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⑤ Improvements in machines for the continuous manufacture of concrete elements.

⑤ Improvements in the machines for the continuous manufacture of concrete elements, of the type made up of a displaceable frame (1) which has a hopper (8) from which concrete is poured into a mould (7) where it is compacted and moved by means of vibration to another finishing mould (9) where the final parts are profiled. This operation implies dirt and breakages in the mentioned moulds, whose constitution and position make access to them difficult, a problem which is solved with these improvements constituted essentially by a receiver-vibrator mould (7), divided into various parts with respective vibrators (24) and detachably secured the same as other elements such as the compacting blades (16), which, like the finishing mould (9) are height-adjustable, with the mentioned blades (16) and the drum (6) for the machine haulage cable having some drive mechanisms with incorporated regulator (58 and 59). The mechanical drive of the cable guiding trap (60) is also notable.

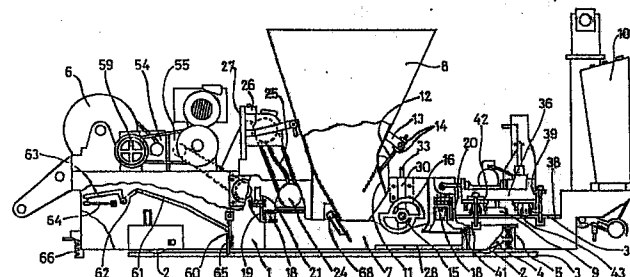


Fig. 1

## Description

Improvements in machines for the continuous manufacture of concrete elements.

This invention refers to some improvements in the machines for the continuous manufacture of concrete elements.

Machines of this type have been known for many years now, which are made up of a frame fitted with wheels which slides along some rails on a track, on which some tensed wires or armatures have previously been arranged, and on which the continuous pretensed reinforced concrete elements shall be made, such as beams, on whose frame the following are fitted: its haulage means; a concrete supplying hopper; and a mould train, the first of which receives the concrete which is put through an initial moulding, the concrete then passing to a second finishing mould from which the fully moulded element comes out, whose mould train circulates on the tensed wires on the track and which have to make up the armature of the beams.

With the passing of time, these machines have been improved by the addition of new devices and the improvement of other, already existing devices.

The applying entity is already the owner of various patents of this type of machine, particularly mentioning the Spanish introductory patent n<sup>o</sup> 517.451, according to which some rotating blades were added to these machines in the receiver mould, whose purpose was to compact the concrete and drive it towards the finishing mould, also adding other accessories such as a trap in the front part of the machine which in turn acted as a guide for the wires making up the armature of the elements to be manufactured.

The same applying entity is also the owner of Spanish invention patent n<sup>o</sup> 549.261, where the mentioned compacting blades are improved by having a arched structure forming a cam so as to obtain better pressure in the concrete from the receiver mould to the finishing mould.

Although these machines fulfil their task, they have some problems which are offered a solution with the present improvements.

One of the problems of these machines affects the receiver and finishing moulds, which, as they are fixed to the machine, are very difficult to clean and repair, the same occurring with the compacting blades fitted in the receiver mould.

So as to solve this problem, it has been envisaged that in the new machine, both the receiver mould and the compacting blades are fitted to the frame on the machine in a dismountable manner, with these blades and the finishing mould being fitted with means for their height adjustment. It has also been envisaged that the mentioned moulds include their bearing sections on the track made up of rechargeable parts which are easily replaced in the event of wear.

Another of the advantages of the new machine lies in offering the vibrators which act on the receiver mould cooling based on an external oil circuit which allows them to operate better on eliminating turbulences inside. These vibrators have been made up

by means of a mono-block eccentric shaft which allows normal roller bearings to be used with which they can work at high revolutions, the ends of the mentioned shaft including the assembly of eccentrics so as to graduate the eccentricity of the same. Each vibrator shall preferably include an oil tank so as to individualize its continuous oil bath external cooling circuit.

The receiver mould is divided into two side parts which are joined by means of an elastic tie-rod, and a vibrator corresponds to each part. As protection for the elastic joint between the two side parts of the receiver mould against the vibrations to which it is subjected, the mentioned mould is divided also horizontally in accordance with two superimposed coplanar halves joined together by means of an elastic joint.

In the known machines, also a problem is the complexity of the drive means of the winding drum of the machine haulage cable, and those of the motor-driven gear reducer which drives the rotation of the compacting blades, whose means in this new machine include some mechanisms fitted with a regulator and arranged on each side of the frame, the drive mechanism of the mentioned drum being able to be controlled from the main control panel, which shall preferably be made up of a motor-driven variator or else an electronic variator, the variation being obtained by means of pulleys or mechanically.

In this patent, the drive means of the front trap are also improved, as well as the guide frame for the armature cables, whose means are purely mechanical and the height graduation for the cables and their lateral graduation are made possible.

Another characteristic of this new machine consists of fitting the hopper with an articulated trap in the rear part of its mouth which allows the mentioned mouth to be opened more or less so as to make way for the appropriate concrete to the compacting blades, while by the front part of this mouth, a series of blades (one per receiver mould department) has been envisaged to prevent the passage of concrete towards the front part of the mentioned mould, whose blades are fitted turning on a transversal shaft so as to be able to overcome, with the ascending movement, the obstacle represented by the anchoring limiter of the wires existing at the end of the track along which the machine runs.

