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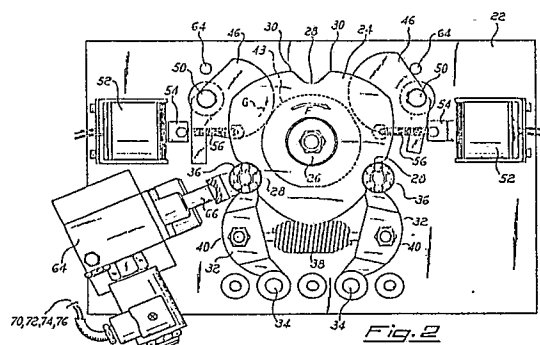
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54 An improved turnstile provided with rotation resistance control means, and with automatic allowable rotation direction control means.

57 This invention concerns an improved turnstile provided, among the innovatory features thereof, with turnstile rotation resistance adjustment means (64, 70, 72, 74, 76) as well as with means (43, 46, 52) for automatic selection of the turnstile rotation direction.

In particular, the first advantage of the above turnstile is obtained in that the turnstile locking control means (24, 32), which enable the turnstile to rotate in order to allow a person to walk through, upon a suitable control action, are associated with adjustable hydraulic means (70, 72, 74), whereby the force to be applied to cause a turnstile to rotate can be changed. In this way, the turnstile exploitation range can be greatly broadened, and the turnstile can be installed anywhere, depending upon the particular requirements of the location of use.



Description

AN IMPROVED TURNSTILE PROVIDED WITH ROTATION RESISTANCE CONTROL MEANS, AND WITH AUTOMATIC ALLOWABLE ROTATION DIRECTION CONTROL MEANS

This invention relates to a multiple arm turnstile wherein turnstile rotation necessary to bring one arm at a time to the operating position where said arm closes the passage guarded by the turnstile, is controlled by a suitably shaped cam which is keyed on the same shaft where the arms are mounted.

A pair of jaws cooperates with the above cam, each jaw being pivoted at one end thereof to the turnstile frame, while the other end engages into a cam recess. The jaws are connected to each other through resilient means adapted to keep said ends engaged within the cam recesses while allowing in any case the jaw to move apart from each other whereby the ends thereof can move out of the cam recesses whereupon the cam is enabled to rotate through the same angle an arm has to cover in order to get to the operating position. In the latter position the jaws ends will have entered into abutment with a different pair of cam recesses.

A turnstile of the type outlined above has been disclosed and claimed in Italian Patent No. 1114851, filed on January 4, 1977 in the name of Italdis S.r.l. Reference will accordingly be made to the disclosure and to the drawings attached to said patent for illustration purposes, in order to get a better understanding of this portion of the invention.

Obviously other turnstile types are known, besides the one making the subject of the patent mentioned above, and it is believed to be worthwhile to recall their drawbacks herein.

A first important drawback becomes apparent when recalling briefly the principle of operation of almost all the presently commercially available turnstiles. Said operation makes it possible to unlock the turnstile only through a pair of operating steps which must follow each other in a predetermined sequence, and unlocking of the turnstile is impossible if said sequence is not followed.

The first of said operating steps to be performed is the unlocking step, which may be performed by means of a control pushbutton or by inserting a ticket, a magnetic card or the like in a reader device provided on the turnstile. This operating step unlocks the turnstile locking mechanism whereby the second operating step is enabled, i.e. pushing the turnstile arm all the way to the off position thereof, while the following arm comes simultaneously through to the operative position.

After one user has proceeded through the turnstile, having performed in sequence the two operating steps described above, the turnstile gets ready for the next user.

Unfortunately it so happens often that the pair of operating steps are performed in reverse order, i.e. the pushing action on the arm which is still in an operative position is performed first whereby the turnstile gets locked and cannot be unlocked by inserting the ticket or magnetic card in the reader device. This is often the cause of considerable problems, among which there may be mentioned the

buildup of long lines, in case the user insists in performing the two actions in a sequence which is reverse of the correct one, or in the worst case the locking mechanism failure if the pushing action is performed rudely enough.

For the purpose of correcting the above mentioned drawbacks, some turnstiles have been devised wherein the locking mechanism is an electro-magnetic brake. Nevertheless this solution involves drawbacks which, though being different from the ones affecting the turnstiles mentioned above, still have a negative influence on turnstile performance whereby the latter cannot be satisfactory. In fact, the electro-magnetic brake is a locking mechanism whose action is limited, in that it cannot positively counteract a pushing action performed upon the arm which is in an operative position, even though said action is not overly rude. Accordingly, the turnstile can unlock and enable one or more people to go through even though the operation of inserting a ticket or magnetic card in a turnstile reader device has not been performed.

Further important drawbacks of the turnstile types wherein said electro-magnetic brake is used are the lack of possibility to set a turnstile for two-direction operation and the fact that a turnstile remains unlocked in case of an electric power failure.

In order to correct the insufficient locking action of an electro-magnetic brake, some single-direction turnstiles have been designed wherein, in order to drive a locking latch out of its seat, powerful electromagnets are provided, which among other things are bulky and very noisy, and cause the latch to be violently ejected out of the corresponding seat when the cam mounted on the arm-bearing shaft has to be released in order to perform the desired rotation.

As it is apparent, this type of turnstiles, besides suffering from the important limitation of a single direction operation, are very uncomfortable to use and sometimes the violent action of the electromagnet can damage the latch or other parts.

There has now been devised, and it is the object of the present invention, an improved turnstile wherein, owing to its new conception, all the above mentioned drawbacks have been eliminated. Therefore, the subject turnstile ensures reliable and particularly quiet operation, and the rotation direction thereof can be changed in an extremely simple way.

Therefore, it is an object of this invention to provide a turnstile wherein the unique locking mechanism is adjustable according to need whereby a turnstile may be set in such a way as to be unlocked under a limited intensity or a high intensity force, depending upon the field of application of the subject device. As it will be shown more particularly in the following part of the disclosure, the turnstile resistance to unlocking may be varied within a range of values ranging from a completely loose to a completely locked turnstile condition.

For exemplary purposes only, there will be considered herein the use of the inventive turnstile as an access enabling device to a ski resort lift facility. As it is apparent, in this case, the turnstile resistance to unlocking should be limited, in that the turnstile should not become a dangerous obstacle for a user arriving at the turnstile location while wearing his skis, whereby he is in an unstable condition, due in some cases also to the arriving speed.

Another object of this invention is to provide a turnstile wherein selecting the allowable rotation direction is an extremely easy operation, owing to the provision of a unique mechanism which enables said rotation direction to be immediately set or modified, without requiring any additional operation on the turnstile, such as for instance a partial or total disassembling thereof.

A further object of this invention is to provide a very sturdy turnstile construction, which is quiet in operation, whereby all the discomfort deriving from a noisy operation is done away with, said discomfort although being unessential from an operation standpoint still being considered by the users as an objectively negative factor.

The features as well as the advantages of the turnstile of this invention will become apparent from the following detailed but not limiting description of two embodiments thereof, made with reference to the attached figures.

The embodiments considered and shown in the attached figures relate to a turnstile wherein the arm-bearing shaft slopes slightly downwards, whereby that one of the arms which is in the operative position lies horizontally. Accordingly, the plate supporting all the various turnstile mechanisms, and located within the turnstile, slopes slightly downwards as well, but it should be apparent that the same inventive concept can be applied for a turnstile wherein the arm-bearing shaft lies in a different position. Concerning this subject, a limited modification of the rotation direction selecting device will be sufficient, without exceeding the scope of said inventive concept.

In the drawings:

figure 1 is an outer perspective view of the turnstile of this invention;

figure 2 is substantially a front view of the mechanisms of a first embodiment of the turnstile of the present invention;

figure 3 is a cross-sectional view of the locking mechanism of the turnstile of figure 2, in the off condition;

figure 4 is a view of the locking mechanism of figure 3, in the operating condition;

figure 5 is a block diagram of the locking mechanism hydraulic circuit, for the turnstile shown in figure 2;

figure 6 is a partial view showing one of the locking jaws at the start of cam rotation;

figure 7 is a view similar to figure 5, wherein the cam has already gone through substantially half of its rotating stroke;

figure 7a is a view showing a detail of the engagement of the locking mechanism with one of the jaws;

figure 8 is a substantially front view limited to the rotation direction selecting device of the turnstile shown in figure 2;

figure 9 is a partial top view of the turnstile of figure 2, showing the rotation direction selecting device;

figure 10 is a plan view, with parts broken away, of another embodiment of the turnstile of the invention;

figure 11 is a side view, with parts broken away, of the turnstile shown in figure 10;

figures 12 and 13 show, in a plan view, two operating conditions of the turnstile locking mechanism, and

figures 14 and 15 show a side view of two operating conditions of means adapted to enable the turnstile to be unlocked, independent upon the fact that the turnstile locking mechanism is in its active condition.

Reference will be made at first to figure 1, to describe the turnstile arrangement, limited to the general outline thereof, but this is deemed useful to make the following detailed description of the turnstile control mechanisms more easily understood.

In figure 1 the turnstile is shown to include a stationary support stand, shown in general at 10 and comprising a pair of support posts 12 fastened, at the lower end thereof, to base plate 13. To the upper ends of posts 12 there is fastened a substantially prism shaped box-like member 14 within which the various turnstile motion control mechanisms are located.

On one of the sides of box-like body 14 there is fastened, in any known fashion, a plate 20 and projecting therefrom there is provided a dome 18 bearing three arms 16 fastened thereto in any known fashion.

It should be emphasized that the embodiment shown herein, relating to a three-armed turnstile, should not be considered limiting, in that the innovative concept of the inventive turnstile can be embodied, without any modification, in a turnstile having a number of arms higher or lower compared to the one considered herein.

Reference will now be made to figure 2 which shows in general the several turnstile motion control mechanisms in the first embodiment.

In said figure there may be noticed a large plate 22 which supports the various mechanisms and is fastened in any known fashion within box-like body 14. To plate 22 there is in turn fastened outer plate 20 which closes box-like body 14 and whose removal allows the interior of the turnstile to be reached for the routine maintenance operations which, on the other hand, owing to the original arrangement of the mechanisms of this invention are substantially nil. However, access to the mechanisms may be gained from the top as well.

