(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 059 699**
A2

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: **82850036.3**

(51) Int. Cl.³: **A 62 B 1/14**

(22) Date of filing: **25.02.82**

(30) Priority: **27.02.81 SE 8101288**

(43) Date of publication of application:
08.09.82 Bulletin 82/36

(84) Designated Contracting States:
CH DE FR GB LI NL SE

(71) Applicant: **Marinkonsult AB Mako Gustav Nobelius**
Gösta Ekmans väg 37
S-126 54 Hägersten(SE)

(72) Inventor: **Nobelius, Gustav**
Gösta Ekmans Väg 37
S-126 54 Hägersten(SE)

(74) Representative: **Nordén, Ake et al,**
AWAPATENT AB Box 7402
S-103 91 Stockholm(SE)

(54) **Rescue device.**

(57) A device in an appliance for the rescue of persons from highly situated places comprises a drum provided at the place of stay of the person in question for storing an elongated flexible carrying means, and a device adapted to be moved under braking along said carrying means and supporting a harness, sack or the like for the person to be rescued.

The novelty of the invention resides in that the elongated flexible carrying means (I) is in the form of a band having a thickness that is small in relation to its width and that the person-carrying device (III) which is movable under braking along said band, includes braking surfaces which are engageable with the sides of the band.

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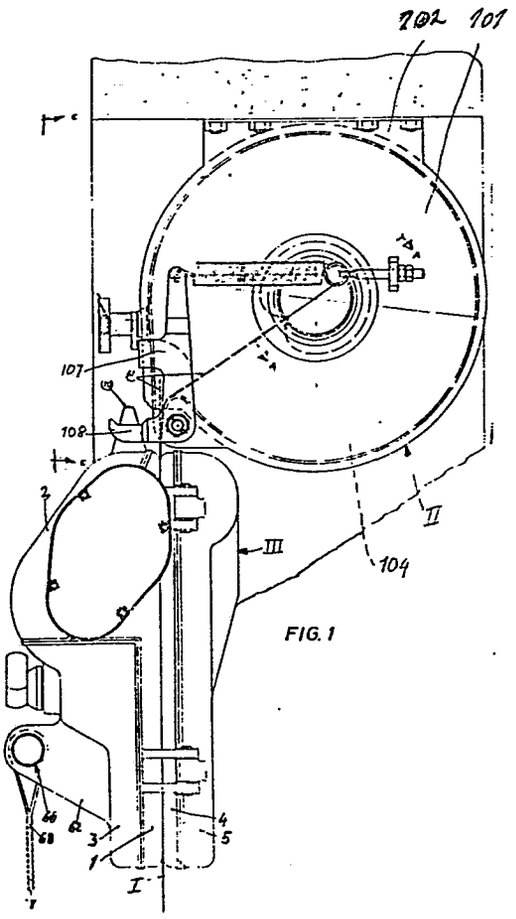

FIG. 1

RESCUE DEVICE

The present invention relates to a device for use in appliances for the rescue of persons from highly situated places, comprising a drum provided at the place of stay of the person in question for storing an elongated flexible carrying means, and a device adapted to be moved under braking along said carrying means and supporting a harness, sack or like means for the person to be rescued.

As is well known difficult fires relatively often arise all round the world in premises and blocks of flats and sometimes at such heights that it will be difficult for a fire-brigade efficiently and sufficiently rapidly to rescue people shut up by fire and smoke.

The present invention permits persons to escape on their own and without help from other people and to reach the ground uninjured also from heights of two- three hundred meters or more.

The novelty of the invention resides in that the elongated flexible carrying means is in the form of a band having a thickness that is small in relation to its width, and that the person-carrying device, which is movable under braking along said band, has braking surfaces engageable with the sides of the band.

The device according to the invention includes a harness with a rescue-sack in which the distressed person rides or slides along a band, preferably consisting of steel and being, say, 50 mm wide and 0.5 mm thick and having rounded side edges. The band is stored in a preferably cylindrical cassette in which the band is wound on a rotary cylindrical journal which is borne in the cassette. When the rescue device is to be used the band is pulled out through an opening in the cassette. The size of the cassette is adapted to the required length of the band which must reach down to the ground in unwound condition. The cassette is provided with stable anchoring means above or on the

side of a suitable opening and is so arranged that the band cannot unwind by itself in rest position. The band is sealed to the cassette and consequently the seal must be broken before the device is used. A crank means makes it possible to rewind the band into the cassette after use. A braking means, for instance a simple centrifugal speed regulator, is fitted to the cassette so that the band cannot get entangled during unwinding. The band, which preferably is of tempered stainless steel, has a strength of 4 - 5000 kg, and is resistant to any temperature that it normally can be exposed to in case of fire without therefore losing carrying capacity to the point where the rescue work would be impaired or rendered impossible. An inflatable cushion of about one meter in diameter can be detachably arranged in the outer end of the band. The cushion is preferably attached to the band at its upper centre and is provided with a CO_2 bottle for inflating purposes. A handle is fitted on the periphery of the cushion. People on the ground should possibly help each other to keep the band spaced from the wall of the building, thus facilitating the rescue work and reducing the risk of injuries by shocks or scraping against the outer wall of the building. The landing takes place on the cushion which softens the shock.

The maximum falling velocity for this rescue device is set as low as 1.5 meter per second to permit rescuing persons without experience as well as old people in bad physical condition. Well-trained parachutists are able to stand falling velocities of about 6 m per second without injuries.

The height rescue device functions automatically during the rescueing operation independently of the body weight, and the falling velocity is automatically adjusted to a preset value, which permits rescuing also an unconscious person provided that somebody can get him into the device.

The invention will be described more fully below with reference to the accompanying drawings, in which:

Fig. 1 is a side view of the band cassette with rescue devices ready for use;

Fig. 2 is a sectional view taken on line A-A in Fig.1;

Fig. 3 is a front view taken on line C-C in Fig. 1;

Fig. 4 is a sectional view taken on line B-B in Fig.3;

Fig. 5 is a side view taken on line F-F in Fig. 7;

Fig. 6 is a sectional view taken on line C-C in Fig.7;

Fig. 7 is a sectional view taken on line D-D in Fig.6;

Fig. 8 is a side view taken on line E-E in Fig. 7;

Fig. 9 is a sectional view taken on line G-G in Fig.5;

Fig. 10 is a radial section taken on line B-B in Fig.6;

Fig. 11 is an axial section of the detail in Fig. 10;

Fig. 12 is a sectional view of a detail taken on line K-K in Fig. 7;

Fig. 13 is a sectional view through section A-A in Fig.7;

Fig. 14 is a sectional view on line L-L in Fig. 7; and

Fig. 15 is a section on line H-H in Fig. 12.

The appliance comprises, in addition to the band 1, a part II, i.e. the band cassette, attached to the building, and an arbitrary number of rescue devices III which are adapted to be fitted on the band. The band I, which preferably is made of stainless steel, is of such a length that it will reach from the building part, where the band cassette is attached, and well down to the ground. The band is plane and to increase friction it may also be provided with a perforation, a rough surface or otherwise be so treated that the band, together with the details cooperating therewith, will have a satisfactory frictional engagement or a positive tooth-wheel engagement.