Also the object of these improvements is the incorporation into the machine of first means designed to eliminate the lower flashes in the concrete elements and second means for obtaining an even finish in the upper part of the mentioned elements. The first means may be driven with a common or individual control for each core of the finishing mould, and are made up of vertical knives pushed downwards elastically and which may be raised so as to adopt a passive position by means of the cam control. The knife and its spring shall preferably be fitted in a housing envisaged in a rear

prolongation of each core. The second means are made up of a section arranged between every two cores and between the same, some elastic sections facilitating their vibration are arranged longitudinally.

This machine allows working with almost dry concrete which represents an important saving in cement and a high resistance in the concrete.

These and other characteristics shall be clearer in the detailed exposition which follows, which, to facilitate its understanding, is accompanied by some sheets of drawings in which some practical cases of realization have been represented and which are given only as a non-limiting example of the scope of this invention.

In the drawings:

Figure 1 shows a diagrammatic side elevation and partially sectioned view of the machine unit in accordance with the present improvements,

figure 2 is a ground view of the same unit without the hopper,

figure 3 shows a front elevation view of a detail of one end of the rear part of the finishing mould with the common control for the flash-removing means,

figure 4 illustrates a detail in sectioned side elevation of the rear part of the receiver-vibrator mould, without the horizontal division in the same,

figure 5 shows in side lateral elevation section the horizontally divided constitution of the vibrating receiver mould,

figure 6 shows a rear elevation view of a part of the machine with its lower finishing means, with individual control, and upper finishing means of the moulded concrete element,

figure 7 illustrates an elevation cross section of a vibrator and its oil tank corresponding to the receiver-vibrator mould, and

figure 8 represents a ground view of a speed variator mechanism of the winding drum of the haulage cable, with remote control.

In accordance with these figures, the illustrated machine includes a main frame 1 fitted with wheels 2 for circulating along the rails 3 of the track where the wires shall be tensed and which will form the armature of the beams which shall be made in continuous manufacture parallelly by the mentioned machine.

The height of the mentioned wheels can be adjusted due to the fitting in the centre part of a support 4, which is hinged by one end to the frame 1, being crossed at the other end by a vertical screw 5 with a nut and counternut which is fixed in the upper part to the frame.

In this frame 1, three parts stand out:

- A front part where, among other elements, there is the winding cable 6 of the machine haulage cable,
- a centre part where the receiver mould 7 is found with the upper hopper 8, and

- another rear part where, also among other elements, the finishing mould 9 and the electrical control panel 10 are found.

The hopper 8 includes in the rear part of its output mouth an articulated trap 11, which has on its external side the articulation of one or two rods 12

which string up to some transversal shafts which join respective couples of appendices 13 parallelly locked together to the hopper 8.

With the handling of two flywheels 14, which as a nut and counternut of rod 12 act on and under their fitting in the shaft of the appendices 13, the trap 11 is arranged in the most suitable position in accordance with the opening needed at each moment in the output mouth of hopper 8.

In the receiver-vibrator mould 7, and between hopper 8 and the finishing mould or profiler 9, shaft 15 is fitted transversally, which includes two concrete-compacting locked rotating blades 16 in each longitudinal department 17 into which the mentioned mould 7 is divided, each department corresponding to one beam or similar element to be manufactured.

With reference 18, the elastic blocks of mould 7 are shown, with which the latter is sustained in the front and in the back on some tie-rods 19 and 20 in a convenient manner, which join the two parts of the mould and which are detachably fixed to corresponding inverted T-section cross beams locked to the frame 1 so as to be able to dismount the mould from the frame 1.

The mould 7 is also divided in the illustrated example into two side parts, joined by means of a tie-rod made up of an elastic sheet 22, on which two flatbars 23 are supported, one for each part of the mould, the unit being secured with the corresponding screws, with each one of the parts of the mentioned mould 7 including a vibrator 24 on its front part.

In accordance with figure 5, the receiver mould is horizontally divided in accordance with two superimposed coplanar halves 7a and 7b which are joined together with an elastic joint made up of two rubber sections 71 and 72 forming a tongue jointing, with the lower half 7a of the mould having the side notches 29a where the shaft 15 and compacting blades are fitted in a dismountable manner, whose shaft is clamped between two detachable parts, one upper part 30a and one lower part 30'a.

The vibrators include an external cooling circuit made up of three conduits 25 communicating with an oil tank 26 secured in the upper part to a vertical plate 27 locked to the frame 1 in front of the hopper 8, with the mentioned plate also having the motors 24' and transmissions which make the vibrators 24 work. In the mentioned circuit, the oil rises through the central conduit 25 and descends through the side ones.

The vibrators 24 (figure 7) have an eccentric shaft 73 made up of a single part which in the centre has a hollow 74 covered with a sheet 75, and whose eccentricity is graduated by acting of eccentrics 76 and 77 envisaged at the ends of the mentioned shaft 73, which rotates stringed up on normal roller bearings 78 and 79.