Still referring to figure 2, there is noticed a three lobed cam 24, substantially centrally located relative to plate 22, and comprised of a suitably contoured plate lying in a plane parallel to the plane of plate 22.

Cam 24 is mounted on a shaft 26 which in turn, as it will become more apparent in the following, is

fastened to dome member 18 carrying arms 16.

Cam 24 is peripherally provided with three equally spaced recesses 28 in the circumferential direction, located substantially 120° apart from each other. As it is apparent, recesses 28 are in the same number as arms 16, and the latter will be offset of the same angle.

As it is apparent referring in particular to recess 28 located in the upper part of figure 2, said recesses have a substantially semicircular outline, and the connecting regions 30 between them and the periphery of the cam are rounded according to an arc of a circle, since the cam, per se, must enable rotations of the turnstile arms in both directions, just for the purpose of obtaining a two-directional type turnstile. Selection of the rotation direction is performed by means of a mechanism which is still an object of this invention, and which will be described more particularly in the following.

Cam 24 has associated therewith a pair of jaws 32 each having one end thereof pivoted around pivot pin 34 integral with plate 22, while the opposite end of said jaws 32 is in engagement against the periphery of cam 24. In particular, at the latter end of jaws 32 there is provided a ball bearing 36 whose function is to provide for maximum reduction of friction of ends 32 against the periphery of cam 24 as the latter rotates, in order to assist the rotation of said cam.

Jaws 32 are connected to each other by means of a spring 38 having both ends thereof fastened to said jaws, for instance by means of a bolt 40.

Spring 38 is provided to make both jaws 32 to converge towards each other, whereby the jaws ends abutting against cam 24 are biased against the periphery thereof. In this way, cam 24 provides a resistance action in both directions; as it is apparent from figure 2, the ends of jaws 32 are engaged within cam recesses 28, whereby a cam rotation can take place only by making said ends to come out of recesses 28. Jaws 32, owing to the action of spring 38, already by themselves oppose a certain degree of resistance to rotation of cam 24 for the first 60° of rotation. but, as it will become more apparent in the following, the turnstile of this invention is provided with a new and original mechanism allowing the amount of said resistance to be adjusted. This is because, as it has already been mentioned, according to the location of use of the turnstile, the desired turnstile rotation resistance may be different.

In the following there will be disclosed at first the mechanism for selecting the turnstile allowable rotation direction, referring in particular to figures 2, 8 and 9.

The subject mechanism includes a disc 43 fixedly mounted on shaft 26, and having knurled regions 42 on the periphery thereof, close to the base faces of the disc. Upon the non-knurled region there is fitted a rubber ring 44, projecting slightly relative to the circumference of disc 43. The rotation direction selecting mechanism further includes a pair of sector-shaped plates 46 which are provided to cooperate with disc 43, one alternate to the other.

As it may be noticed in particular in figure 9, the periphery of sector shaped plates 46 is partially

knurled. In fact sector shaped plates 46 are of the same height as disc 43, and said plates are knurled only at the bases thereof, for the same height of the knurled regions 42 of disc 43, whereby the two knurled regions of a plate 46 can engage against knurled portions 42 of disc 43.

Between the knurled portions of sector shaped plates 46 there is provided a smooth region 48 against which the periphery of rubber ring 44 comes into engagement.

Referring now in particular to figure 8, there is shown therein that sector shaped plates 46 are pivoted on pivot pin 50, whereby said sector plates 46, as it will be explained in the following, may come into engagement with disc 43 or be moved away therefrom.

It should in particular be noticed that the line connecting pivot pins 50 where sector plates 46 are pivoted, is offset relative to shaft 26 whereby, in case a sector plate 46 is brought closer to discs 42 and comes into engagement therewith, as it is the case for left hand side plate 46 in figure 8, the allowable rotation direction is the clockwise direction, as it is shown by arrow F in figure 8. In fact, in this condition, said plate 46 mentioned above rotates according to the direction of arrow G around pivot pin 50, and arm 16 which is in an operative position, i.e. a position inhibiting the restrained passage, is allowed to move to an off position.

As it is apparent, if an attempt were made to rotate the turnstile in the opposite direction, that action would tend to cause a counterclockwise rotation of disc 43, but said rotation would be opposed by sector plate 46 which is now into engagement with said disc. In fact, as it can be noticed from Figure 8, a rotation in an opposite direction relative to the allowable rotation according to the direction of arrow F is not possible in that the offset between shaft 26 and pivot pin 50, as well as the distance separating said members, together with the fact that center C of the arc of a circle having radius R which defines the periphery of sector plate 46 does not coincide with pivot pin 50 centerline, generate a radial component which in turn inhibits any counter-clockwise rotation.

On the contrary, when shaft 26 rotates clockwise, in the direction of arrow F, the force component between disc 43 and sector plate 46 is purely tangential, whereby this rotation is permitted. It should be noted that, during clockwise rotation, sector plate 46 will not follow disc 43 along the whole arc of a circle but on the contrary it will perform very limited amplitude rotations and then it will go back to the starting position. In Figures 2 and 8 left hand side sector plate 46 has been shown in operating position, said plate, as it was described herein above, allowing shaft 26 to rotate only clockwise. Right hand side sector plate 46 is in an off position, in that it is not in engagement against disc 43. As it should be apparent, in order to change the turnstile rotating direction, it will be sufficient to disengage left hand side sector plate 46 away from disc 43, and to drive right hand side sector plate 46 into engagement with said disc. In this case, as it is obvious, the counterclockwise rotation direction will be allowed. To that end, the rotating direction

selection mechanism includes means adapted to control said motions of sector plates 46. Said means comprise, for each sector plate 46, an electromagnet 52 located behind sector plate 46 relative to disc 43.

In order to bring a plate 46 into engagement with disc 43, electromagnet 52 associated with said plate is actuated in such a way as to drive the moving member 54 thereof towards the inside of the electromagnet core, as it is shown for left hand side plate 46, in Figures 2 and 8 against the bias of a spring 56, which, as it is shown in Figure 9, is connected at one end thereof to a pin 58 fastened to the end of electromagnet 52 moving member 54, and at the opposite end to a pin 60 fastened to support plate 22.

Since plate 22 is slightly sloping, as it was said above and shown in Figure 2, and since it is anyway in a substantially vertical position, rotation of sector plate 46 all the way to the position of engagement with disc 43, takes place under the action of gravity due to the fact that plate 46 is essentially lying almost completely on the side of disc 43 relative to pin 50.

Considering now right hand side plate 46 in Figures 2 and 8, said plate is kept apart from disc 43 in that electromagnet 52 associated therewith is de-energized and spring 56 drives moving member 54 out of said electromagnet core, whereby the end of said moving member comes into engagement with an extension 62 of sector plate 46 and moves the same away from disc 43.

The rotation direction selecting mechanism of the turnstile of this invention is completed by a pair of pins 64 integral with plate 22, and acting as limits to the stroke of plates 46, when electromagnet 52 gets de-energized.

Control of the above mechanism is extremely simple, in that it will be sufficient to provide, in a suitable position, a switch adapted to actuate either one of the electromagnets 52, according to the desired direction of rotation.

There should be emphasized herein a further original feature of the rotation direction selecting mechanism, stemming from the presence of rubber ring 44. In fact, when the turnstile rotates in the permitted direction, said ring lies in engagement with one of the sector plates 46. This fact makes it possible to obtain a twofold advantage represented by both a reduction, if not elimination, of wear of knurled regions 42 of disc 43 and of sector plates 46, and a removal of the potentially bothersome noise which could be generated if said knurled regions were in rubbing contact.

According to an even further original feature still deriving from the presence of rubber ring 44, it should be noticed that the latter substantially provides the braking action against rotation in the inhibited direction, in that, as it has been shown, said rubber ring projects slightly out relative to the periphery of disc 43. This is the reason why the rubber ring is compressed, providing essentially the whole of the braking action, while the knurled regions have only to complete said operation, and anyway on a very limited area of the knurled regions which thereby do not wear out, even in this case.

In the following there will be disclosed the original

mechanism for adjustment of the turnstile rotation resistance in the permitted direction and reference will be made in the process to Figures 2 to 7.

The mechanism adapted to vary the turnstile resistance to rotation in the permitted direction uses a hydraulic circuit, shown in Figure 5 and described in the following, which is suitably controlled to drive a hydraulic piston 64 from a first limit condition wherein its piston rod 66 is completely locked, to a second limit condition wherein its piston rod 66 can move freely.

The hydraulic circuit mentioned above makes it possible to obtain, in addition, any intermediate condition between the limit ones mentioned above, each having associated therewith a corresponding resistance value of its own.

Referring now in particular to Figures 2, 6, 7 and 7a, it is shown therein that piston rod 66 of hydraulic piston 64 abuts against a suitably shaped small block, shown at 68 (Figure 7a), having a contoured shape on side 73 where piston rod 66 comes into engagement therewith, while at the other end the block ends in a fork 69 surrounding jaw 32 and being pivoted around pivot pin 71 of bearing 36. Small block 68 is preferably metal, and it substantially provides a pivoted joint between piston rod 66 and jaw 32 upon rotation of the turnstile.

Hydraulic control circuit of piston 64 is shown in Figure 5, in block diagram form, while Figures 3 and 4 show detailed construction drawings thereof.

Said hydraulic circuit includes a one-way or check valve 70, a flow control valve 72, and eventually a pressure control valve 74, connected in parallel with each other. The above valves are known per se and, for instance, said one-way valve 70 may be a globe check valve, flow control valve 72 may be a valve provided with a precision throttling orifice, while the pressure control valve may be a directly actuated valve (by means of a spring), or else an indirectly actuated valve (by means of a suitable auxiliary valve provided for the purpose).

Eventually, hydraulic control circuit of piston 64 includes an auxiliary piston 76, whose function is to bring piston 64 back to initial conditions, each time it has been actuated in order to enable the rotation of the turnstile.