Even if steel would seem to be the most appropriate material for the band it is quite possible to make the band of other material having equivalent properties concerning temperature resistance, modulus of elasticity and storage life.

The part II, i.e. the band cassette, consists of a housing 101 provided with fittings 102 by means of which the housing can be secured to a suitable building part, e.g. a window frame. A band hub 104, containing the required band length, is mounted on a journal 103 in the housing. The band hub is provided with a brake 105, preferably a centrifugally

regulated brake 106, preventing too rapid unwinding of the band, as this could cause it to get entangled. The band drum can be rotated by means of a hand crank (not shown) for use when winding in the band. There is also an abutment 107 with suspension hooks 108 on which the rescue device III is suspended for connection to the band I.

The rescue device proper III is built up of an outer base plate 1, with an upper casing 2 and a lower casing 3, and an inner base plate 4 with an inner casing 5. The outer base plate and its casings are joined by screw joints and form in joined condition an envelope for all the details included therein which will thus have the desired protection. Provided in the upper part of the bottom plate 1 are two bearing sites for ball bearings 10 which support the shaft 9 on which two guide flanges 6 are provided on the friction drum 7 which is supported by the hub 8. A gear wheel 11 is attached on the free end of the shaft 9. This gear wheel 11 is in permanent mesh with another gear wheel 12 which is formed in one side of a shaft 13 in the opposite end of which another gear wheel 15 is provided. The shaft 13, which supports the gear wheels 12 and 15, is provided in either end with journals carried by the ball bearings 14.

Provided in parallel with the shaft 13 is a centrifugal regulator of per se known design but working according to a new mode of operation. This regulator has a regulator shaft 17 supported in two ball bearings 18 which support the regulator driven by the gear wheel 19 which is in permanent engagement with the above-mentioned gear wheel 15. In the right-hand part of the regulator shaft 17 the gear wheel is fixedly connected to the shaft. In the same shaft end as the gear wheel the regulator shaft 17 forms spring brackets for the regulator springs 21 with mounting screws 23. The right-hand spring bracket forms a stationary unit with the regulator shaft 17. In the opposite, left-hand end of this shaft a regulator disc is formed with a hub 22 running freely with a key joint against the regulator shaft 17 to prevent rotation or turning of the details 17 and 22. Between the regu-

lator disc 22, which on its hub part also has mountings formed for the regulator springs 21, these springs 21 are connected with the screws 23 and on the central part of said regulator springs the regulator weights 20 are fitted. The centrifugal force acts upon rotation of the regulator shaft 17 in such a way that the weights, which are thrown outwardly in radial direction, entrain the regulator disc 22 to the right, whereby the fork-shaped regulator lever 24 via the two ball bearings 25 on their journals 26 and lock nuts 27 also is carried to the right while the regulator lever turns about its bearing screw 28. The opposite end of the regulator lever 24 is formed, as also appears from section B-B, Fig. 10, with a ball bearing 30 supported by a pin 71 locked for instance by split pins 72. When the centrifugal regulator is idle the ball bearing 30 abuts the lever 34 at the lower part of the inclined plane. When the regulator is set in rotation the regulator levers will turn clock-wise about their suspension and mounting screw 28 due to the displacement of the regulator disc 22 to the right. At this moment the ball bearing 30 will travel upwards on the inclined plane on the brake lever 34 which, due to its pivotable mounting on the pivot pin 38, displaces the mobile brake block 35 with the brake lining 36 to the right, that is towards the band I, with a power determined, on one hand, by the leverage and, on the other hand, by the angle of the brake lever 34, the angle or inclination of the inclined plane, but otherwise by the weight of the regulator weights. The adjusting forces produced by the centrifugal regulator are a function of, on one hand, the regulator revolution and, on the other hand, of the mass of the regulator weights. To obtain a good function together with a low weight of the components in this case the regulator is geared up to about 5000 r.p.m.

With the aid of an outer hand brake lever 31 it is possible to pass the centrifugal regulator and directly actuate the brake lever 34 manually via the regulator lever 24 which is provided, at its mounting screw 28, with a groove

32 in which the hand brake lever 31 engages by its head 33, while the hand brake lever is also retained by the screw 28 and will thus at the same time have a bearing in the lower casing 3 which has a through bearing at the hand brake lever 31.

To bring the centrifugal regulator in rotation it is necessary that the friction drum 7 is forced to rotate and this result is obtained by the band I being pressed against the friction drum, which takes place by means of the straining roller 39 which, in a fork on the clamping lever 42, is borne on two ball bearings 41 on the journals 40. The opposite side of the clamping lever is borne between two lugs formed in the inner casing 5 and is movable about the pivot pin 47. In the upper part of the clamping lever 42 is a bracket through which the straining screw 43 passes with play. The straining screw 43 has a conical head anchored in the inner base plate 4, and a tension spring 44 is adjusted by means of an adjusting nut 45 and a locking nut 46 so that a suitable pressure is obtained between the straining roller 39 relative to the friction roller 7 via the conveyor band steel 67. Provided on the inner casing 5 are two lugs 51 between which a non-displaceable but pivotable brake block 48 with brake linings 49 is mounted on the pivot pin 50. When braking is carried out by hand or is the result of the operation, described above, by rotation of the centrifugal regulator, then the braking takes place against this brake block 48 with brake lining 49, while the band 67 is squeezed between said block and the movable brake block 35 with brake lining 36.

To make it easy to adapt the rescue device about the band I, which has been wound out of its cassette, the device is provided with two joints or hinges the appearance of which appears from Figs. 5 and 9, sections F-F and G-G and Fig. 7. In Fig. 9 the hinge joints are shown from the side. The hinge lug 53 forms part of the outer base plate 1. The hinge lug 55 is part of the inner casing 5. The joint on the pivot pin 54 is displaced downwards in the drawing, i.e. inwards towards the inner casing 5.

The reason therefor is of a constructive nature but also depends on the fact that the opening will thus take place in a more favourable manner.

After the device has been opened about the pivot pins 54 the entire device is suspended in open condition in its suspension lug 70 on the suspension hook 108 intended therefor on the release mechanism of the band cassette. The open device is suspended on the outside of the band which is to be visible from the interior of the premises and pass between the guide flanges on the friction roller 6, and in the lower part pass between the guide pins 52.

In this position one grasps with one hand the handle 66 of the apparatus and with the other hand the inner base plate 4 is turned with its inner casing 5 over the conveyor band, like closing a book, and one of the pivotable straining screws is turned into the recess of the locking lug 58, whereupon the straining and locking wheel 56 is tightened until higher resistance is noticed. When this has taken place also the other pivotable straining screw 59 is turned into its recess in its straining lug 58.

The configuration appears from Fig. 12 where the pivot pin 60 constitutes a mounting for the pivot sleeve 61 and the straining screw 59 is screwed against a recess in the pivot pin 60 so that this is retained. The pivot pin is movable and is pivotally mounted between two lugs 69 which are formed on the outer base plate 1. The mounting lugs in their turn are formed in one piece with the casing 5 of the inner base plate.