Each vibrator 24 communicates with an upper oil tank 26a by means of three conduits 25a so as to make up an individualized cooling circuit for each vibrator, with permanent lubrication, the oil rising through the central conduit until coming out through an axial tube 80 in the tank and falling on the oil contained in the same, which returns to the vibrator

through the side conduits 25a coupled to the bottom of the tank.

The mould 7 is completed with some substantially rectangular section replaceable sections 28 detachably and longitudinally secured in the lower part of the rear zone of each one of the walls of the different departments into which the mentioned mould is divided, with the compacting blades 16 and their shaft 15 also being dismountable, which is mounted by being fitted between some lateral notches 29 in the mould 7 (see figure 4), where it is clamped between two detachable parts 30 and 30', the ends of the mentioned shaft 15 also being detachably secured in the journals 31' of the shafts 31 of the wheels transmitting the rotation movement.

Each one of these two shafts 31 string up a sliding part (not shown in the drawings) in some notches in the sides of the frame 1 and whose height can be adjusted, which is achieved with the manipulation of a threaded nut 32 in the upper end of a stud 33 which, vertically secured to the upper part of the aforementioned sliding part, fits to another part 34 secured detachably by means of screws to the sides of the frame 1 together with another part 35 facing the previous one and which partially fits in the notches in the mentioned sides. With this organization, the working height of the compacting blades 16 can be adjusted.

With regard to the finishing mould 9, it is fitted under a frame 36 fitted with some couples of wheels 37 on its sides which, by means of their circulating along some rails 38 locked to the frame 1, allow the access to the most hidden parts of the finishing mould for the latter to be cleaned or repaired.

The unit is immobilized by means of six threaded studs 39 joined to both sides of the frame 1, four located beneath the rails 38, being fitted vertically and secured by means of nuts in the notches of some horizontal plates 40 fixed to the frame 36, and two located laterally opposite the mentioned frame, being fitted horizontally and secured in the notches in other plates locked vertically in the front part of the frame 36, whose two studs act as tensors in the coupling between the two moulds.

In this situation, the finishing mould 9 is fitted against the vibrating mould 7, with an elastic joint 41 fitted peripherally around the finishing mould being arranged between both.

The mentioned mould also includes some supports made up by rectangular plates 42 (figure 3) with some couples of vertical flanges for the assembly of the wheels 37, whose plates are secured to the frame 36 by means of a series of screws, some longer ones 43 with a counter-nut included so as to determine the distance from the support to the frame, and others 44 so as to ensure the position, with the height of the finishing mould being adjusted in this way.

In the rear part of this mould, a series of inverted U-section parts are arranged on a lower plane and in an elastic assembly, which, as knives, eliminate the flashes produced between the manufactured V concrete beams; these parts 45 are secured to some vertical rods 46 with housing spring 47 which distances them from some flatbars 48 locked to a

cross beam 49, in whose flatbars, the mentioned rods are fitted, with some transversal pins going through their protruding ends in the upper part so as to prevent uncoupling.

Likewise, the longitudinal beam 49 is fitted to the frame 36 through some supports 50 locked to the mentioned frame and which in their lower part have a horizontal prolongation 50' on which a cam 51 is supported, which has on its shaft the suspended assembly of an arm 52 joined to the longitudinal beam 49, the rising or lowering of which is produced with the driving of a handle 53 secured to the cam 51, with which the parts 45 are prevented from rubbing against the ground when the machine is not working.

In accordance with figure 6, in the rear end of the longitudinal cores of the finishing mould 9, some complements 81 are coupled in prolongation with a front cover 82, forming a housing where the knives 45 have been fitted vertically, secured in the lower end of the rod 46 with the housing spring 47 which pushes them downwards. The rods 46 protrude from the upper part of the housing 81 and to their end a cam 83 is coupled with a grip 84 for the individual operation of each knife, so that on turning the cam upwards, it is raised to rod 46 and with it, knife 45.

Between the cores, in their upper zone and rear part, some transversal sections 85 are secured and which determine the uniform finish of the upper part of the beam being manufactured, with some couples of elastic sections 86 being fitted longitudinally between the mentioned cores, also in the upper zone, and which facilitate the vibration of the finishing mould and hermetically close the passage of concrete to the upper part. In figure 6, with reference 1, the frame of the machine is shown, and with reference 37, the wheels of the upper frame 36 of the finishing mould, on which the high frequency vibrators 87 are coupled.

In the front part of the machine and on the frame 1, the drum 6, where the machine haulage cable is wound, turns through the action transmitted to it by a reducing housing 54, which, the same as reducing housing 55, which through a series of transmissions makes the shaft 15 of the compacting blades 16 turn, receive the action of some motors 56 and 57 arranged on both sides of the frame 1, and which have some external flywheels 58 and 59 for regulating the diameter and corresponding movement speed of the respective transmitting belts.

The drum where the cable 88 is wound, driven by motor 56, receives the movement through an adjustable speed variator 89 by means of a servomotor 90. With reference 91, the possibility of coupling a crank for the manual operation of the speed variator is indicated.

This speed indicator can also be of the electronic type, with which the mechanism 89 would then be eliminated, with both the motor-driven variator and the electronic variator being driven from the electrical control panel of the machine.

The speed variator 89 can include pulleys and belts or a suitable transmitting mechanism.