More particularly, auxiliary piston 76 includes a piston rod 78 having a spring 80 coiled therearound, said spring abutting, at one end against a face of the cylinder of piston 76, while at the opposite end it abuts against head 82 of rod 78.

In Figures 3 and 4, which show the actual construction drawings for the hydraulic circuit described above, like parts are referred to by the same reference numbers, whereby there seems to be no purpose in describing the latter Figures.

On the contrary, a description of the hydraulic circuit should prove more meaningful, in order to understand how the turnstile rotation resistance is controlled, in the enabled rotation direction. For the above purpose, reference will be made, besides Figures 3, 4 and 5, also to Figures 6 and 7, which show the start position, wherein the ends of jaws 32 are engaged within recesses 28 of cam 24, where said ends have to get out from, in order to enable

cam 24, and thereby the turnstile, to rotate; upon rotation of the turnstile said ends engage within the next adjacent recesses 28.

Even though in Figures 6 and 7 there is shown a single one of jaws 32, and in particular the left hand side one of Figure 2, it is understood that the other jaw as well will be located in a corresponding position.

The turnstile rotation resistance may be calibrated as follows. First of all, flow control valve 72 is completely closed by means of a suitable electric signal, said valve being actually an electrically operated valve.

Pressure control valve 74 is similarly actuated although it is manually closed, since it is a mechanically operated valve.

In these conditions, stem 66 of piston 64 is locked, even in the case, in an attempt to rotate the turnstile, a strong force P (Figure 5) is applied to said stem 66 by end 36 of jaw 32. In fact, the oil contained within the cylinder of piston 64 cannot flow out neither through single-acting valve 70 nor through flow control valve 74, in that said valves are closed.

Reference is now made to the calibrating step proper, involving a setting of the pressure control valve 74 by manually positioning said valve in a partially open position. Once said setting has been established and, as it is understood, possibly visualized on indicator instruments, the turnstile is enabled to rotate whereby stem 66 of piston 64 under the action of force P, moves and sends oil to the auxiliary piston 76, through valve 74. The oil is injected within auxiliary cylinder 76 causing a total compression of spring 80 (Figure 4) and a total collapse of piston rod 66 within the associated cylinder, which corresponds to the condition shown in Figure 7 wherein the ball bearing end 36 of jaw 32 has moved half the way along the periphery of cam 24.

Given the particular shape of the cam, having a cusp at the intermediate region of the path to be followed by end 36 of jaw 32, as it is apparent jaw 32 will rotate clockwise, i.e. in a reverse direction compared to the previous one, under the action of spring 38. Therefore, rod 66 of piston 64 will go back to the position shown in Figures 3, 5 and 6, i.e. completely extended out from the cylinder of piston 64. This operating is provided by auxiliary piston 76 which, owing to the action of spring 80, brings rod 78 to the starting position, while the oil flows back into the cylinder of piston 64, through one-way valve 70.

It should be understood that the above mentioned calibrating operation may be performed either when installing the turnstile, or during operating of the same, if particular reasons require the turnstile to be adjusted for the particular use said turnstile has been assigned to.

It should also be apparent that adjustment of the enabled rotation resistance may be performed at any time, for emergency or safety reasons as well, if electrically operated valve 72 is closed.

Turnstile locking and unlocking may be performed, independent of the condition of valve 74 which will never be totally open during normal operation, through electrically operated valve 72

adapted to be opened or closed by means of electric pulses.

Electrically operated valve 72 may be set to remain locked or open in case of a power failure, and such setting may be provided in a known way.

In the first case, the turnstile remains in the locked condition and unlocking can be performed through adjustment of valve 74, as previously mentioned.

If valve 72 is not open or opening thereof is delayed, in any case valve 74 enables the turnstile to rotate, provided said valve is in a partially open position. In the embodiment described herein a single hydraulic piston 64 has been provided in association with turnstile jaws 32. In any case it should be understood that, even though such an approach may prove to be expensive, a pair of hydraulic piston may be provided, each one of them being associated with one of the jaws 32.

As it was emphasized in the preamble of this disclosure, the turnstile according to the invention has been described and shown as having a substantially vertical plate 22 for supporting the various turnstile mechanisms, but this arrangement should not be considered as a limitation, in that the same inventive concept may be applied to a turnstile wherein said plate has a different position. It had also been added that, with a non-vertically arranged plate, a slight modification of the rotation direction selected mechanisms was sufficient. That statement will now become apparent if reference is made in particular to Figures 8 and 9.

In the embodiment shown herein, either one of sector plates 46 comes into engagement with disc 43 under the action of gravity. Assuming that the plate is substantially horizontal, it will still be possible to provide for engagement of either one of sector plates 46 with disc 43. For instance, it will be enough that each sector 46 has a spring connecting extension 62 thereof to the body of electro-magnet 52 whereby, when the latter is energized, and moving member 54 thereof collapses within the associated core, said spring makes sector plate 46 to rotate towards disc 43 until said plate comes into engagement with the latter. As it is apparent, the spring constant of the spring mentioned above will have to be lower than the spring constant of spring 56 of this embodiment. In fact, if this is not the case, when electro-magnet 52 is energized, said spring 56 would not be able to make electro-magnet 52 moving member 54 to extend out of the core associated therewith, in order to disengage sector plate 46 away from disc 43.

Reference will now be made to Figures 10 to 15, to describe another embodiment of the turnstile according to the invention, which in any case differs only slightly from the first embodiment, in that it follows the same basic inventive concept thereof.

Based on the above, in Figures 10 to 15, the same members of Figures 1 to 9 will be indicated with identical reference numbers.

In this embodiment, the three-lobed cam has been replaced with a set of three ball bearings 82, only two of them being shown in the subject Figures. Ball bearings 82 are positioned 120° apart from each other and, as it is apparent in particular from Figures

11, 14 and 15, they are supported on the lower side of a support disc 84 rotating mounted on shaft 26.

While the turnstile rotates, ball bearings 82 come in sequence into engagement with a positioning member 86 comprising an arc-shaped arm whose concave side faces towards ball bearing 82.

Positioning member 86 is fastened to, or integral with, rod 66 of piston 64 which, owing to the fact that piston rod 66 can move back and forth, allows the turnstile to rotate. What has been described above is shown in sequence in Figures 12 and 13 wherein substantially half of a complete rotation of arm 16 is shown, always according to the direction of arrow F. In particular, the position shown in Figure 13 is close to the intermediate position within a complete rotation corresponding to complete collapsing of piston rod 66 within its cylinder, which takes place when bearing 82 is positioned facing the median region of positioning arm 86. Owing to the presence of compensating piston 76, piston rod 66 can subsequently move forward whereby arm 86 is brought back to the starting position thereof.

Concerning both pistons 64 and 76, and electrically operated valve 72 as well as check valve 70, operation of the turnstile is the same as for the first embodiment.

In the second embodiment, flow control valve 74 is missing, in that it has been replaced by further different means, to be described in the following.

At it is apparent in particular from Figures 10 and 11, in this embodiment a single disc-engaging plate 46 is provided, whereby the subject turnstile is a single-direction turnstile. However, it should be understood that, if a second plate 46 is provided, a two-direction turnstile is easily obtained, similar to the first embodiment.

The means mentioned previously to enable a turnstile rotation in any case, said means being used, for instance, as it was mentioned above, in a turnstile provided at a ski resort lifting facility, include in this case yielding and adjustable connecting means provided between knurled disc 43 and ball bearing 82 support disc 84, as it appears in particular from Figures 11, 14 and 15. Said means include three balls 88 inserted within suitable channels 89 provided inside knurled disc 43 and positioned substantially 120° apart from each other. Each one of the balls 88 is retained within a seat 90 of disc 84, under the action of a pin 94 subjected, at an enlarged cross section head 92 thereof, to the action of a spring 96 whose opposite end abuts against the inner face of a threaded locking ring 98 which is threaded on the upper end of a substantially cylindrical body 100 within which pin 94 can move, while projecting out of locking ring 98 through an opening of the latter.

Operation of the means described herein above is extremely simple to understand, once reference is made to Figures 14 and 15.

In Figure 14, the set of three balls 88, under the action of spring 96 associated therewith, are kept engaged within seat 90 of disc 84, so that knurled disc 43 is kept locked to disc 84. In case of a pushing action, even a substantially lesser strength one, the balls can be brought to the position of Figure 15,

where they moved out of respective seats 90, whereby knurled disc 43 is free to rotate relative to disc 84, and allows for a rotation of arms 16 being schematically shown with a dashed line in Figure 14.

Once each one of the balls 88 has reached the subsequent seat 90, the turnstile is back to the initial condition.

The degree of compression of springs 96, and therefore the strength of the force necessary to rotate the turnstile, may be controlled by means of locking rings 99, even though the locking mechanism has not been disengaged. Concerning the remaining turnstile parts which have not been described in detail, as it is understood, what has been said for the first embodiment is still applicable.

The advantages of the turnstile of this invention are apparent from the above description, and it is only necessary to recall herein that the turnstile operation is reliable, flexible and extremely noiseless.

It should eventually be understood that variations and/or modifications may be made to the turnstile of this invention, without exceeding the scope of protection of the invention.

Claims

1. An improved two-directional turnstile including passage closing arms fastened, at one end thereof, to a dome-like member which is in turn keyed to a shaft supporting said arms and mounted on the turnstile structure, as well as disengageable locking means adapted to enable the arms support shaft to go through subsequent rotations, each having the same amplitude as the angular distance between two adjacent arms, characterized in that said disengageable locking means have means associated therewith for automatic selection of the allowable rotation direction, as well as means for adjusting the turnstile resistance to the allowable rotation.

2. The improved turnstile of Claim 1, characterized in that the automatic rotation direction selecting means include at least a disc (43) mounted on support shaft (26), wherein the disc periphery is provided, at both bases thereof, with knurled areas (42), a non-knurled portion being defined between said two knurled areas, whereon a ring (44) of a substantially resilient material, for instance rubber or the like, is applied in such a way as to project slightly from disc (43), wherein disc (43) and rubber ring (44) cooperate alternatively with either one of a pair of sector plates (46) which are pivoted around a stationary pivot pin (50), the periphery of said sector plates (46) being knurled at the bases, for a height corresponding to that of knurled parts (42) of disc (43), while in the remaining area (48) they are smooth, means being eventually provided to control either one of sector plates (46).

