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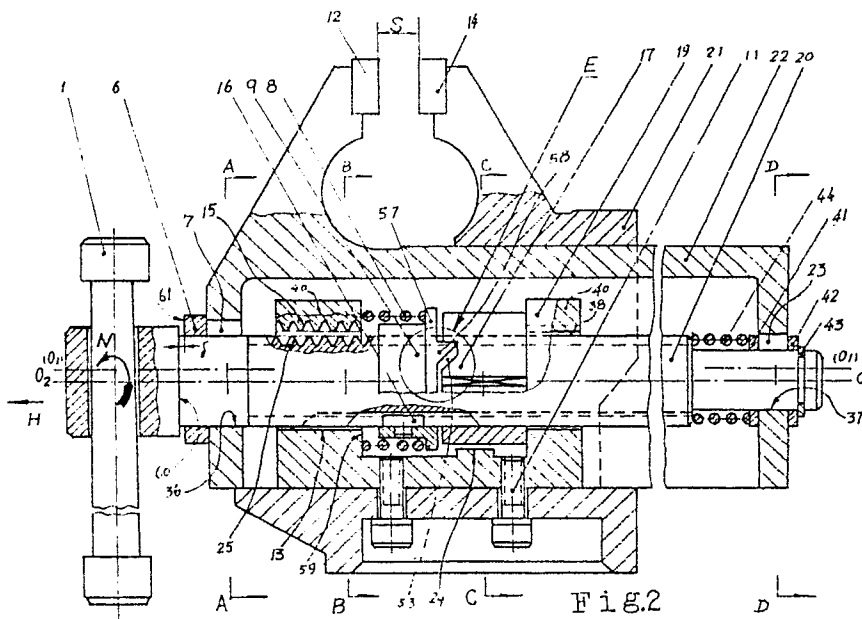
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(54) Screw drive mechanism and vice.

(57) A screw drive mechanism, particularly suitable for a fast-clamping vice. A screw (20) for moving a movable body (22) relative to a stationary body (21) is engageable in threaded portions of holes (38) in arms (40) of a screw nut seat (19). A cam (17) is provided eccentrically of the screw (20) between the arms (40), and is rotatable to shift the axis of the screw (20) laterally into or out of engagement with the threads by a one-way pawl device (9, 58) which is keyable to rotate with the screw (20).



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SCREW DRIVE MECHANISM AND VICE

The present invention relates to a novel screw drive mechanism which permits the screw fast to engage with or disengage from a screw nut by a relative movement between the screw and the nut, which can be widely used in manual bench vice, bench vice for a tool or sliding table of a tool where there are requirements for quickly passing over an idle stroke, speedily adjusting a relative distance or fast clamping.

There are many known types of fast clamping vice. The U.S. patent No. 2102602 (1937) disclosed a mechanism which the locus of center of the screw is an arc when the screw disengages or engages to the nut. Thus, the nut has to slidably connect with a stationary body, which would render a poor strength. The U.S. patent No. 2430458 (1947) also discloses a mechanism in which the screw nut will still remain on the screw after the later has disengaged from the former and where the screw nut bears against to an outer circumference of the screw by a spring and a pin, which will bring a too great resistance. Moreover, the present applicant submitted a patent application to the European Patent Office (No. 88301613; See Fig. 1) which disclosed a fast clamping mechanism, in which a driving nut is provided outside the vice body, and the mechanism is complex in construction.

An object of the present invention is to overcome the aforesaid drawbacks by employing a oneway pawl and cam mechanism to effect straight-line relative movement between the screw and the nut so that the screw engaging with or disengaging from the screw nut. Preferably it is simple in construction and is low in cost.

According to one aspect of the invention, a mechanism comprises a movable sliding body, a stationary body, a screw, a screw nut seat, a eccentric cam, a oneway pawl device, the springs and a positioning pin. etc, where the screw passes through the cam and the screw nut seat. In a embodiment of the present invention, the two ends of the screw are supported in two long-circular holes in two end walls of the movable sliding body respectively, the oneway pawl device adopts a ratchet sleeve, which is positioned between the eccentric cam and a arm of the screw nut seat and connects with screw through a guide key. There is provided one (or more) one-way pawl on the end face of the ratchet sleeve and the pawl has a vertical surface and an oblique surface which may engage correspondingly with a vertical surface and an oblique surface on the pawl grooves of the eccentric cam. The sleeve is beared against on an end surface of the cam by a spring. Under the

action of cam, the screw vertically moves relative to the secured nut seat.