Underneath the mentioned drive mechanisms and inside the frame 1, the cable guiding trap 60 is situated, which is mechanically driven through three

articulated levers, one of which 61 is joined to the mentioned trap at one of its ends, its other end being joined to another lever 62, which ends in a journal joined to the frame 1, with a third lever 63 in inverted L-section being locked to this journal for driving the unit.

A rod 64 joined to frame 1 underneath the lever 63 locks its position when the trap 60 is raised, this trap having the detachable attachment of a series of flatbars 65 with the corresponding notches for the guiding of the cables. This attachment is carried out by means of screws which pass through horizontal slots in the flatbars 65, which allows the same to be adjusted laterally.

Some articulated arms 66 in the mouth of the front part of the machine, underneath the drum and in the inside part of the sides of the frame 1 complete the perfect guiding of the cables, the mentioned arms including various notches for placing transversal flatbars where the mentioned cables are supported at different heights.

Finally, a series of blades 67 with notches for the passage of the cables are fitted on a transversal rotating shaft 68 located by the mouth of the hopper 8 in its front part, with this shaft 68 having some flatbars 69 locked at its ends, which on striking through the upper part of some stopping dogs 70 of the frame 1 prevent the rotation towards the front part of the machine, at the same time as the passage of concrete to that zone is prevented, and in turn allowing, with the backward elevation, the passage of the anchoring limiter of the wires existing at the end of the track.

In the event of the machine's including a guillotine device for having the pretensed wires of the beams visible so as to facilitate the latter cutting of the same, the mentioned device shall be preferably fitted in the rear part of the machine, after the flash-removing knives, and may be driven manually or by means of a programmer installed in the machine or out of it.

## Claims

1.- Improvements in the machines for the continuous manufacture of concrete elements, of the type which includes a frame (1) which moves along rails (3) on a track and which has a hopper (8) from which the concrete is poured to a mould train (7, 9) which passes on the wires of the armature which are located on the track, with the front mould (7) being the concrete vibrator and receiver, and being fitted with rotating blades (16) which compact the concrete towards the rear finishing mould (9), characterized essentially by the fact that the vibrating mould (7) is divided into two or more lateral parts, joined by means of a tie-rod (22), each one of which includes a vibrator (24), the mentioned mould (7) being installed in a dismountable manner in the frame (1) and the rotating blades (16) included in the same also being dismountable, which, moreover, are

height-adjustable, with the finishing mould (9) height also being adjustable, and which is fitted with a complement (45) which eliminates the flashes produced in the lower part between the concrete elements (V), the vibrator and finishing moulds (7 and 9 respectively) being connected by means of two lateral vertical screws in the finisher and one horizontal one as a tensor, between whose moulds an elastic joint (41) is arranged, and with the same including their sliding sections (28) on the track, fully or partly able to be changed over for replacement due to wear.

2.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claim 1, characterized by the fact that the vibrators (24) acting on the receiver mould include an external cooling circuit made up of conduits (25) communicating with an upper oil tank (26).

3.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claim 1, characterized by the fact that the winding drum (6) of the machine haulage cable and the geared motor (57, 55) which drives the rotation of the blades (16), are driven by means of mechanisms with a regulator (58 and 59) fitted respectively on one and the other side of the frame (1).

4.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claim 1, characterized by the fact that the cable guiding trap (60) is mechanically driven and includes independent means (66) for the graduation of the height of the reinforcing cables and jointing means (65) for the lateral regulation between the same.

5.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claim 1, characterized by the fact that the hopper (8) includes in the rear part of its output mouth an articulated trap (11) with which the opening of the mentioned mouth is regulated, while, on the opposite side, by this mouth, the transversal assembly has been envisaged of as many blades (67) as departments in the receiver mould (7), which prevent the passage of the concrete towards the front part of the mentioned mould, whose blades (67) are fitted on a transversal shaft (68) which permits the rotation of the same, so with the elevation, as to overcome the obstacle of the anchoring limit of the wires existing at the end of the track.

6.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claims 1 and 2, characterized by the fact that the receiver or vibrator mould (7) is also divided horizontally in accordance with two superimposed coplanar halves (7a and 7b) which are joined by means of an elastic joint (71, 72) with which the vibrations in the external walls of the mentioned mould are avoided, and because the vibrators (24), which act respectively on the two lateral parts of the

mentioned mould (7), have a monoblock eccentric shaft (73) which can be graduated by means of some eccentrics (76 and 77) envisaged on the ends of the mentioned shaft, with each vibrator (24) including an upper oil tank (26a) for individualizing its cooling circuit. 5