Provided in the locking lug 58 is, as already mentioned, a groove 63 which is shown in Fig. 15, from which it also appears how the straining and locking wheels 56 after application are blocked against unvoluntary release of the pivotable straining screws 59 because the neck of the locking wheels 56 goes down into a depression which makes it necessary to thread out the locking wheel somewhat more than the depths of the depression before it is possible to turn out the straining screw.

The tightening of the straining and locking wheels 56 is so strong that the spring pressure in the tension spring 44 is overcome and the outer base plate 1 is entirely pressed together with the inner base plate 4 without any gap being left between them. The band should then pass into the rectangular intake of the device and between the guide flanges 6 on the friction drum 7 and further on between the guide pins 52 and out through the rectangular recess.

In operation and use the load in the height rescue device, i.e. the weight of the person to be rescued, is transmitted, with the aid of the above-mentioned rescue sack via harnesses 68 to the central portion of the double handle 66 between the fastening lugs 62. As the centre of the double handle 66 in the attachment of the harnesses 68 has a considerable distance from and outside the band plane a moment will arise and as a consequence thereof the entire device will under loading turn its lower part inwards towards the building wall and away from the person to be rescued who will thus not be hampered by the incoming band part which passes the rescue sac with a good margin.

Instead of the described mechanically operating brake assembly, actuated by the centrifugal mechanism, it is of course possible to use a hydraulic brake assembly which is controlled by a mechanically driven hydraulic pump which, in a suitable manner and in cooperation with a constant-flow valve and an oil accumulator, adapts the braking force to the person's body weight and the desired maximum falling velocity.

The essential novelty of the invention is that the rescue work takes place via a thin and wide band which can be stored in great lengths in suitable cassettes which are most simple to handle without requiring any experience whatsoever. The band possesses high heat resistance, high strength and pliability at the same time as it is well apt to have brake blocks applied to it without its lining being worn to any degree worth mentioning during use because the braking according to this method will all the time take

place against a cold band surface. The temperature increase which takes place in the band as a consequence of the braking, decreases rapidly after the passage of the device which is swept by the air which rapidly cools the thin material.

Because the invention includes a speed regulator which automatically controls the falling velocity it is possible also to rescue an injured or unconscious person if only somebody manages to get the rescue apparatus on to the injured or unconscious person. Another advantage resides in the fact that the person to be rescued can himself control the falling velocity during the descent by reducing the velocity wholly or partly by means of the hand brake.

As soon as the person to be rescued has landed on the ground the height rescue device should be detached from the steel band to make room for the next person to be rescued along the same conveyor steel band. The problem with the detachment can be solved in that the band is allowed to end freely on or close to the ground so that the rescue apparatus will run off the band by itself.

The device according to the invention may of course be constructed in various ways within the scope of the invention and the various components can be arranged in various ways without departing from the inventive idea. The advantage of using band along which the rescue work takes place is that a relatively small cassette will hold hundreds of meters of band which has high temperature resistance and is very apt to having braking devices applied against it. The band has the advantage relative to drum or disc brakes that the friction or brake linings during the braking period will all the time work on band surfaces which have not been heated before by the braking operation. The band is rapidly cooled because of its large width and surface in combination with its small thickness so that a plurality of persons can simultaneously pass down on the band in perfect safety.

CLAIMS

1. A device in an appliance for the rescue of persons from highly situated places, comprising a drum provided at the place of stay of the person in question for storing an elongated flexible carrying means, and a device adapted to be moved under braking along said carrying means and supporting a harness, sack or the like for the person to be rescued, w h e r e i n the elongated flexible carrying means (I) is in the form of a band having a thickness that is small in relation to its width and w h e r e i n the person-carrying device (III) which is movable under braking along said band, includes braking surfaces which are engageable with the sides of the band.

2. A device as claimed in claim 1, w h e r e i n the band (I) is a steel band.

3. A device as claimed in claim 1 or 2, w h e r e i n the device (II) movable along the band includes a braking device (35, 36) which is applicable to the band by means of a mechanism (20 - 24) which is adapted to be controlled by a means sensing the displacement velocity along the band.

4. A device as claimed in claim 3, w h e r e i n the means sensning the displacement along the band includes a centrifugal regulator or the like, driven across a gearing device (11, 12, 15, 19) by means of a wheel or the like unrolling the band.

5. A device as claimed in claim 1, w h e r e i n the band (I) is adapted via a gearing device to drive a controllable application device for at least one brake-shoe.

6. A device as claimed in claim 3, w h e r e i n the braking assembly is also provided with means (31) for manual braking.

7. A device as claimed in claim 1, w h e r e i n the device (III) movable along the band is adapted to be opened to permit its application on and removal from the band.

8. A device as claimed in claim 1, w h e r e i n

the device movable along the band is provided with an attachment (68) for the harness or the like at a point which is at a perpendicular distance from a plane through those points at which the band (I) passes into and out of the device.

9. A device as claimed in claim 1, w h e r e i n a sack provided with a hole for the person's legs is attached to the harness.

10. A device as claimed in claim 1, w h e r e i n the braking surfaces (35, 36, 48, 49) which are applicable against the band preferably have a larger width than the band (1) and are fitted to bodies (35, 48) which are turnable about shafts (37, 50) which are disposed in parallel with the band surfaces in order to produce a certain automatic application effect.

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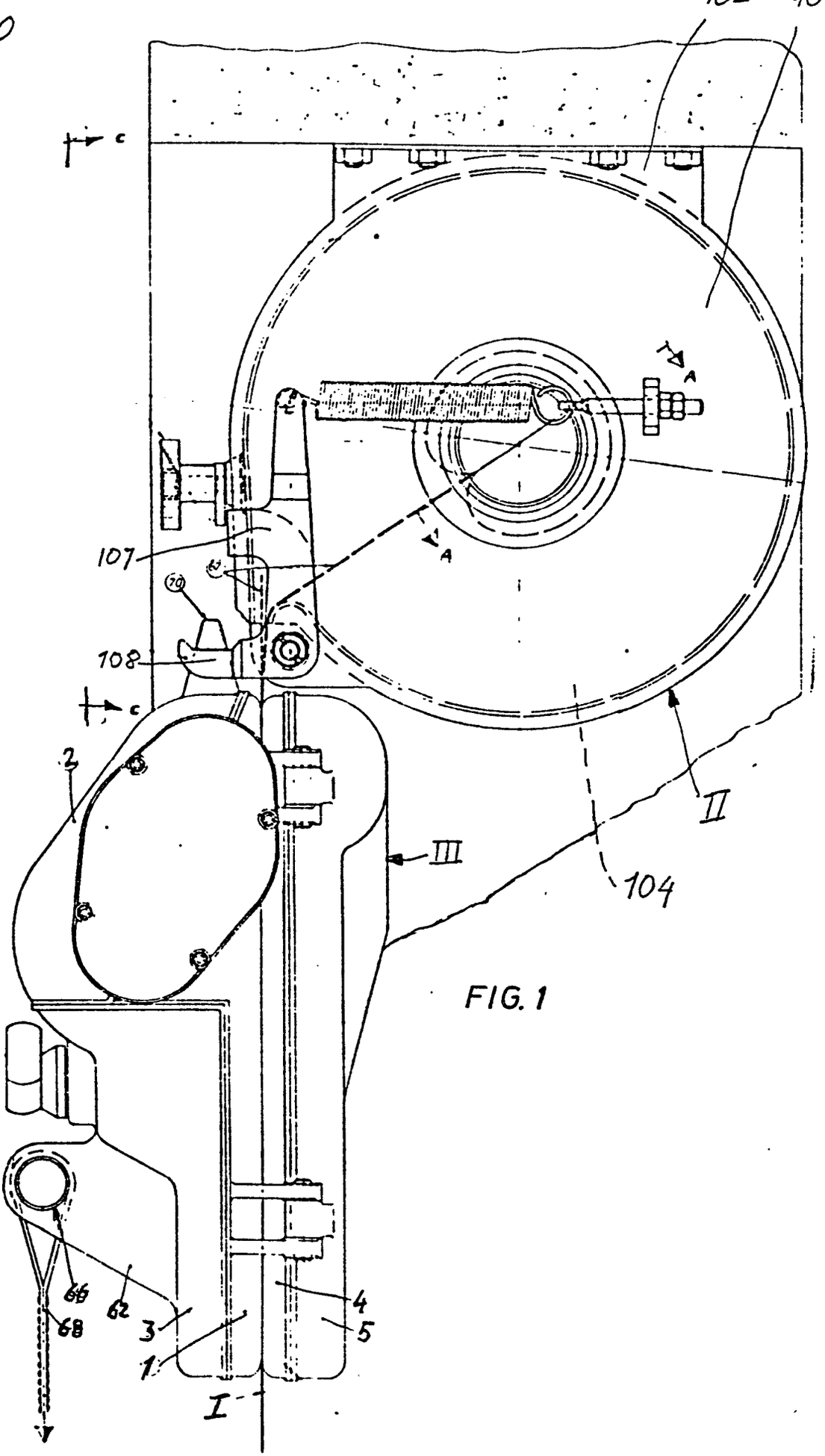