In second embodiment of the present invention, the oneway pawl device adopts a pawl pin, which is located within a radial hole on the cam and pulled by a ring extension spring. The screw nut seat is provided with two longcircular holes, said holes have the threads on its lower portion.

In third embodiment of the present invention, the nut seat is provided with a guide pillar on its bottom surface, the guide pillar can vertically slide along a guide hole on the base of the stationary body. The screw is secured in the radial direction, under the action of the cam the nut seat can move vertically relative to the radially secured screw.

The present invention will be explained in the following by taking the bench vice as the embodiments in referring to the accompanying drawings.

Fig. 1 is a view showing a screw drive mechanism of the prior art.

Fig. 2 illustrating a embodiment of a bench vice employing the drive mechanism according to the invention is a sectional view showing the bench vice in a released position.

Fig. 3 is a sectional view of the bench vice in Fig. 2 but in a position clamping a workpiece.

Fig. 4 is a general view of the screw nut seat of Fig 2.

Fig. 5 is a side view of Fig. 4.

Fig. 6 is a perspective view of the ratchet sleeve of fig. 2.

Fig. 7 is a perspective view of the eccentric cam of fig. 2.

Fig. 8 is a sectional view of fig. 2 taken from line AA and DD, showing a relative position of the screw neck journal in the support holes of the front and back vertical plate of the movable body, when the bench vice is in a released position.

Fig. 9 is a sectional view of fig. 2 from line BB, showing a relative position after the outer threads of screw having been disengaged from the inner threads of an axial hole in the screw nut seat, when the bench vice is in a released position.

Fig. 10 is an orthogonal projection drawing of the local view E showing the pawl of ratchet sleeve to engage with the pawl groove on the cam when the bench vice of fig. 2 is in a released position.

Fig. 11 is a sectional view taken from line CC of fig. 2, showing relative position of the eccentric cam and the screw nut seat when the bench vice is in a released position.

Fig. 12 is a sectional view taken from line A'A' and line D'D' of fig. 3 showing a relative position of the screw neck journal in the support

holes on the front and back vertical plate of the movable body, when the bench vice is in a position clamping a workpiece.

Fig. 13 is a sectional view taken from line B'B' of fig. 3, showing a position where the outer threads of the screw engage with the inner threads of the screw nut seat when the bench vice is in a clamping position.

Fig. 14 is an orthogonal projection drawing of the local view E' showing the pawl of ratchet sleeve having disengaged out from the pawl groove of the cam in fig. 3 where the bench vice is in a clamping position.

Fig. 15 is a sectional view of fig. 3 taken from line C'C', showing a relative position of the eccentric cam and the screw nut seat when the bench vice is in a clamping position.

Fig. 16 is a view of the second embodiment of the present invention, showing a bench vice for a tool in a released position.

Fig. 17 shows the bench vice of Fig. 16 in a clamping position.

Fig. 18 is a perspective view of the pawl pin of fig. 16.

Fig. 19 is a perspective view of the eccentric cam of fig. 16.

Fig. 20 is a perspective view of the ring extension spring of fig. 16.

Fig. 21 is a perspective view of the screw nut seat of fig. 16.

Fig. 22 is a sectional view taken from line DD of fig. 16.

Fig. 23 is a sectional view taken from line EE of fig. 16.

Fig. 24 is a sectional view taken from line FF of fig. 16.

Fig. 25 is a sectional view taken from line D'D' of fig. 17.

Fig. 26 is a sectional view taken from line E'E' of fig. 17.

Fig. 27 is a sectional view taken from line F'F' of fig. 17.

Fig. 28 is a view of the third embodiment of the present invention, showing a bench vice in a released position.

Fig. 29, shows the bench vice of fig. 28 in a clamping positions.

Fig. 30 is a perspective view of the screw nut seat of fig. 28.

Fig. 31 is a sectional view taken from line PP of fig. 28.