7.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claim 1, characterized by the fact that the complement for eliminating the lower flashes in the concrete elements is made up of a vertical knife (45) pushed elastically (47) downwards and which in the upper part can be raised by means of a cam (83), it being installed in a housing envisaged in a rear prolongation (8) of each core of the finishing mould (9), between whose cores, in the upper part, in its rear zone, a transversal section (85) has been arranged, and which determines the uniform finish of the upper part of the concrete element, with elastic sections being fitted longitudinally between cores, in the mentioned upper zone, and which facilitate the vibration and avoid the passage of the concrete to the upper part. 10  
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8.- Improvements in the machines for the continuous manufacture of concrete elements, in accordance with claim 2, characterized by the fact that the speed regulating mechanism of the winding drum (6) of the machine haulage cable (88) shall include a motor-driven variator (89, 90) or else an electronic variator, and the variation shall be obtained by means of pulleys or mechanically, the drive of the mentioned mechanism being obtained from the control panel (10) of the machine. 25  
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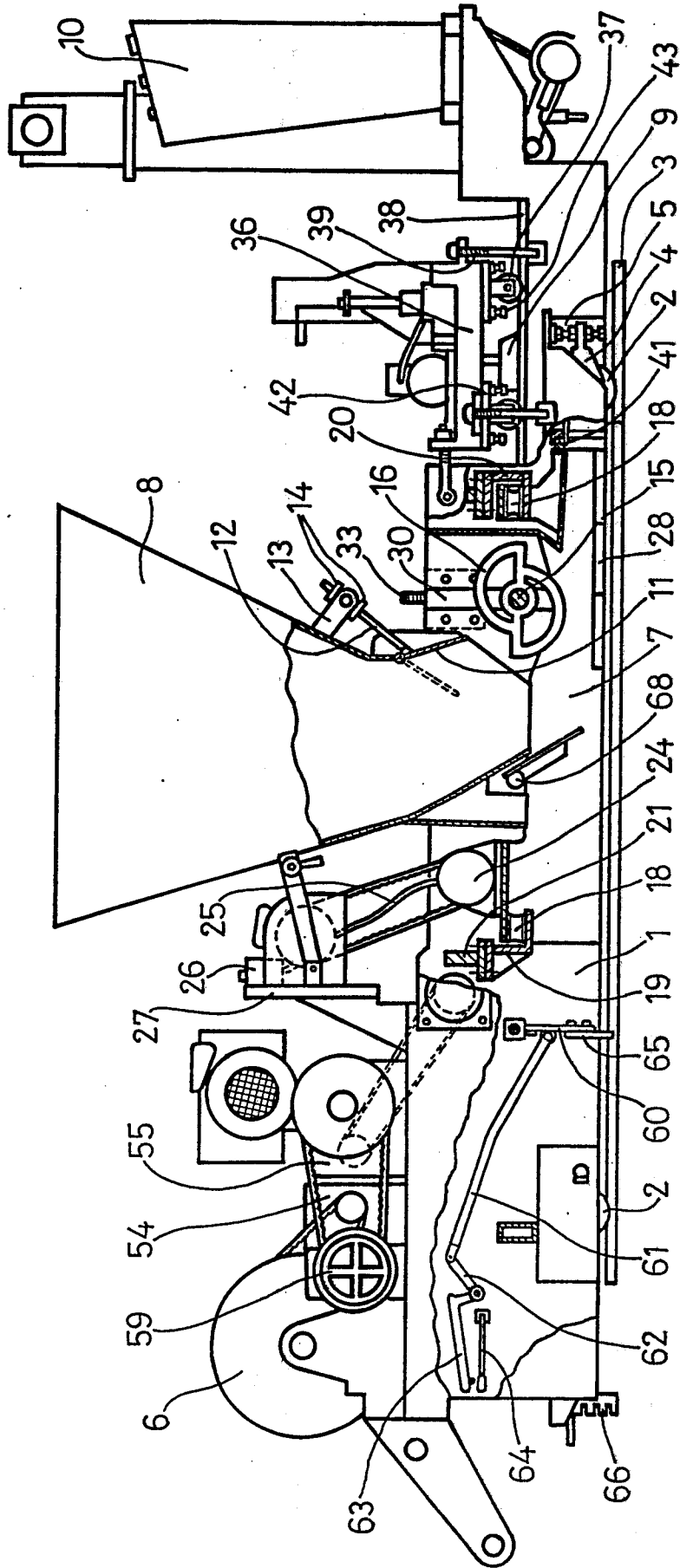