FIG. 1

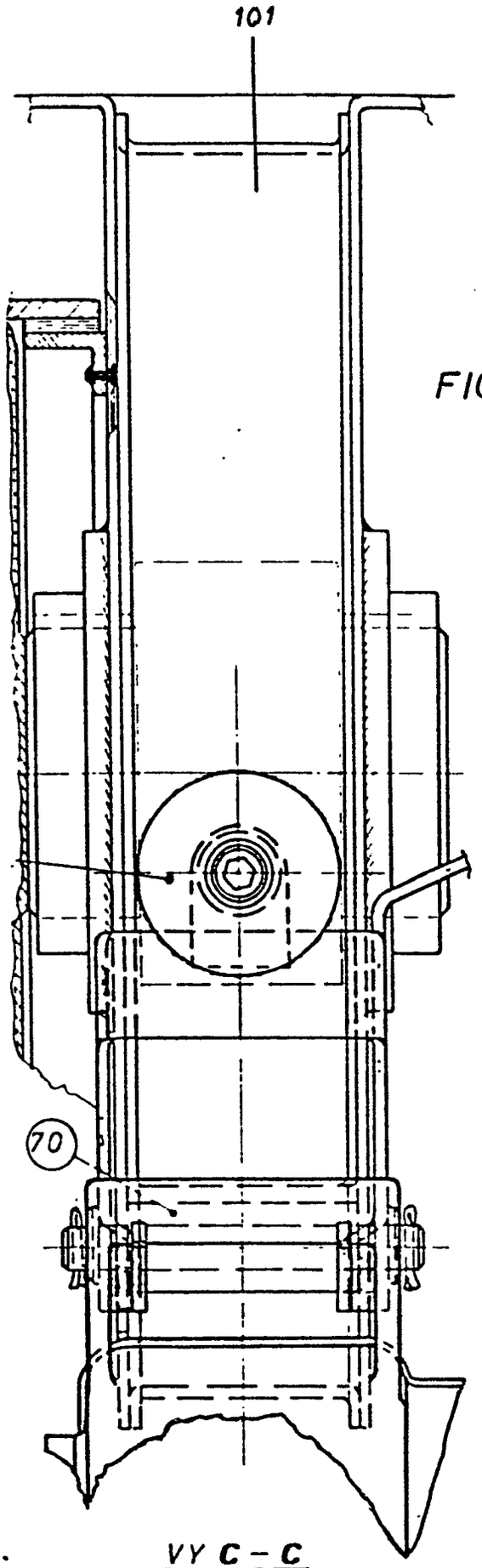

FIG. 2

FIG. 3

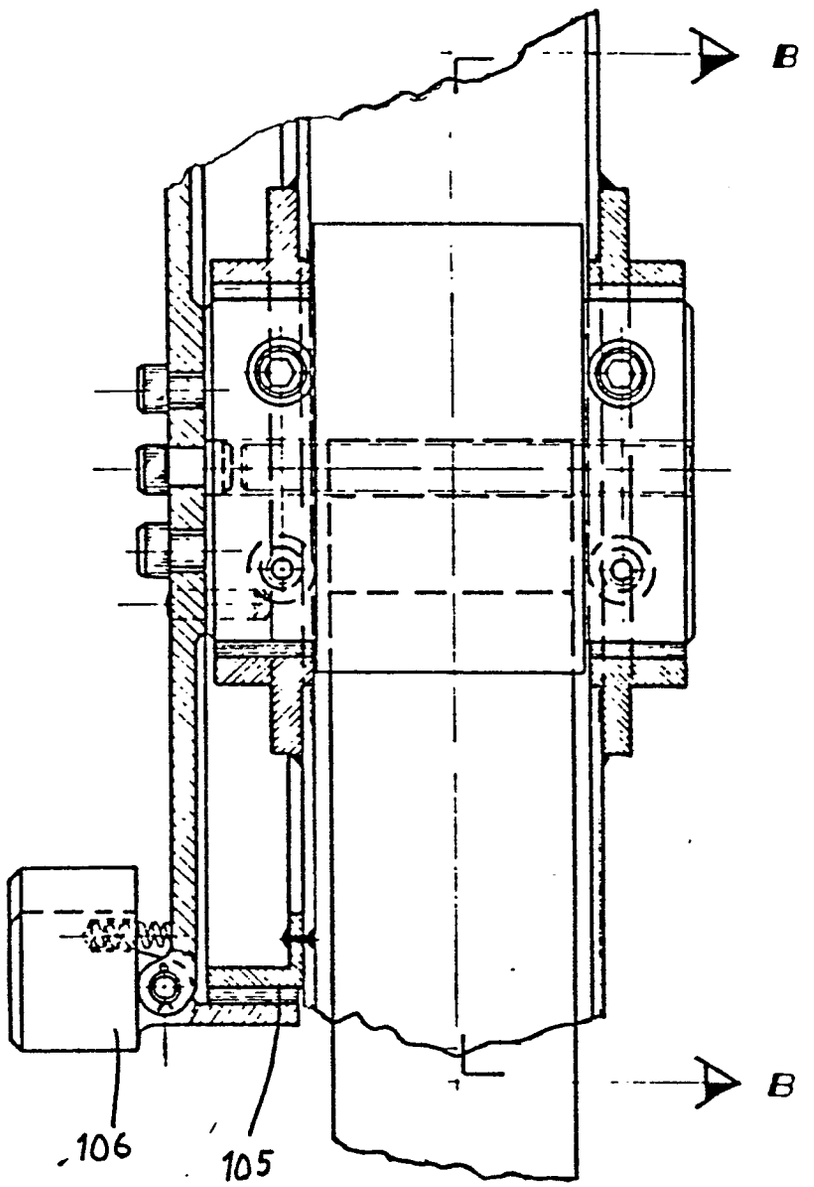

FIG. 4

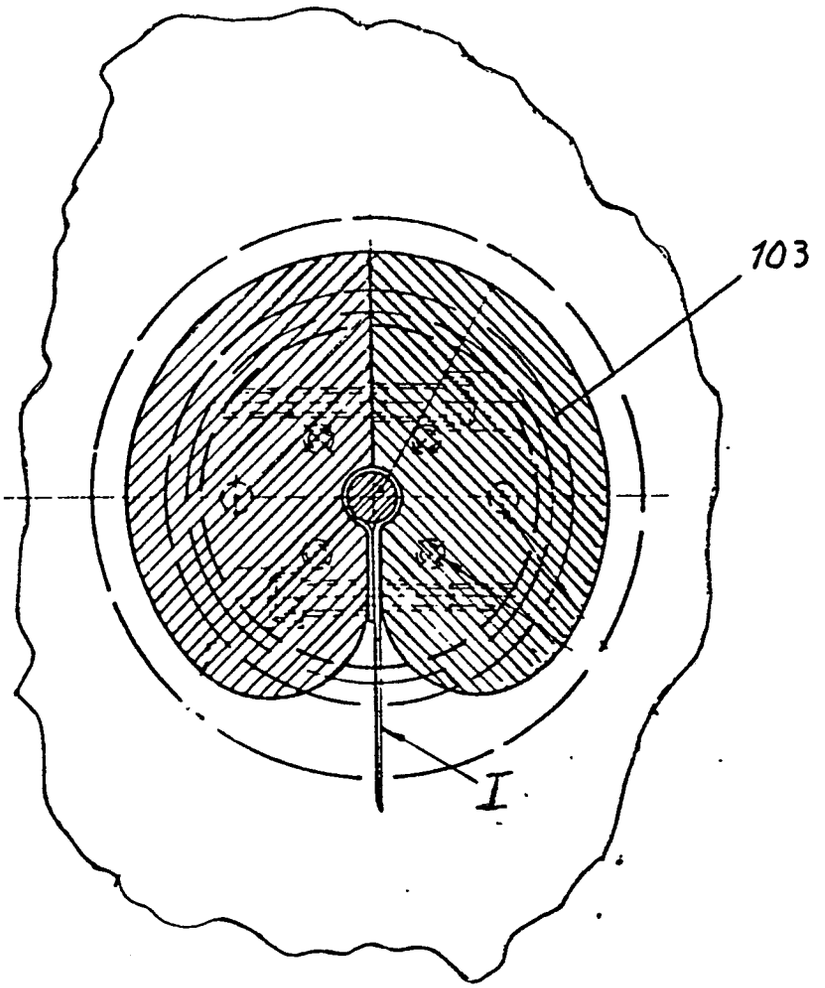