Fig. 32 is a sectional view taken from line P'P' of fig. 29.

Figs. 2-15 show the first embodiment of the bench vice employing the screw drive mechanism according to the present invention, which comprises a stationary body 21 having a hollow portion; a movable body 22 positioned within said hollow

portion of said stationary body 21; a pair of vice jaws 12, 14; a handle 1, a screw 20, an eccentric cam 17, a screw nut seat 19, ratchet sleeve 9, a compression spring 8 and a gasket 6, etc., wherein the movable 22 can slide along the guide track in the stationary body 21 and the handle 1 mounted in a through hole on left end of the screw 20 may cause the screw turning to left (N-direction) or right (M-direction).

Two ends of the screw 20 are supported respectively in the support holes 7,23 on the front and back vertical plate of the movable body 22, the two support holes 7,23 are all in a long-circular form having two parallel side walls 101, the width of holes is substantially equal to the diameter of the screw to permit the screw 20 able only to move up and down vertically. The gasket 6 is provided between an inner end surface 68 on a left projection of the screw 20 and an outer end surface of the support hole 7 on front vertical plate of movable body 22. At the right shoulder of the screw 20, there is provided a cylindrical compression spring 44, its an end through a gasket 41 bears against the inner side the back vertical plate of movable body 22, while the end of the right neck journal of screw 20 has a gasket 42 and a stop collar 43 to protect the neck journal from sliding off. In assembly, it should be ensured that there is a gap δ between the end surface 60 on left projection of the screw 20 and the end surface 61 of gasket 6. The width of δ is about $\frac{1}{2}$ of the pitch in screw 20. This δ is prepared for that when accidentally there happens the teeth touching against in an engagement of the threads 25 and 15 may bring the screw 20 to have a little axial movement freely and then a suitable engagement can be achieved.

The screw 20 being provided a key-way connects with the ratchet sleeve 9 through the guide key 16 and the screw 20 also passes through the axial hole of the ratchet sleeve 9, in addition, the screw 20 has outer threads 25 (see fig. 2 and 3).

The screw nut seat 19 is in the form of saddle (see fig 4), which is fixed on the stationary body 21 by means of the bolts 11. The two arms 40 on the seat 19 have respectively the concentric holes 38. The cross-sectional shape of the holes 38 is formed by two circular arcs, i.e. the upper arc "a" and the lower arc "b" (see fig. 5). The center of circle of the upper arc "a" is O_1 and the central angle α of the arc "a" is no more than 180° . The radius of upper arc "a" is r_1 which equals to the thread radius of the outer threads 25 on screw 20. The surfaces on the upper arcs "a" of the two holes have respectively the inner threads 15 which can engage with the outer threads 25 of the screw 20. The center of circle of the lower arc "b" is O_2 which is beneath the center O_1 of the upper arc "a" and there is an eccentric distance "e" between

the two centers O_1 and O_2 . The "e" should be greater than the tooth depth of the threads 15, 25, and the radius r_2 of the lower arc "b" should be greater than the thread radius of outer threads on screw 20 in order to ensure that when the screw 20 descends from position O_1 to position O_2 , it does not touch with any portions of the wall on the hole of seat 19 (as shown in fig. 9) and can displace freely along the axial direction of screw 20.

The eccentric cam 17 is positioned between one arm 40 and the ratchet sleeve 9. The curve for the cam is divided into a downward stroke curve portion (with the lowest point 32) and an upward stroke curve portion (with the highest point 31) (see fig. 7). In addition the cam 17 has also a positioning projection 52 and a positioning plane 51. In left turning, the positioning projection 52 will touch a horizontal limit plane 56 of the movable body 22, at this point, the lowest point 32 on the cam curve will just oppose the supporting surface 24 of seat 19 so as to cause the cam 17 and the screw 20 to be situated in the most released position O_2 (see fig. 11). Similarly (see fig. 15) in right turning, the positioning plane 51 will touch the side wall surface 55 on the movable body 22, at this point, the highest point 31 on upward stroke curve portion of the cam 17 will touch the cam support surface 24, under an influence of the upward stroke curve of cam 17, causing the axis of screw 20 to ascend from position O_2 up to position O_1 , so that its outer threads 25 engage with the inner threads 15 on the seat 19 (see fig. 13). There is provided on an end surface 45 of cam 17 one (or more) one-way pawl groove 53 (see fig. 7 and fig. 14) which has a vertical surface 50 and an oblique surface 49.