Fig. 1

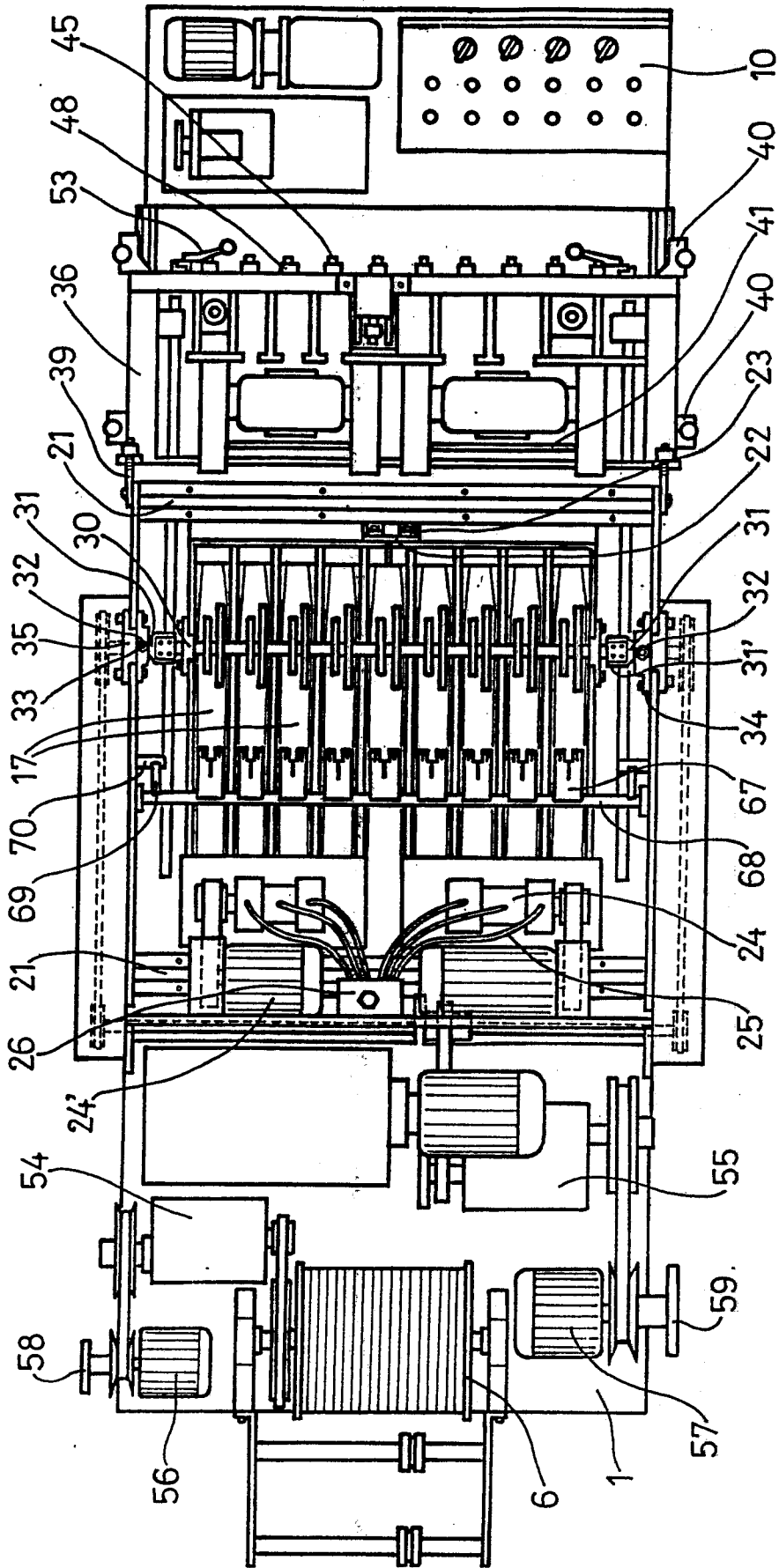


Fig. 2



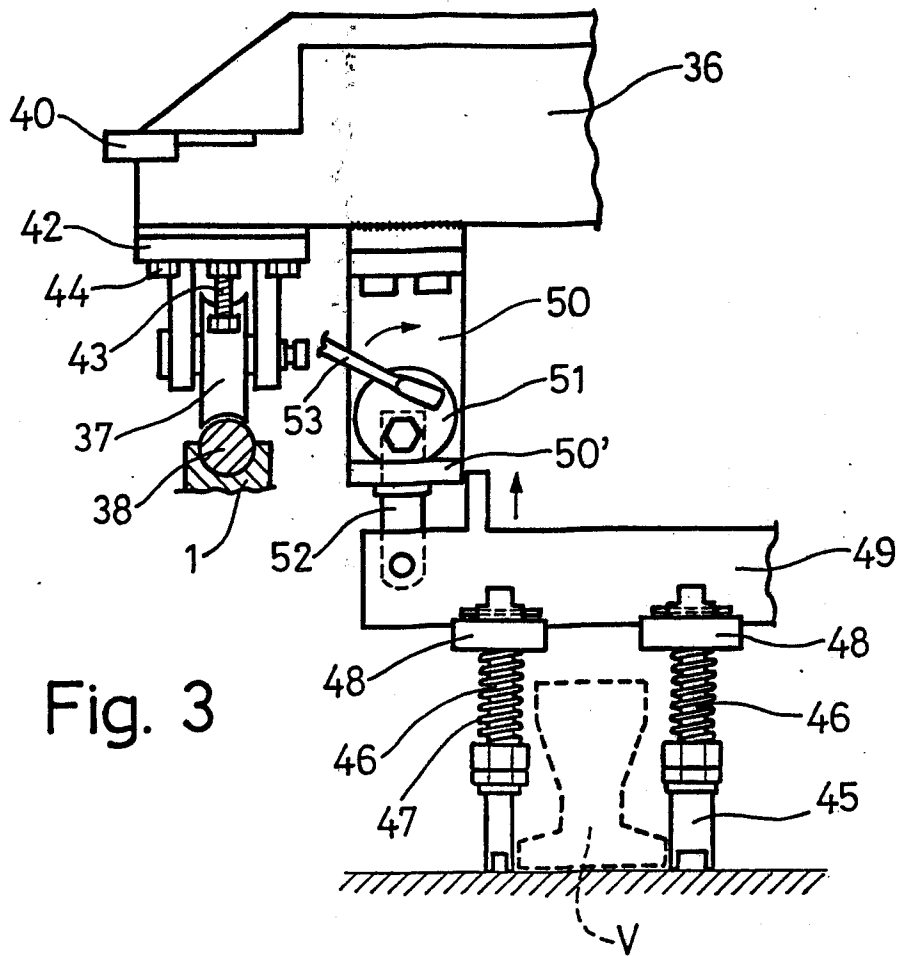


Fig. 3

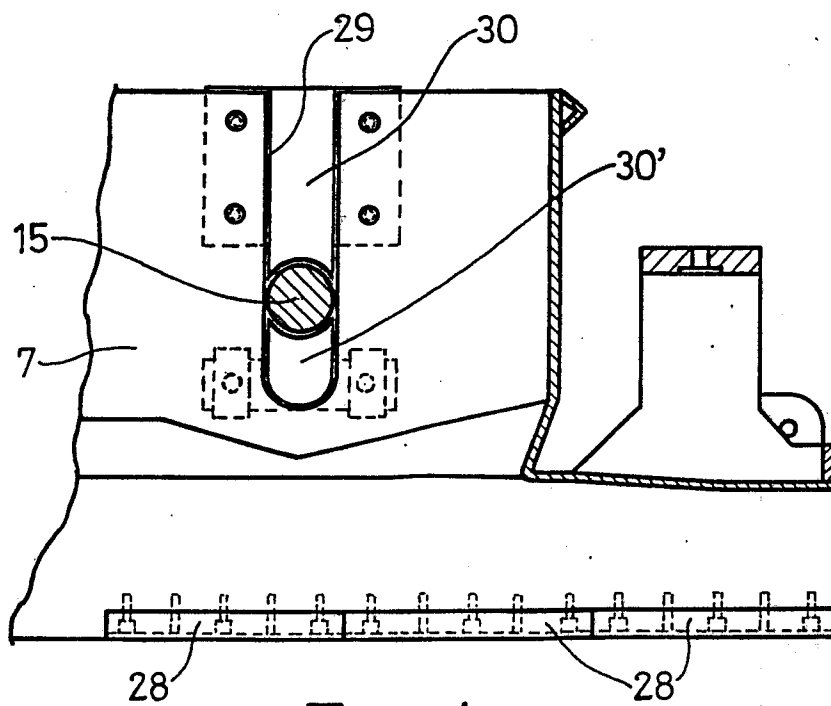


Fig. 4

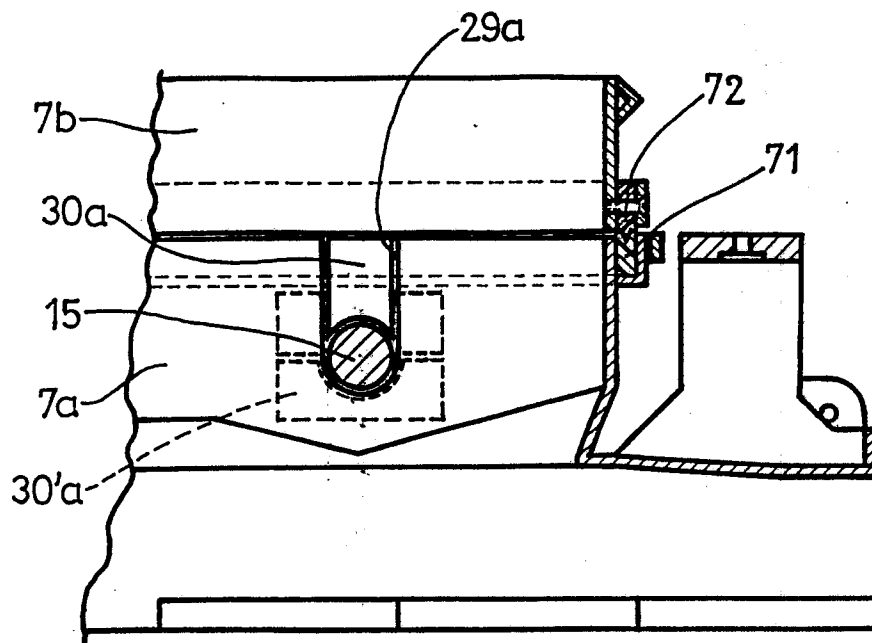


Fig. 5

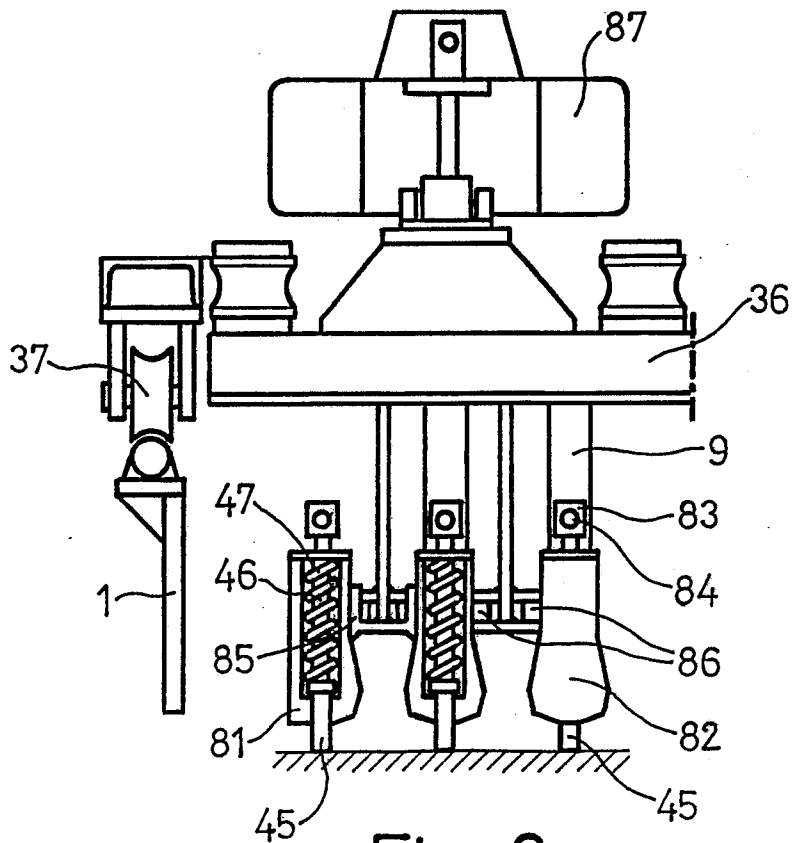


Fig. 6

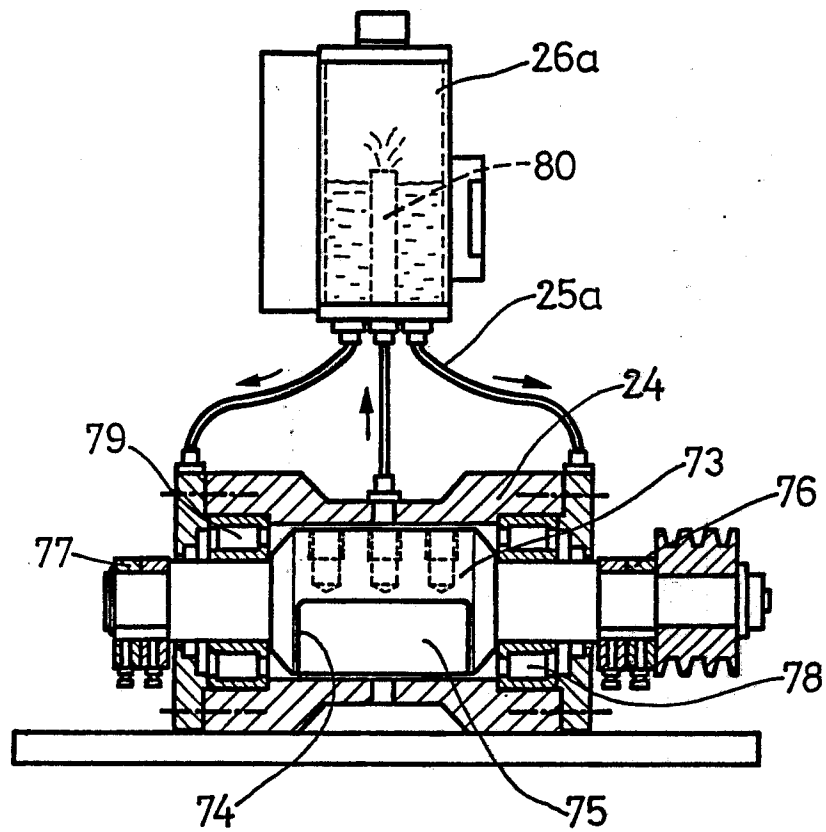