3. The improved turnstile of Claim 2, characterized in that the means to control either one of

sector plates (46) include at least an electro-magnet (52) whose stem (54) is adapted to abut against a substantially radial extension (62) of sector plates (46).

4. The improved turnstile of Claim 2, characterized in that the line connecting pivot pins (50) around which sector plates (46) may rotate, is offset relative to shaft (26).

5. The improved turnstile of Claim 2, characterized in that, owing to the offset position between shaft (26) and pivot pins (50), as well as to the distance between said members, when either one of sector plates (46) is engaged against disc (43), the former allows the latter to rotate in one rotation direction only, while it inhibits the opposite rotation since a radial force component is generated between sector plate (46) and disc (43).

6. The improved turnstile of Claim 3, characterized in that the projecting portion of rubber ring (44) cooperates with the non-knurled portion (48) of sector plate (46).

7. The improved turnstile of Claim 1, wherein said disengageable locking means include an n-lobe contoured cam fixedly mounted on said passage closing arms support shaft, said cam being provided, at the periphery thereof, with recesses wherein the ends of at least a pair of locking jaws come into engagement, under the action of resilient means connecting said jaws, characterized in that the means for adjusting the turnstile resistance to the allowable rotation include at least one hydraulic piston (64) whose rod (66) abuts against the end of one of the jaws (32) which is in turn engaged with cam (24), said piston (64) being suitably actuated by a hydraulic circuit.

8. The improved turnstile of Claim 1, wherein said disengageable locking means include n ball bearings mounted on a disc (84) which is fastened for rotation to shaft (26), said bearings coming into engagement, in sequence, with a contoured positioning arm, characterized in that the means for controlling the turnstile resistance to the allowable rotation comprise said contoured arm (86) integral with rod (66) of hydraulic piston (64).

9. The improved turnstile of Claim 7, characterized in that the hydraulic circuit controlling the operation of piston (64) includes a single acting valve (70), a flow control valve (72) and a pressure control valve (74), in parallel to each other, an auxiliary piston (76) being eventually provided, which is connected to control piston (64) by means of said valves.

10. The improved turnstile of Claim 9, characterized in that flow control valve (72) is an electrically operated valve.

11. The improved turnstile of Claim 9, characterized in that pressure control valve (74) is a mechanically operated valve.

12. The improved turnstile of Claim 8, characterized in that disc (84) supporting ball bearings (82) is made engageable with knurled disc (43) by means of yieldable connecting means which,

under a suitable level pushing action, allow for disengagement of said disc, even in the case said locking means are active.

13. The improved turnstile of Claim 12, characterized in that said yieldable connecting means include a plurality of balls (88) which are retained within a seat (90) of disc (84) under the bias of a spring (96) acting on a pressure pin (94) whose opposite end projects out of a locking ring (98) closing the top of a body (100) wherein said pin is received.

14. The improved turnstile of Claim 13, characterized in that locking ring (98) is threadable on receiving body (100), whereby compression of springs (96) may be adjusted.

15. The improved turnstile of Claim 9, characterized in that auxiliary piston (76) includes resilient means associated to rod (78) thereof, in order to transfer to control piston (64) a flow of control fluid which was sent to said auxiliary piston substantially during the first part of the turnstile rotation.

16. The improved turnstile of Claim 9, characterized in that adjustment of the turnstile resistance to rotation in the allowable direction is effected by means of valve (74).

17. The improved turnstile of Claim 9, characterized in that said turnstile is normally locked or unlocked by means of electrically operated valve (72).

18. The improved turnstile of Claim 17, characterized in that electrically operated valve (72) is provided with means which, in case of a power failure, enable the same to be set either in closed or open position.