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FIG. 5

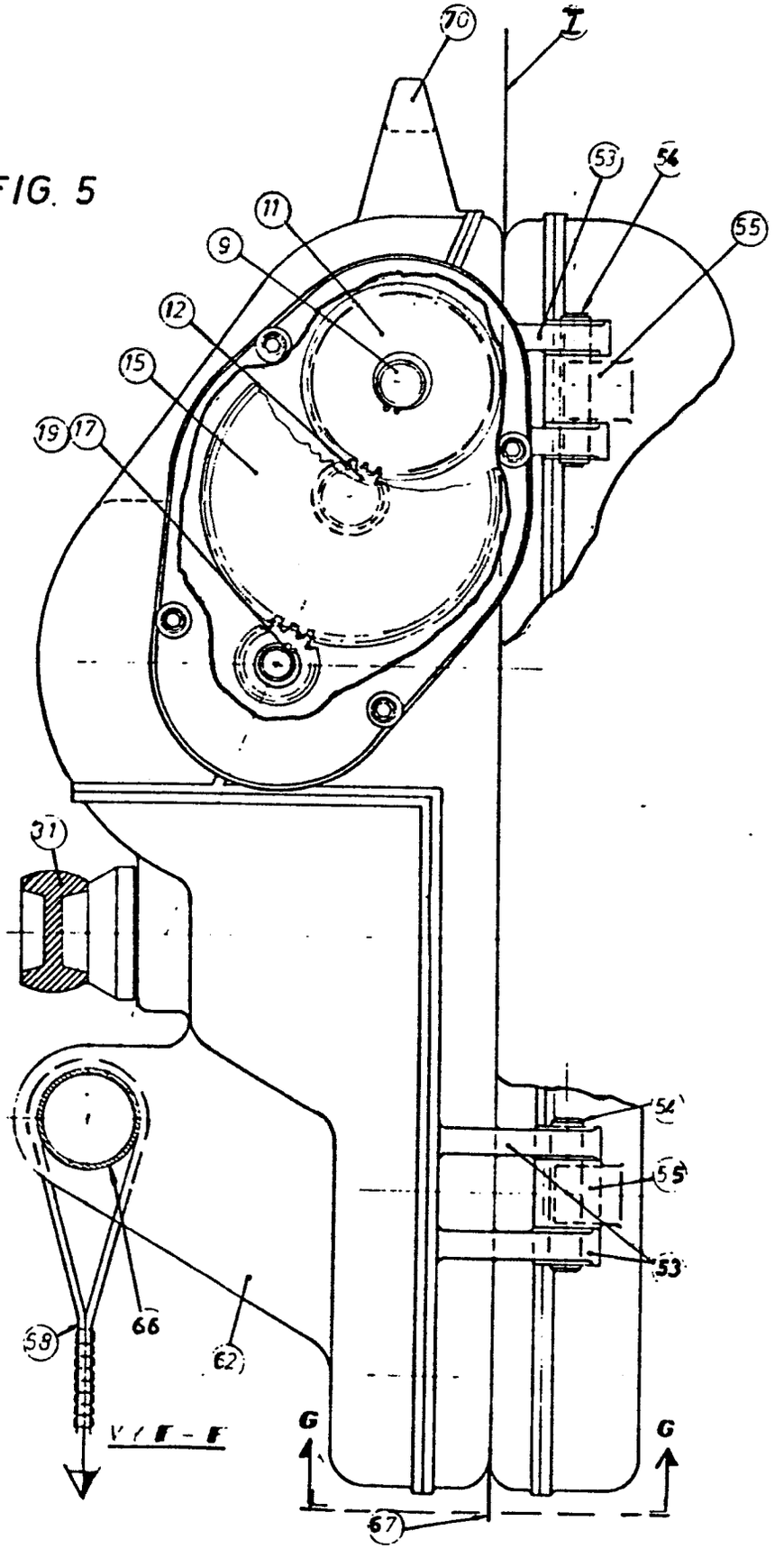
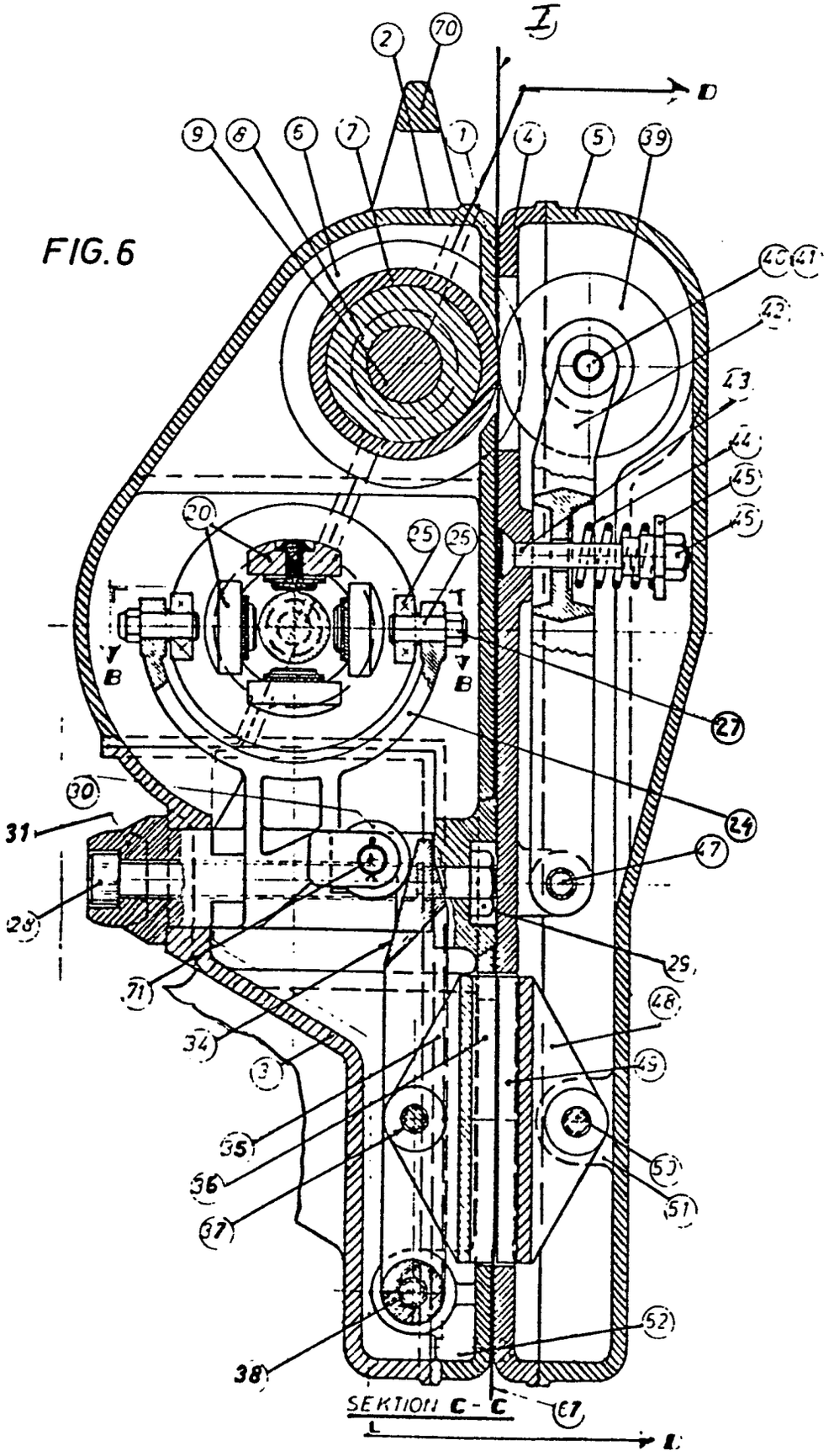


