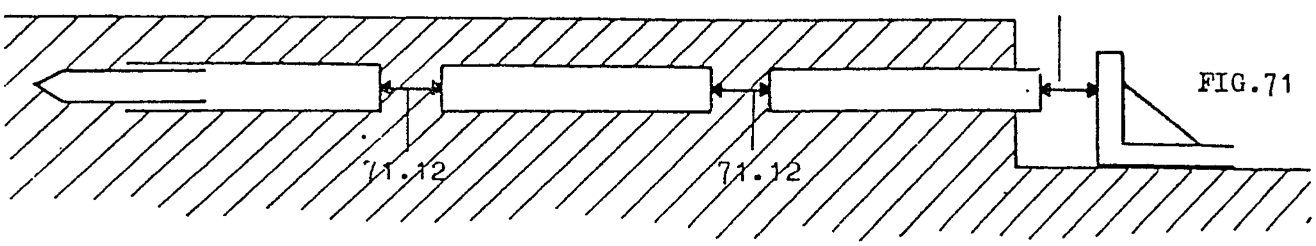
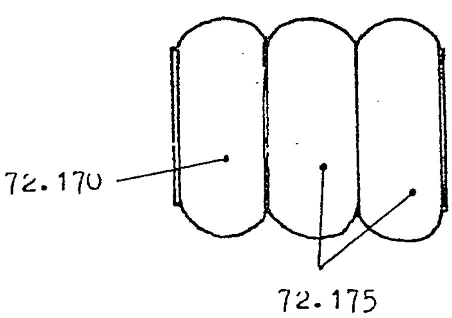