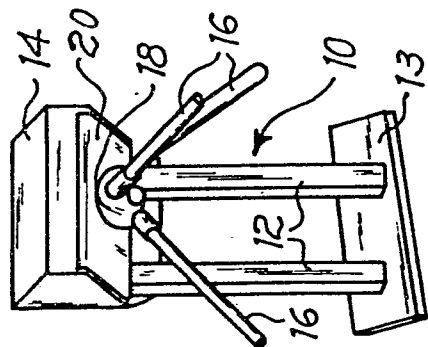


Fig. 1

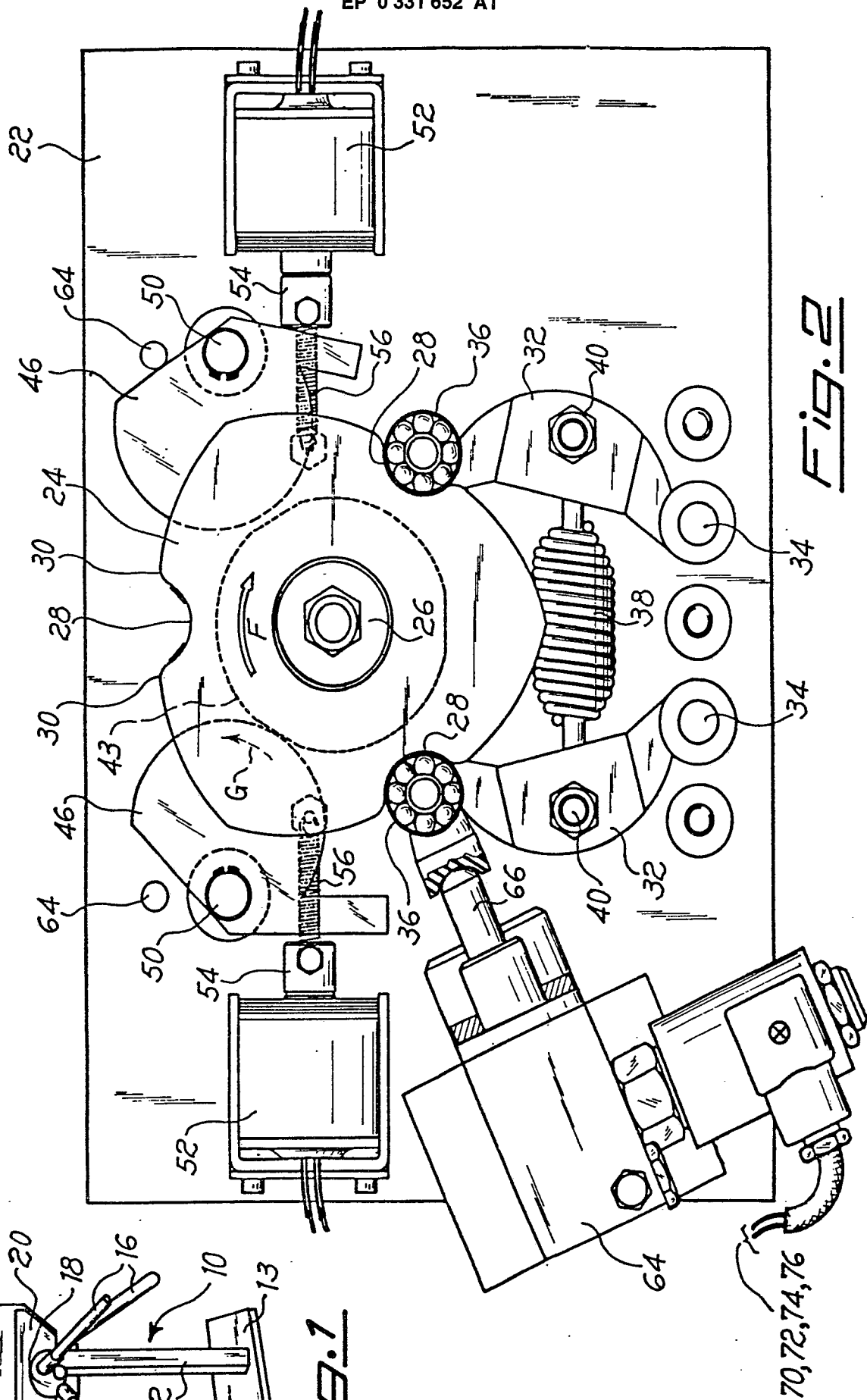


Fig. 2

Fig. 3

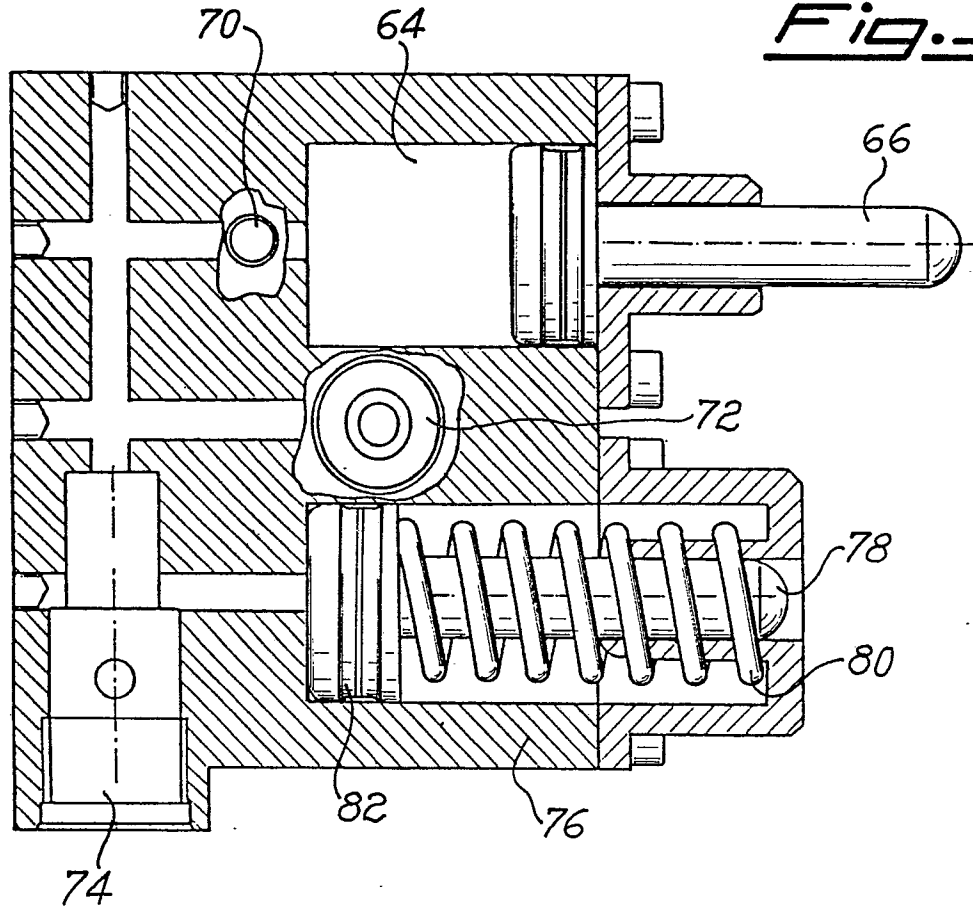
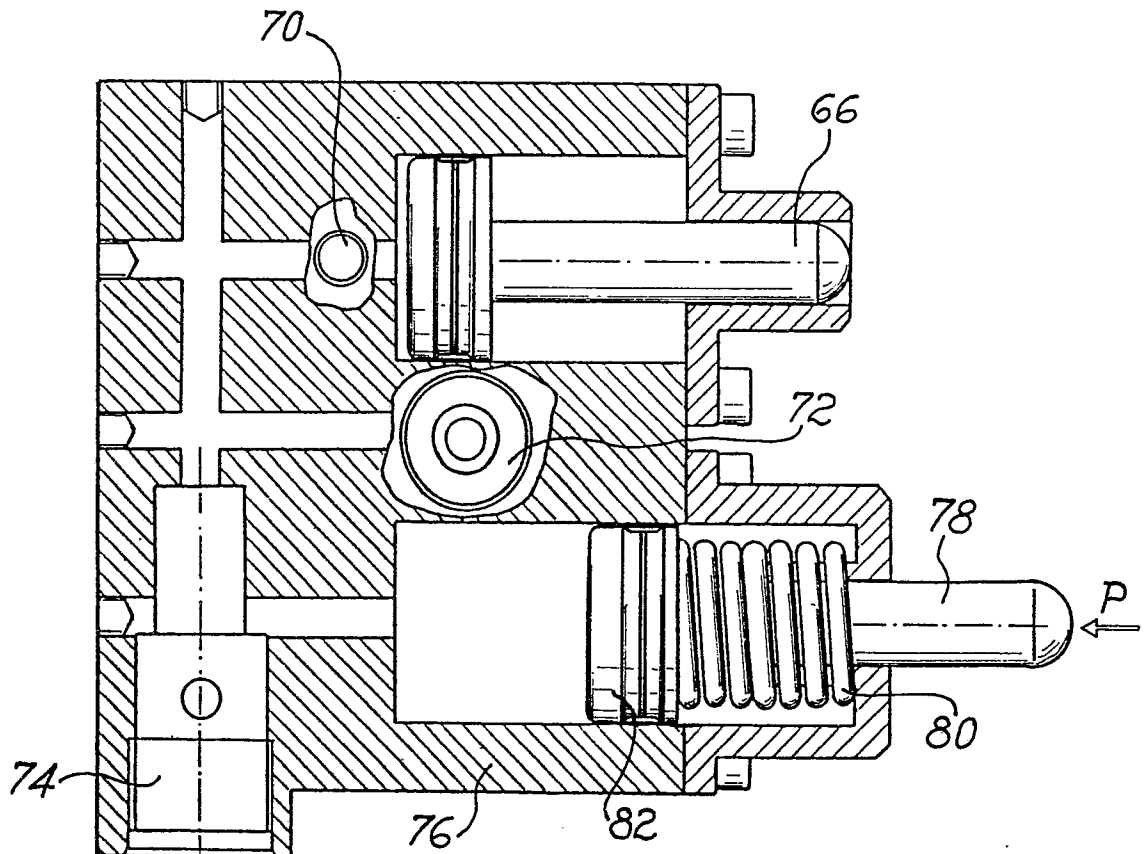


Fig. 4



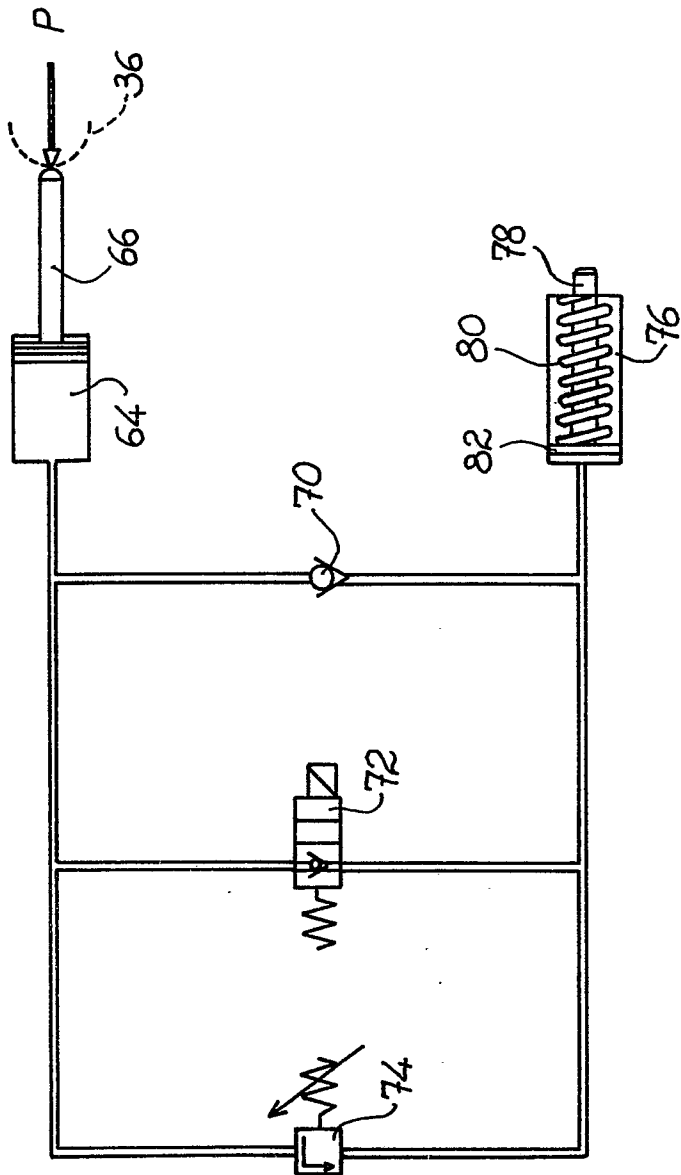
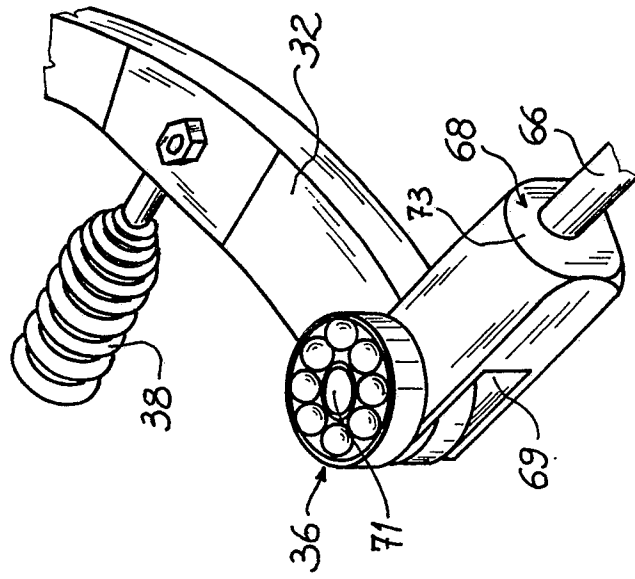