FIG. 6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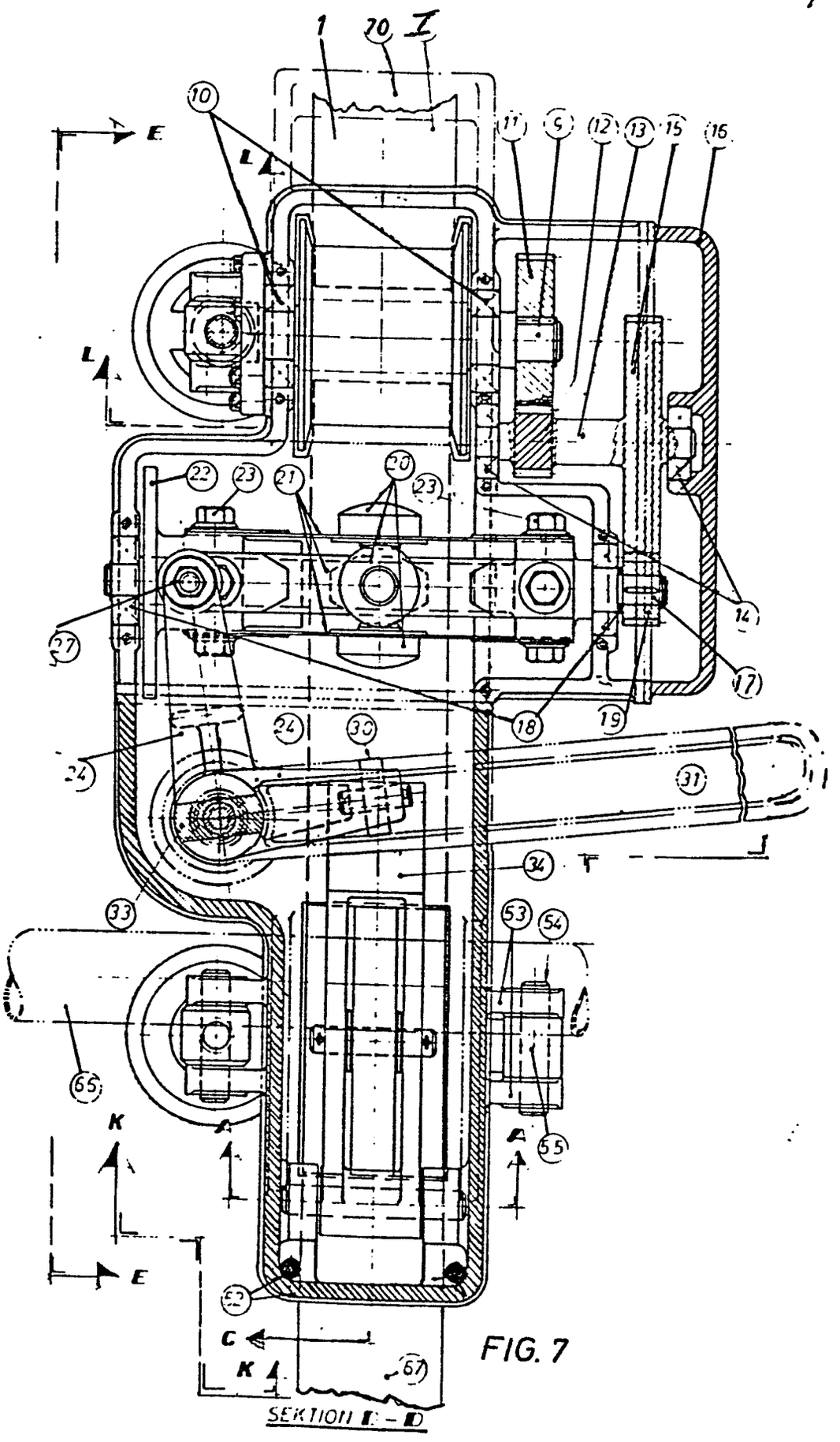
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SEKTION E – E