FIG.71



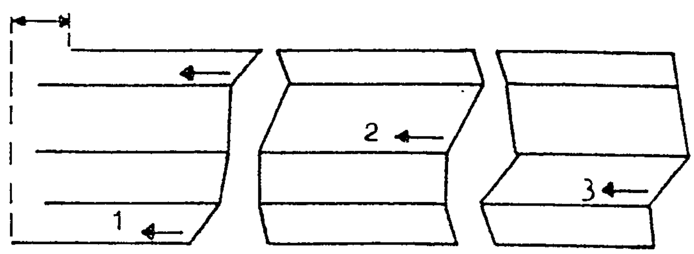


Fig. 73

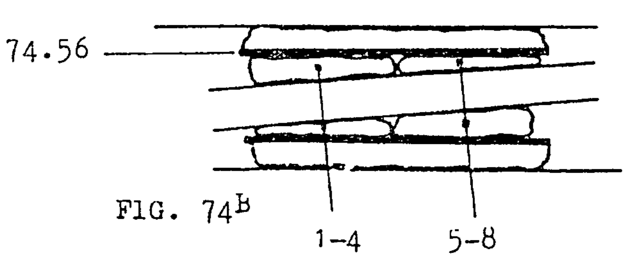


FIG. 74^B

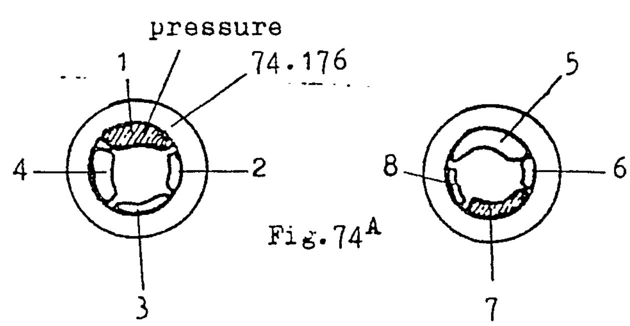


Fig.74^A

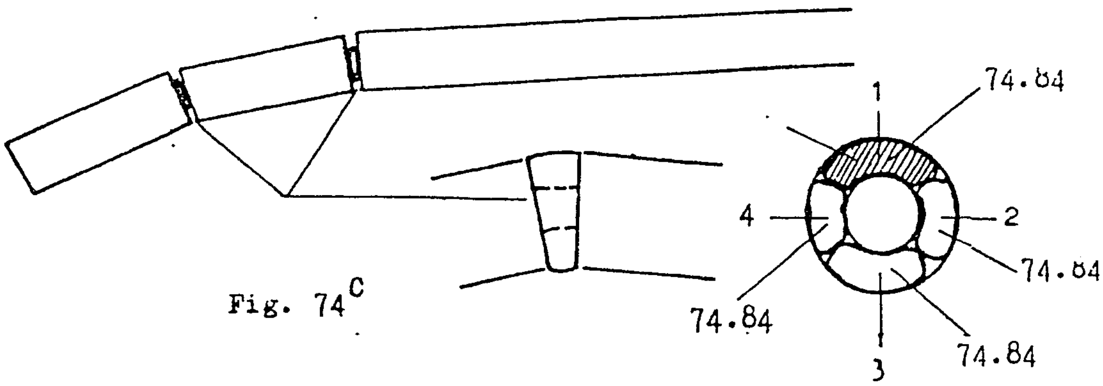


Fig. 74C

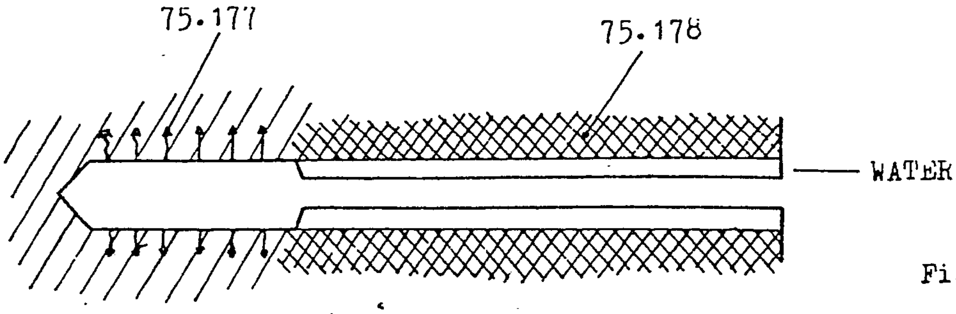


Fig. 75