Fig. 5

Fig. 7a



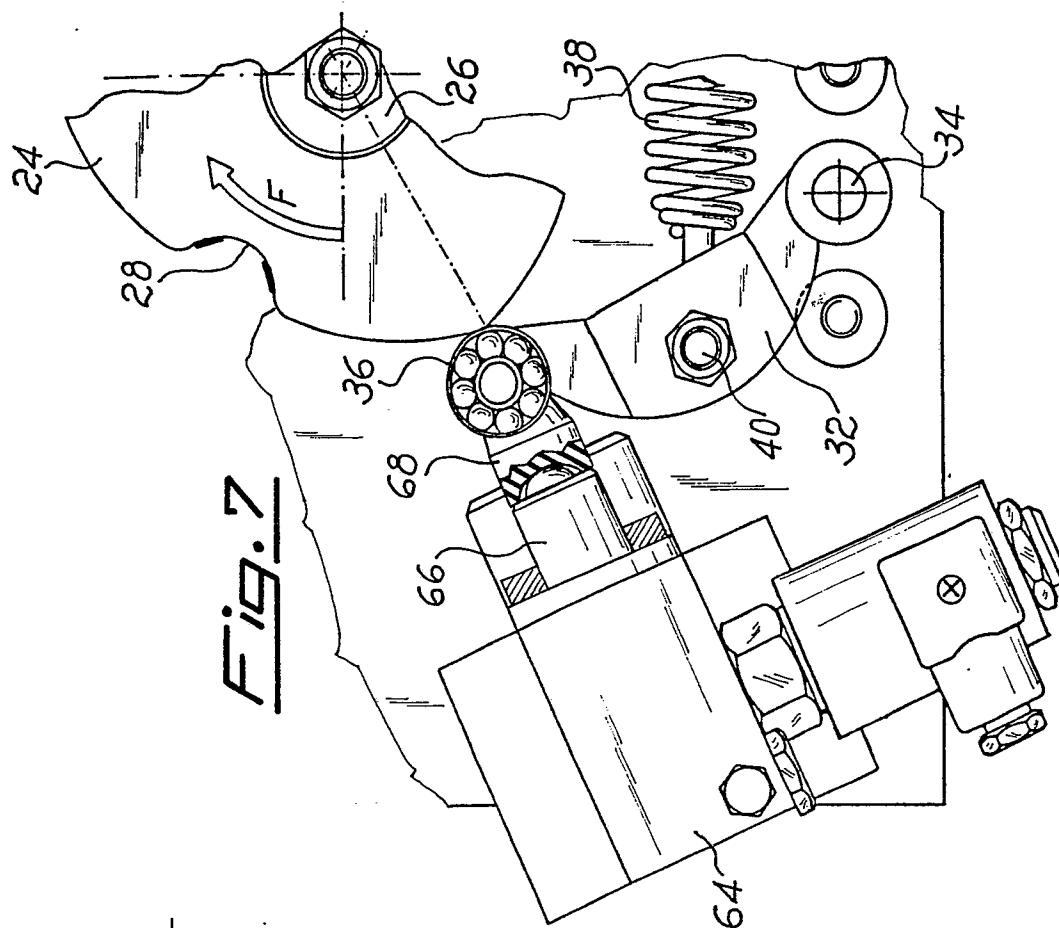
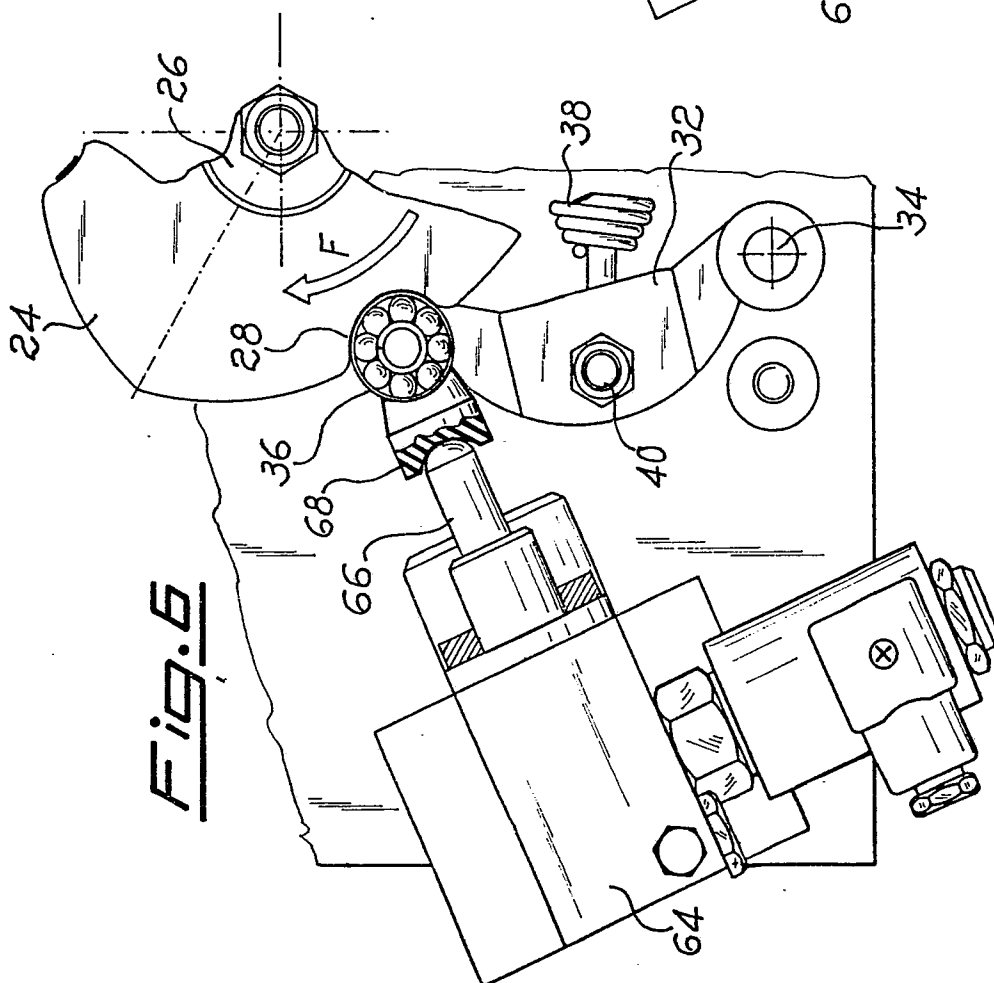