The ratchet sleeve 9 connects with screw 20 through the guide key 16 and has a flange 57 which is provided with one (or more) one-way Pawl 58 formed by a vertical surface 47 and an oblique surface 48 (see fig. 6 and fig. 10), under an action of the cylindrical compression spring 8 to ensure the ratchet sleeve 9 and the cam 19 to press together forever.

Now, the operation sequences of fast clamping bench vice according to the present invention will be explained as follows. There are five steps wherein the second and third steps are simultaneous and the whole operating time is about one second; the fourth and fifth steps are also simultaneous and the whole operating time is about 0.5 second.

(1) The step for free adjustment of the opening in the jaws of a bench vice.

Now the lowest point 32 on downward stroke curve of the cam 17 faces on the cam supporting

surface 24, the cam 17 is in a released position relative to the cam supporting surface 24 of the screw nut seat 19 (see fig. 11). The front end and the back end of the screw 20 are supported respectively on the lower supporting surfaces 36 and 37 of the supporting holes 7 and 23 on the front and back vertical plates of the movable body 22 (see fig. 8), meanwhile, the positions of the supporting holes 7 and 23 ensure the central axis of the screw 20 to be at the center O_2 of the lower arc "b", while the outer threads 25 on screw 20 does not contact with the inner surfaces on the holes 38 of the seat 19 in any portion (see. fig. 9), thus the movable body 22 may be pushed or pulled manually such that the movable body 22 can slide quickly along the guide track in the stationary body 21 with the screw 20 to fast adjust the opening S of the vice jaws according to the size of a workpiece. Depending on the size of workpiece 28, pushing the movable body in a suitable position to cause the jaws 12, 14 in contacting with the workpiece 28.

(2) The step for engaging the outer threads of screw with the inner threads of nut seat.

Turning handle 1 along the right-hand direction (shown as the arrow M in fig. 3) to rotate the screw 20, the screw 20 through the guide key 16 drives also the ratchet sleeve 9 to turn right, meanwhile, the pawl 58 of ratchet sleeve 9 is in a pawl groove 53 of the cam 17, a right turning of the ratchet sleeve 9 causes the oblique surface 48 of pawl 58 to bear against the oblique surface 49 of pawl groove 53 (see the position designed by double dash line in fig. 14), thus, under the action of an axial force from the compression spring 8, by a push of the oblique surface 48 on ratchet sleeve 9, the cam turns also to right, then brings its upward stroke curve to slide on the cam supporting surface 24 of the screw nut seat 19 until the position plane 51 of cam 17 contacts with the limit surface 55 to cease the cam in rotation (see fig. 15), at the same time, the highest point 31 on upward stroke curve of the cam 17 just touches the supporting surface 24 of the seat 19 and the screw 20 also lifts vertically along the parallel side walls 101 of holes 3, 27 to a highest position, i.e., the central axis of screw 20 ascends vertically over an eccentric distance "e" from its original position O_2 - O_2 to a position O_1 - O_1 , until the outer threads 25 of screw 20 engage with the threads 15 in the holes 38 of seat 19 and the engagement should ensure the pair of the inner and outer threads 15, 25 to be turnable each other (see fig. 13).

(3) The step for clamping a workpiece (see fig. 3)

Continuing to turn the handle 1 along the right-hand direction (M-direction) Now, since the positioning plane 51 of the cam 17 has touched the sidewall limit surface 55 of movable body 22 and causes the cam 17 ceasing in rotation (see fig. 15), the rotative moment of the ratchet sleeve 9 will apply to oblique surfaces 48 and 49 belonging to the pawl 58 and pawl groove 53 having been contacted each other, which generates an axial component along the direction "H". When the axial component is greater than the axial pressure of spring 8, the ratchet sleeve 9 displaces along the direction "H", until the pawl 58 leaves out from pawl groove 53 and slides along the end surface 45 of cam 17. Still continuing to turn the handle, Since the outer threads 25 of screw 20 has engaged with inner threads 15 of nut seat 19 with the threads being righthanded and the seat 19 is fixed on the stationary body 21, the screw 20 moves forward along the axial direction "K" while it turns to right. Thus, the screw 20 through the end surface 60 on its left projection and the gasket 6 pushes the movable body 22 to displace until the jaws 12, 14 clamp the workpiece 28.