FIG. 7

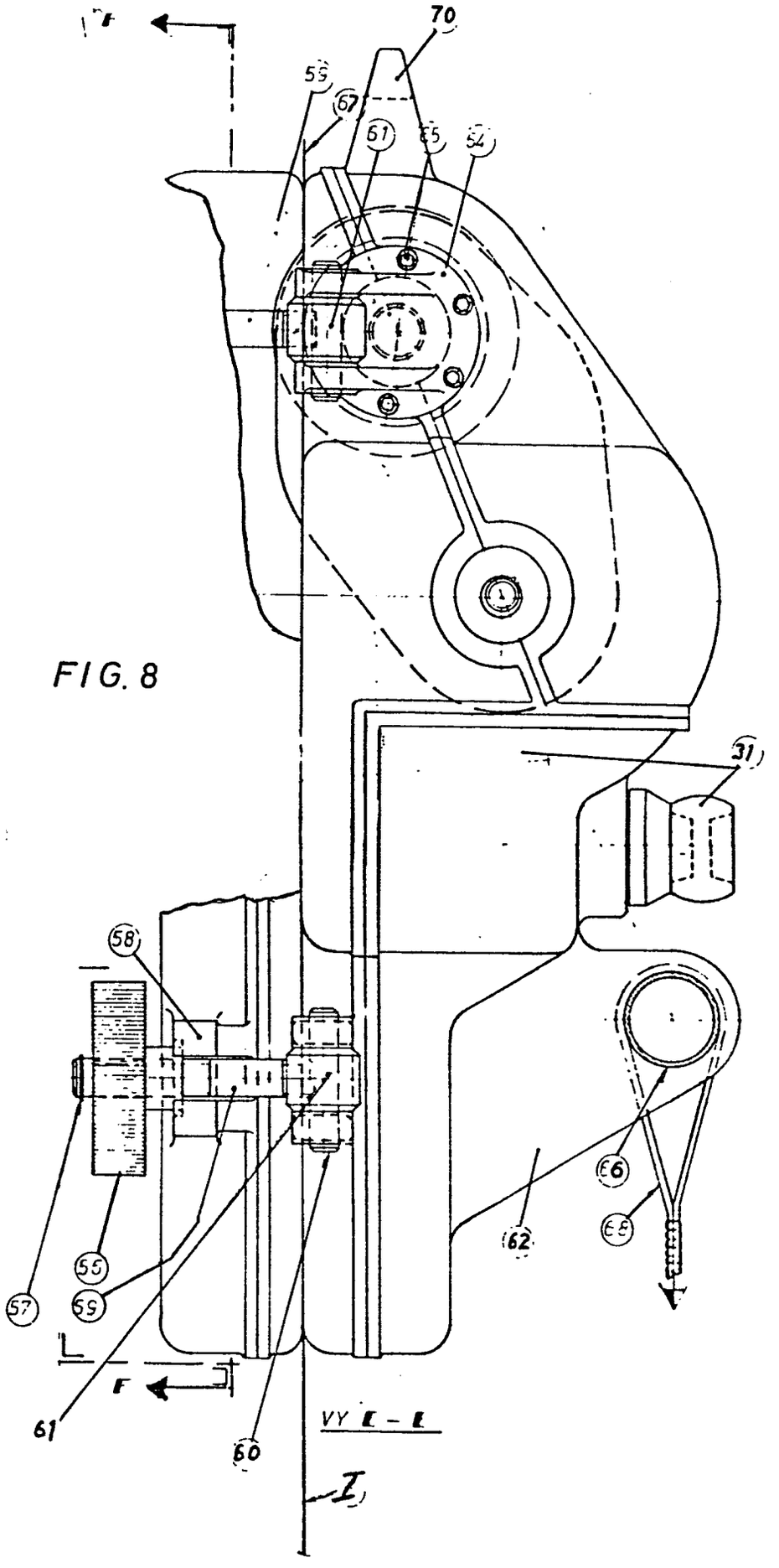
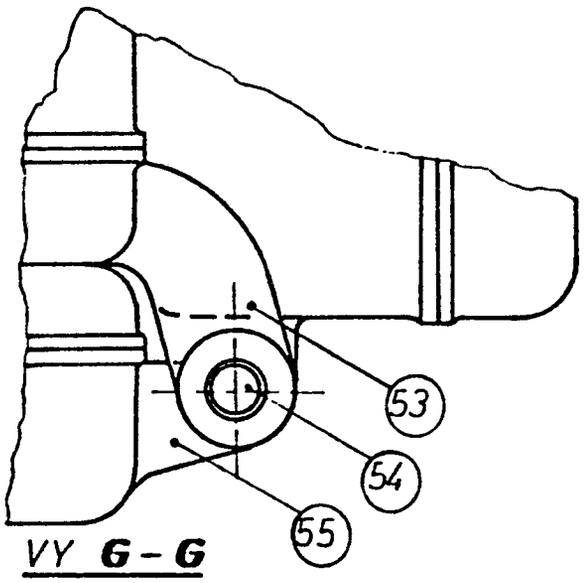