Fig. B

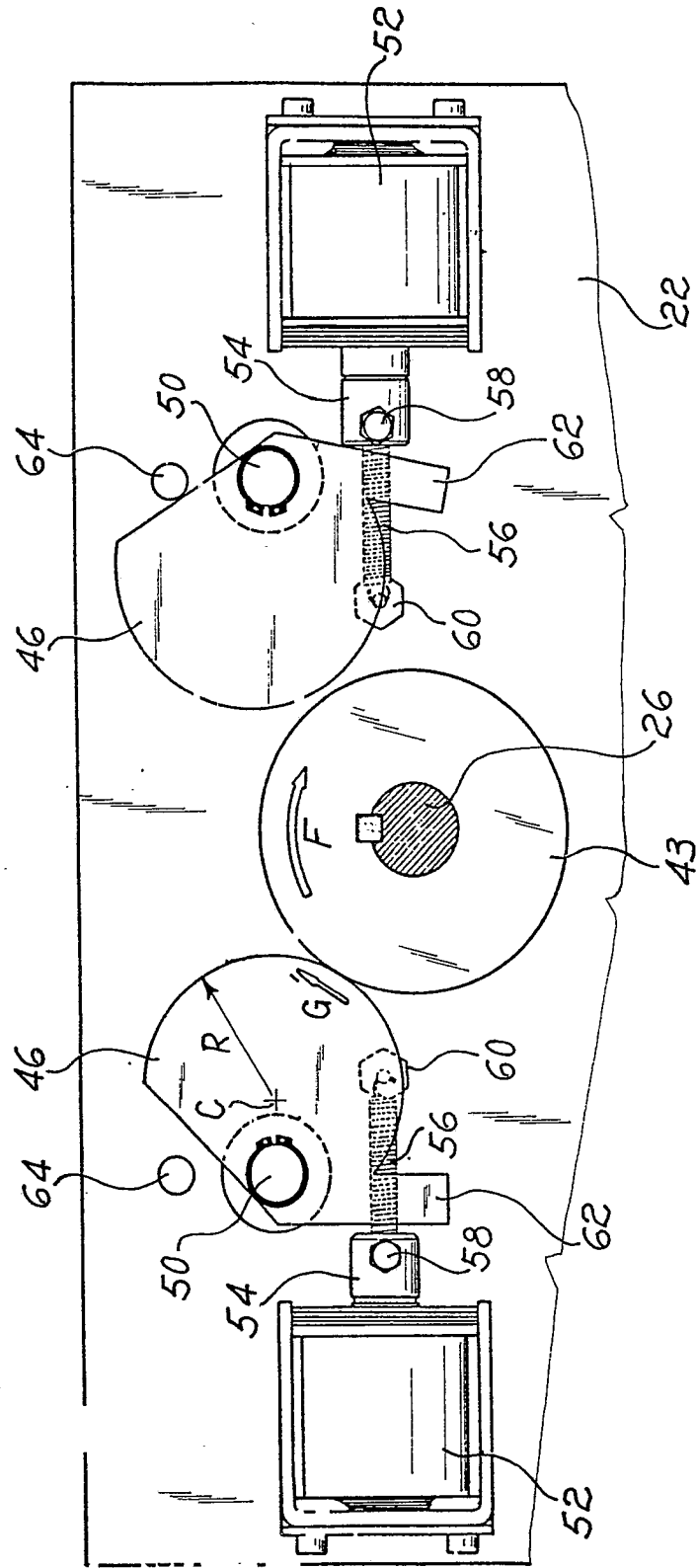


Fig. 9

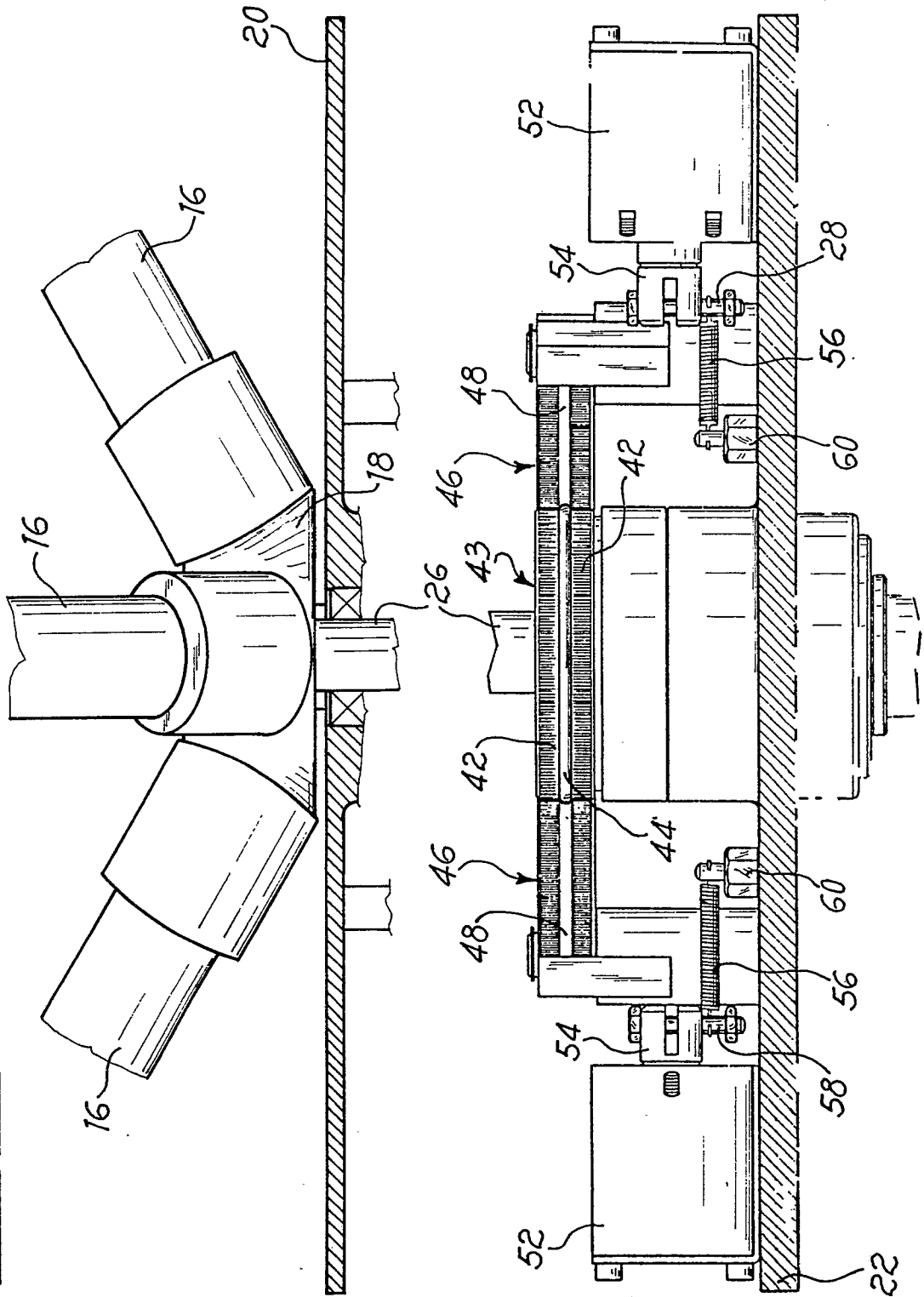
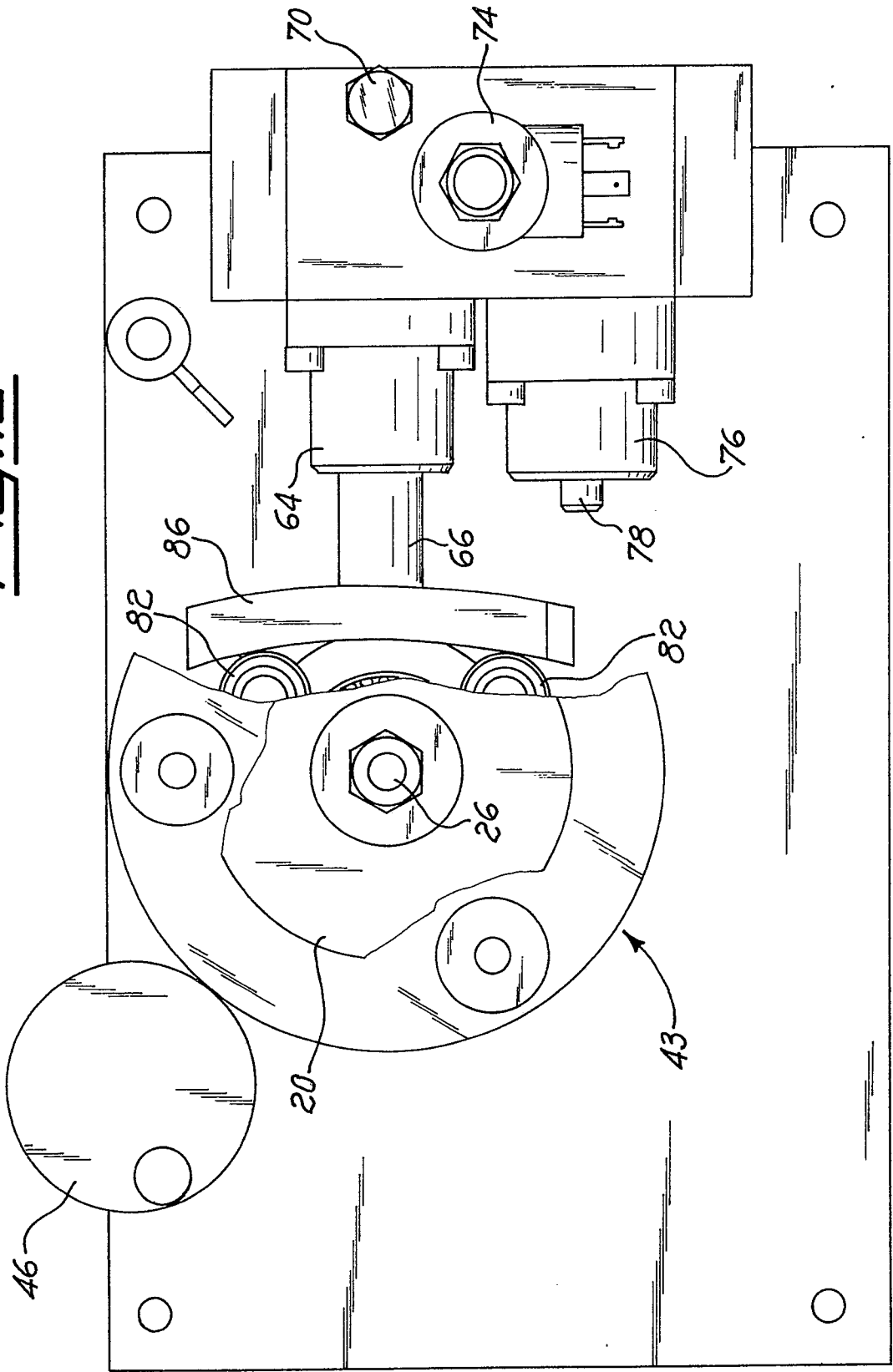