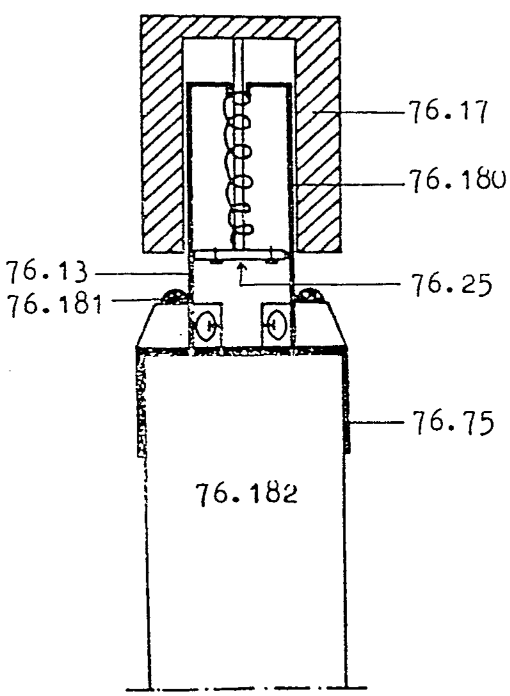


Fig.76A

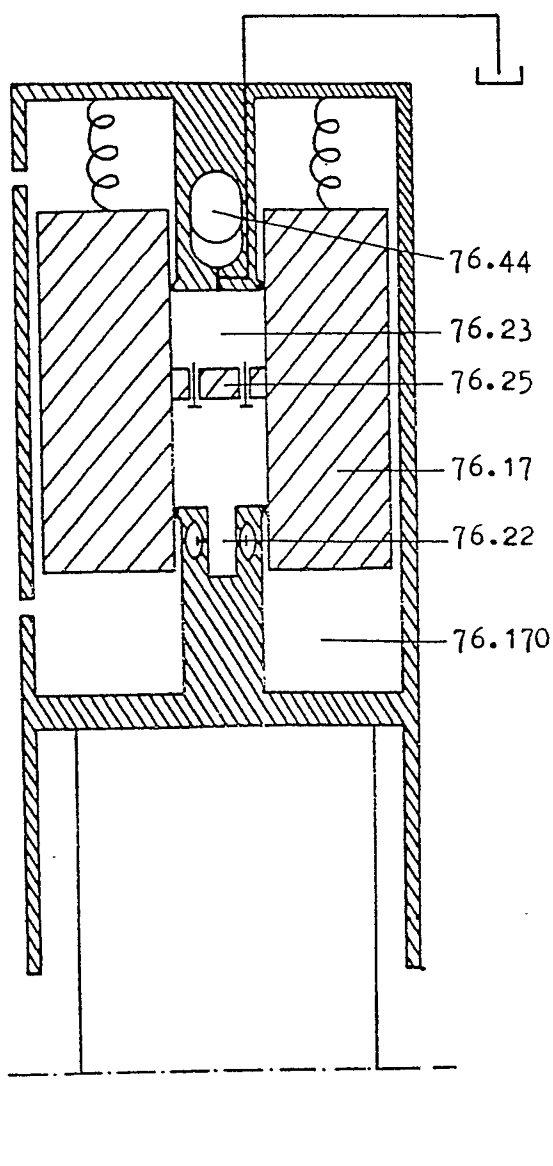


FIG. 76B

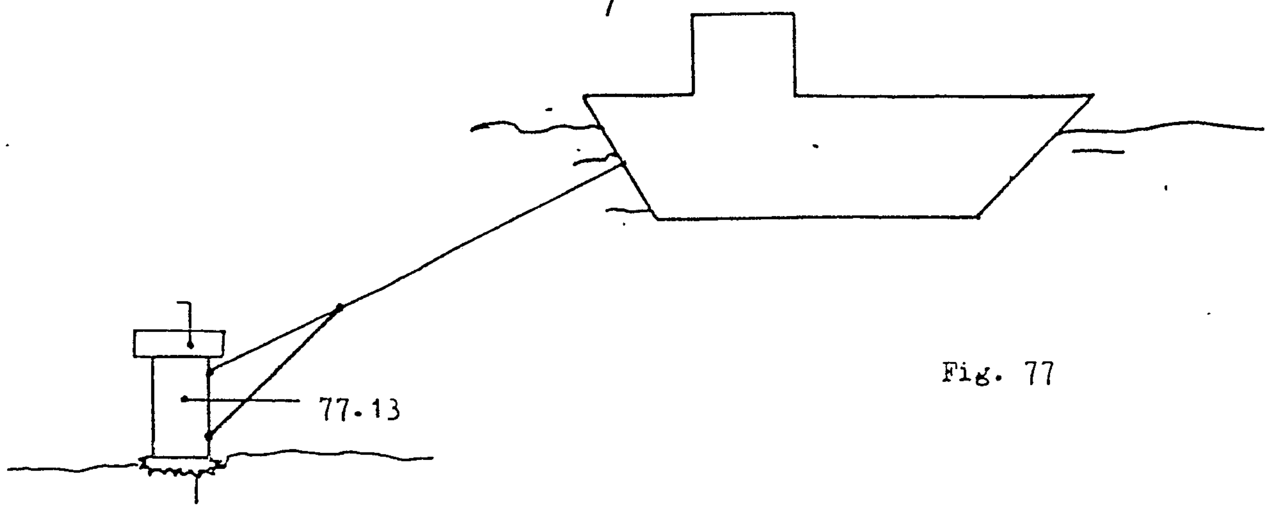


Fig. 77

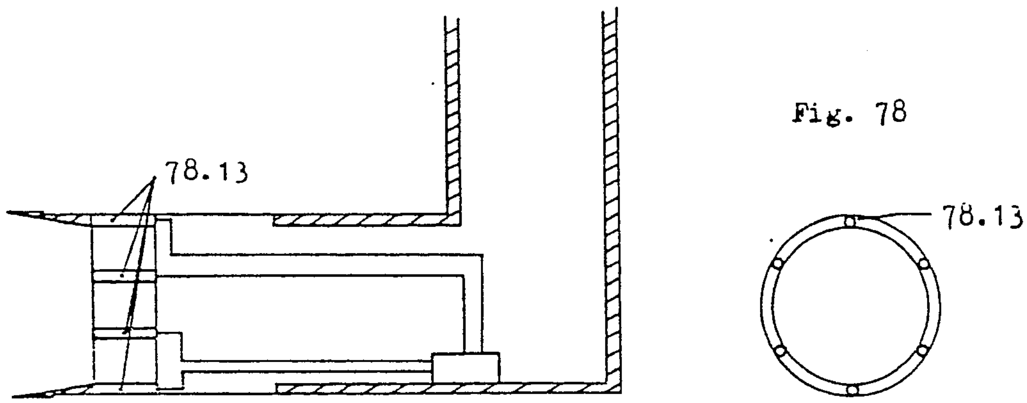


Fig. 78

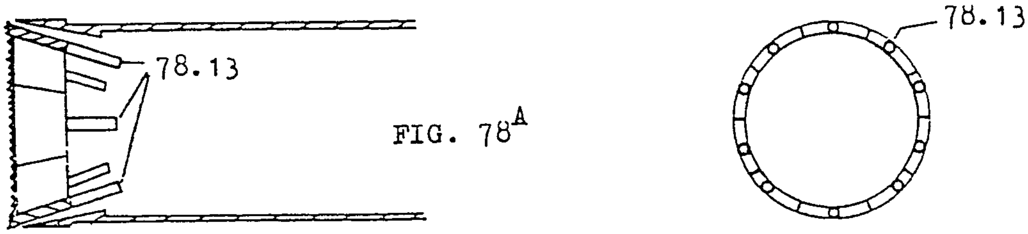


FIG. 78A

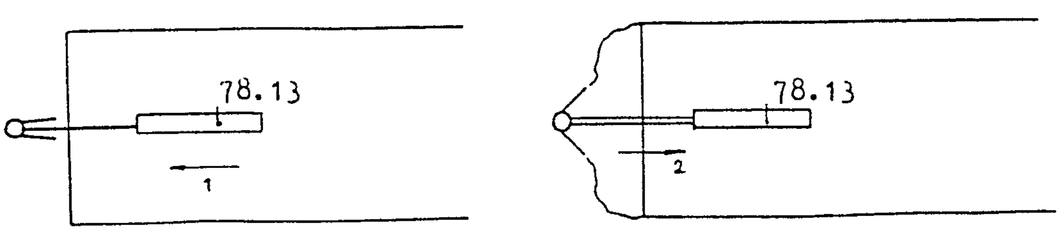


Fig.78b