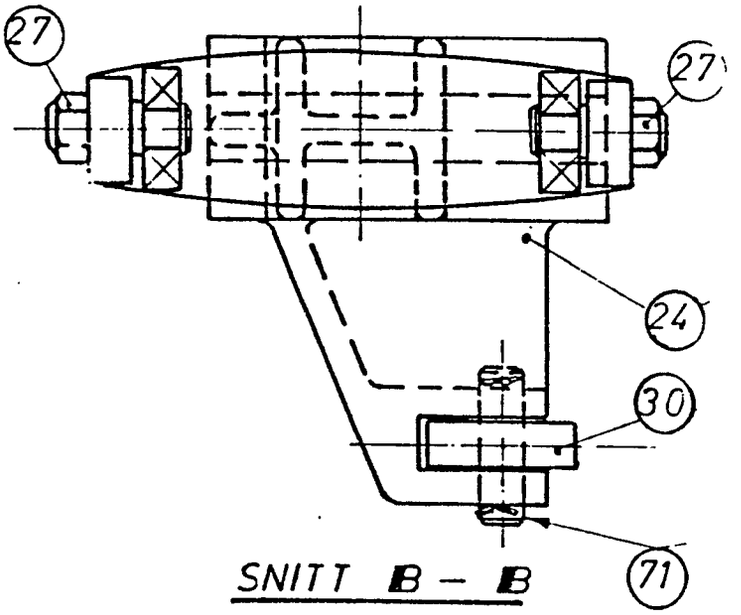
FIG. 8

FIG. 9



VY G-G

FIG. 10



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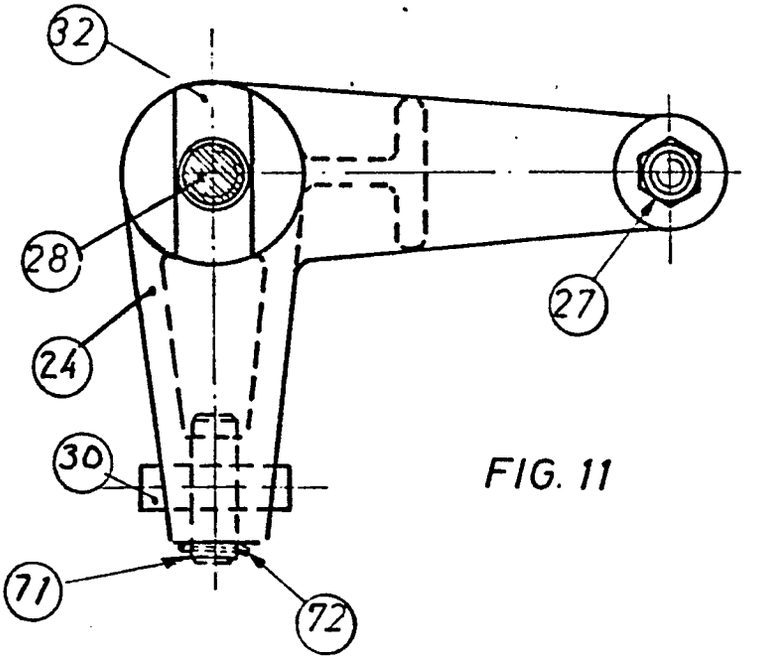
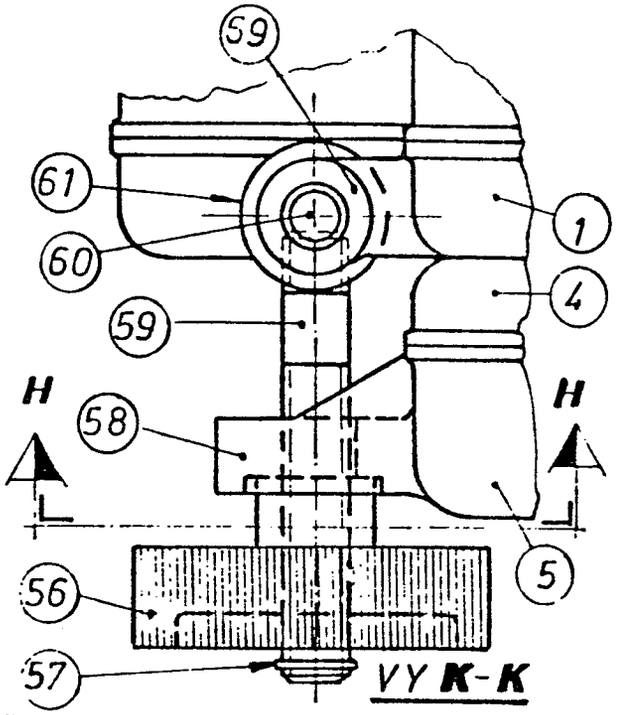


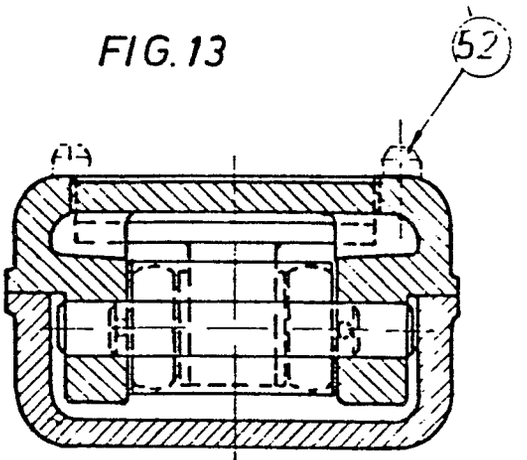
FIG. 11

FIG. 12

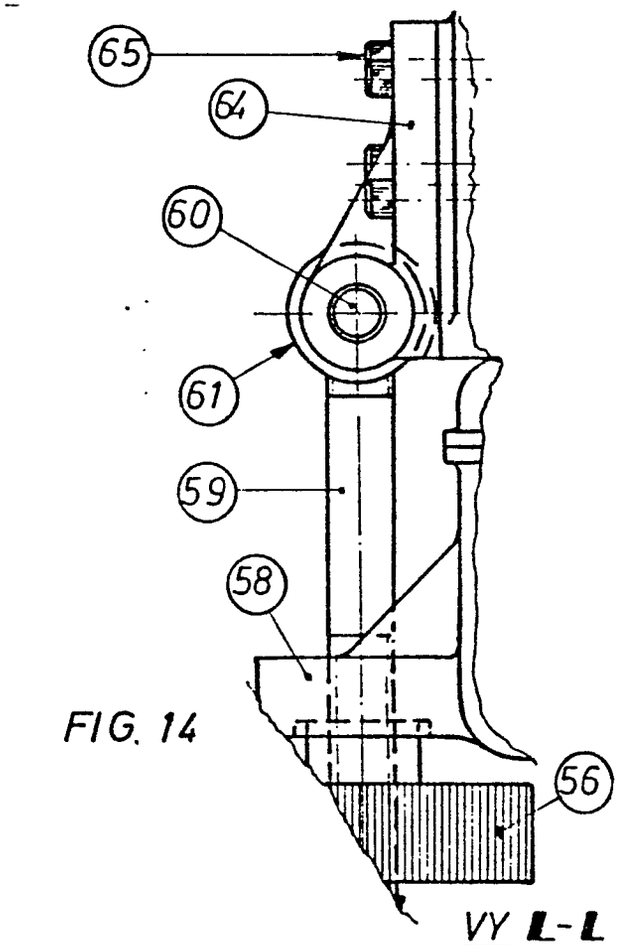


VY K-K

FIG. 13

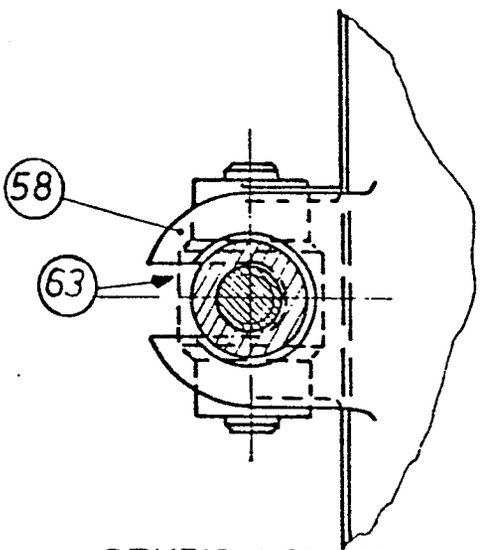


SEKTION A-A



VY L-L

FIG. 14



SEKTION H-H

FIG 15