Fig. 10



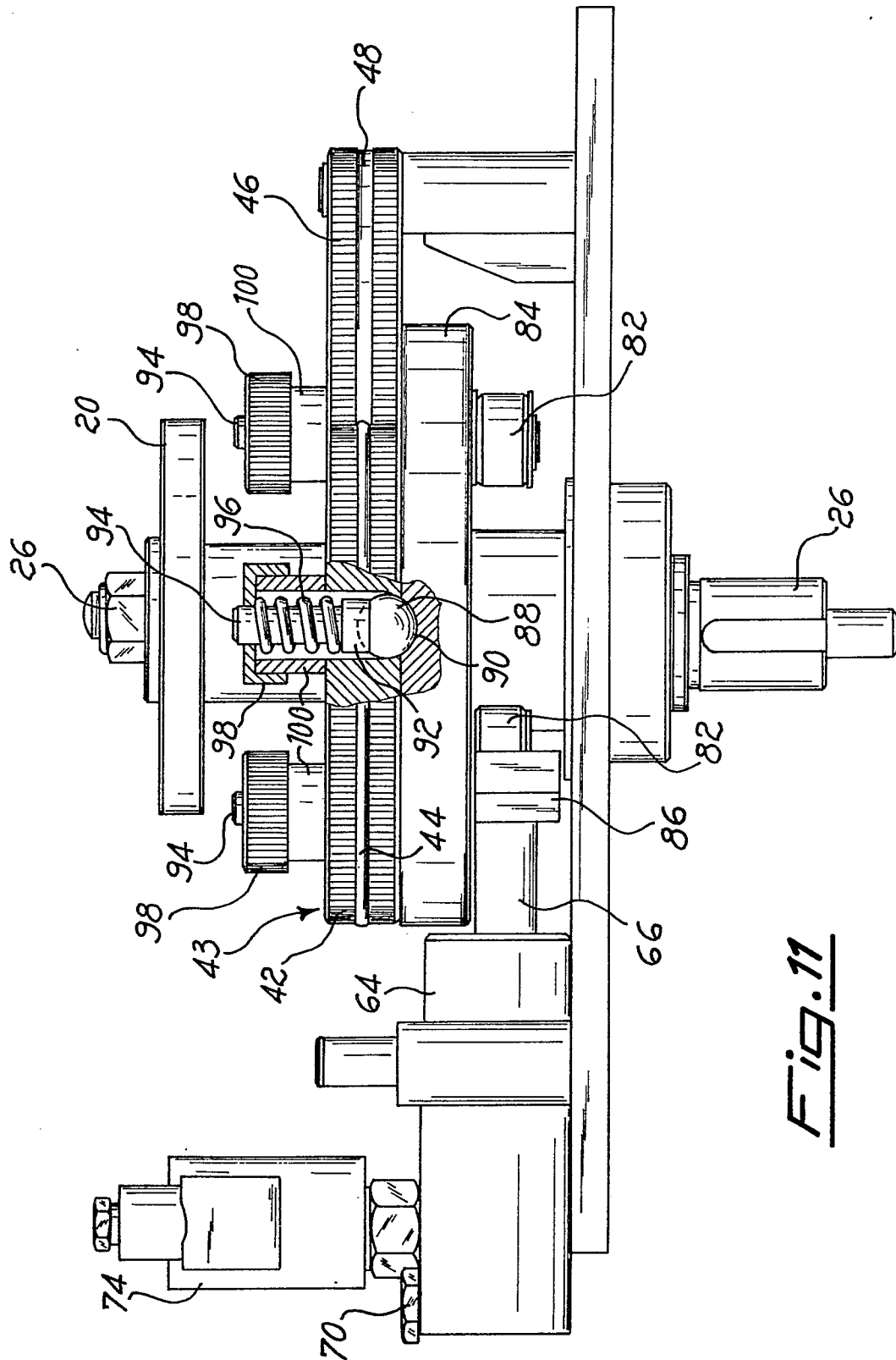


Fig. 11

Fig.12

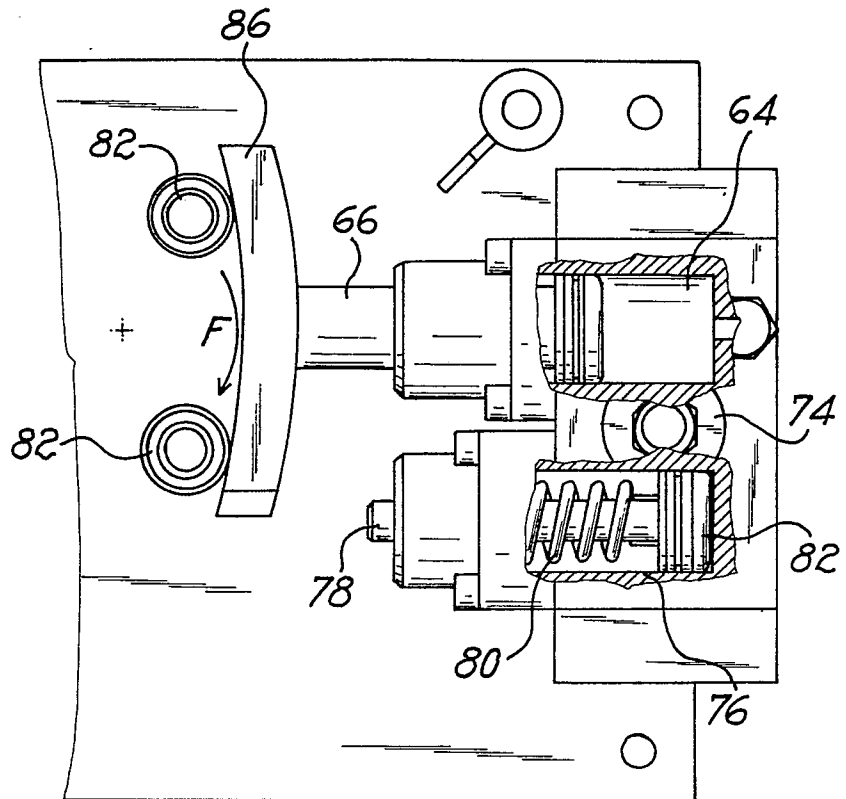


Fig.13

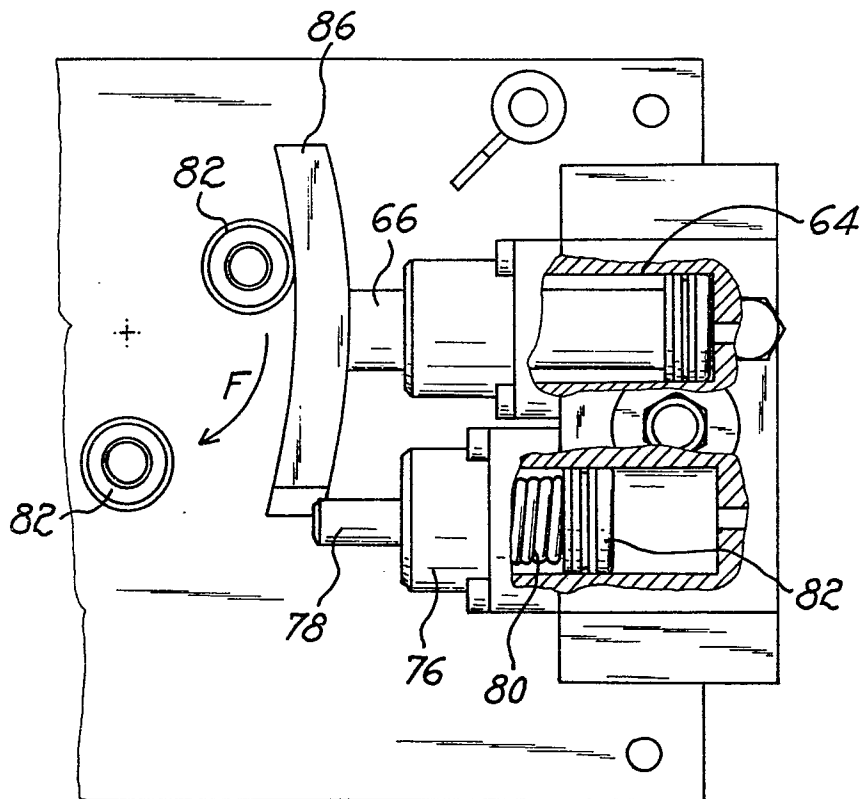


Fig.14

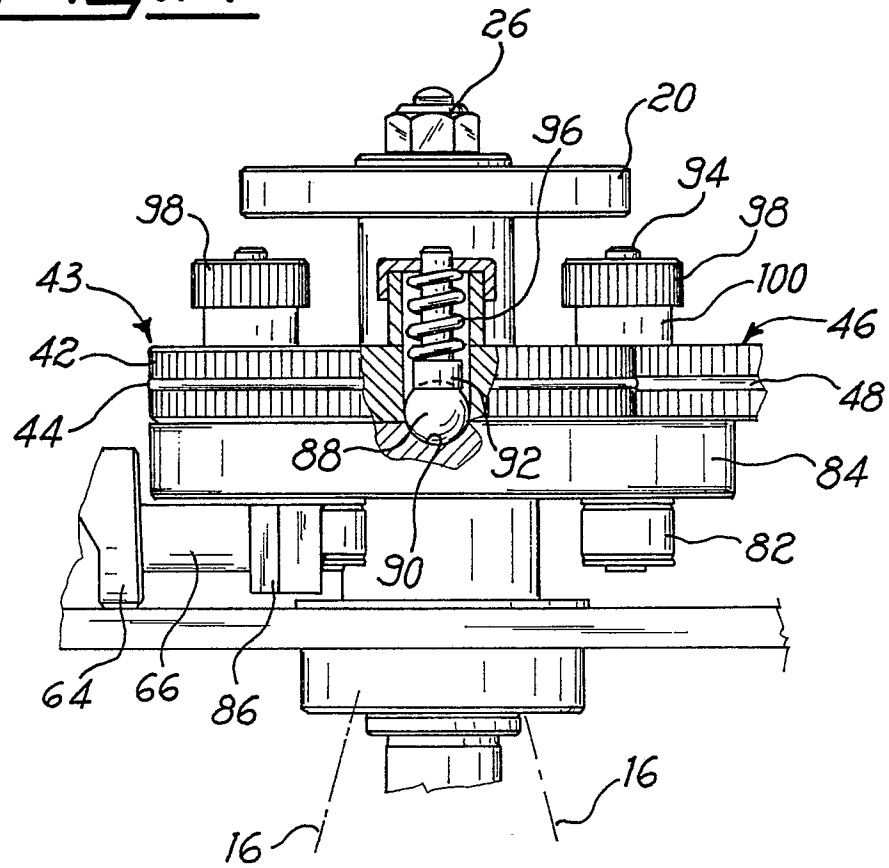
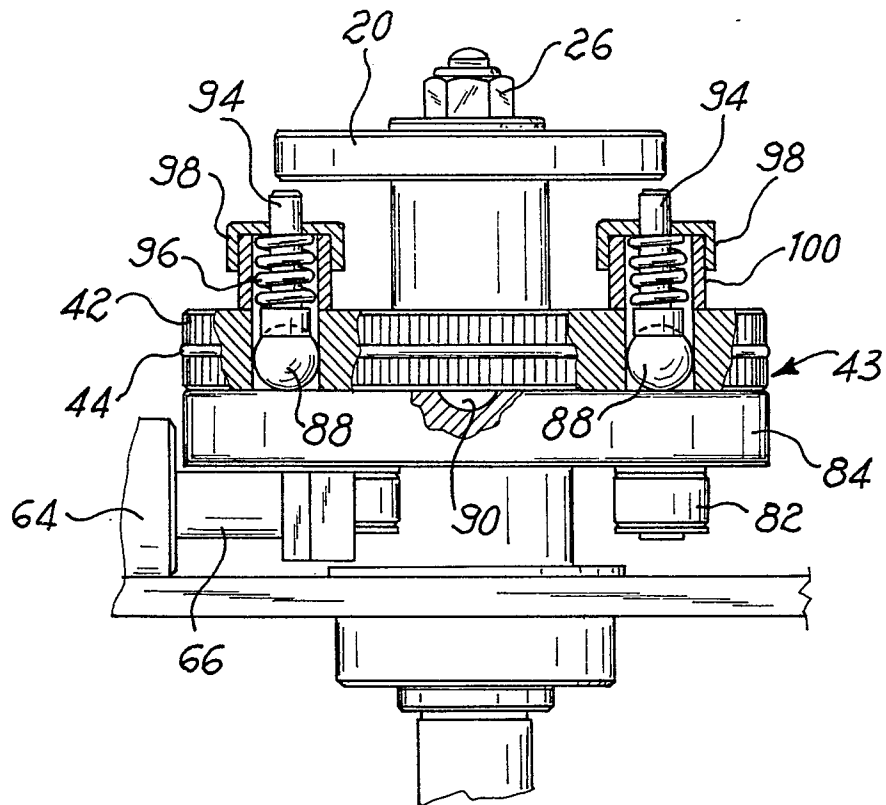


Fig.15





EP 89 83 0086

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
X	US-A-2 004 971 (D.R. BACON) * Page 2, column 1, line 3 - page 3, column 1, line 18; claims 2,4; figures 1-10 *	1	E 06 B 11/08
A	---	9,11,15,16	
X	DE-A-1 905 638 (LITTON IND.) * Page 1, lines 1,2; page 2, paragraph 3; page 4, line 13 - page 7, paragraph 3; claims 6,11; figure 2 *	1,8	
Y	---	7	
A		9-11	
Y	DE-A-2 758 971 (ITALDIS) * Page 6, paragraphs 2-4; page 9, line 18 - page 12, line 4; page 14, paragraph 4; page 15, paragraph 4 - page 16, paragraph 1; figures 2-11 *	7	
A	---	1,8,12,13	TECHNICAL FIELDS SEARCHED (Int. Cl.4)
A	GB-A-1 461 078 (METERMAN) * Page 1, lines 26-37; page 1, line 67 - page 3, line 33; figures 2,3 *	1,7,12	E 06 B
A	US-A-3 978 613 (M.H. HAYWARD) * Column 3, lines 27-48; column 4, lines 1-27; column 4, line 59 - column 5, line 9; figures 1,3,4 * --- -/-	1,7,8	
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05-06-1989	Examiner VERVEER D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
A	EP-A-0 088 605 (CORAS IOMPAIR EIREMANN) * Page 7, line 12 - page 8, line 9; page 9, paragraph 2; page 14, paragraph 2; page 16, lines 8-13; page 17, paragraphs 2-4; figures 2,5-7 *	1,8,17,18	
A	US-A-3 795 075 (W.J. ORZECOWSKI)		
			TECHNICAL FIELDS SEARCHED (Int. Cl.4)
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 05-06-1989	Examiner VERVEER D.
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			