Fig. 7

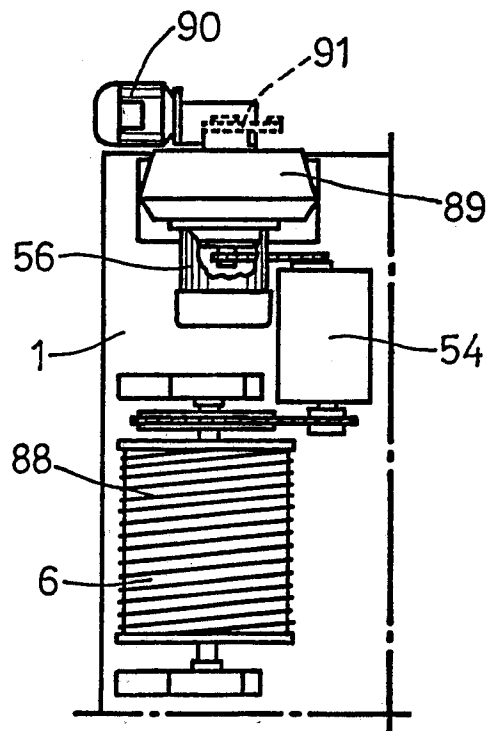


Fig. 8



DOCUMENTS CONSIDERED TO BE RELEVANT			EP 88500034.9
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
Y	DD - A - 25 377 (KULA) * Totality * --	1,7	B 28 B 1/29
Y	FR - A1 - 2 497 716 (SOCIETE D'ETUDES) * Totality * --	1,7	
A	FR - A - 1 312 705 (MAX ROTH) * Page 2, column 1, lines 48-54 * --	1,7	
A	US - A - 3 947 167 (ROCHFORD) * Fig. 3 * -----	1,5	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			B 28 B
Place of search VIENNA		Date of completion of the search 21-06-1988	Examiner GLAUNACH
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