(4) The step for releasing a workpiece.

After the workpiece has been processed and requires to be removed, turning the handle 1 in a lefthand direction (N-direction, see fig. 2) to cause the screw 20 to rotate according to the left-hand direction. Since the outer threads 25 of screw 20 are initially in engagement with the inner threads 15 of seat 19, the screw 20 displaces axially along the direction "H" while turns to left and through the gasket 42 and stop collar 43 pushes the movable body 22 to displace along direction "H" so as to cause the jaws to release the workpiece 28.

(5) The step for disengaging the outer threads of screw from the inner threads of seat (see fig. 2).

At a time in releaisng the workpiece, i.e., a time when the handle 1 turns to left, the ratchet sleeve 9 driven by the screw 20 and quide key 16 also turns to left by a certain angle until the pawl 58 falls into pawl groove 53 (see fig. 10) under the pressure of the compression spring 8. The screw 20 drives the ratchet sleeve 9 to continue its left turn, and pushes the cam 17 to turn in lefthand direction through two contacted vertical surface 47 and 50 respectively on the pawl 58 and pawl groove 53, causing the cam gradually into a released position, i.e., causing the lowest point 32 on

the downward stroke to turn gradually to its lowest position (see fig. 11) until the positioning projection 52 of cam 17 contacting with the horizontal limit plane 56, thus the central axis of screw 20 descends vertically from position 0₁ to position 0₂, just dropping a height "e", hence disengaging the outer threads 25 of screw 20 wholly from the inner threads 15 of seat 19. Now, the front end and the back end of screw 20 fall respectively on the lower supporting surface 36, 37 of the supporting holes 7, 23 on the front and back vertical plate of the movable body 22 (see fig. 8). Therefore, the screw 20 may displace forward or backward freely with the movable body 22 and causes the screw driving mechanism again in a manner that the opening of vice jaws 12, 14 can be fast adjusted as described in the step 1.

Figs 16-27 show the second embodiment according to the present invention, which shows a bench vice for a tool and comprises a stationary body 63, a movable body 64, a screw 20, an eccentric cam 65, a screw nut seat 68, an one-way pawl pin 73, a ring extension spring 76, a positioning pin 74. In this embodiment, said one-way pawl device adopts a pawl pin 73 instead of the ratchet sleeve 9 in first embodiment. The movable body 64 can slide along the guide track in the stationary body 63, the screw 20 passes through the holes in the eccentric cam 65 and the screw nut seat 68; The screw nut seat 68 is in the form of saddle with a upper top portion 88 (see fig. 21), and is fixed on the stationary body 63 by means of the bolts 75; The holes of screw nut seat 68 are in the form of long-circular hole, which have two parallel side walls 87, a upper arc portion 86, and a lower arc portion with the inner threads 15 suitable to engage with the outer threads 25 of the screw 20. The width of the long-circular holes is substantially equal to the diameter of the screw 20. The eccentric cam 65 is located within the screw nut seat 68, the curve portion 92 of eccentric cam 65 is circular and can slide between the upper cam support surface 94 and the lower cam support surface 95 of nut seat 68; the eccentric cam 65 is provided on the plane 89 with a radial hole 67 and a threaded hole 90; the eccentric cam 65 is further provided with a groove 77 for receiving a ring extension spring 76, said groove 77 surrounds the outer circumference of cam 65 and passes through the end centre of radial hole 67 (see fig. 19). The positioning pin 74 is secured in the threaded hole 90 of cam 65 by threads. The pawl pin 73 is located within the radial hole 67 of the cam 65 and can slide radially along the hole 67. The pawl pin 73 is provided with a one-way pawl formed by a vertical surface 79 and an oblique surface 78. The pawl pin 73 is further provided with a hole 80 through which the ring extension spring 76 can

pass. The ring extension spring 76 is located around the groove 77 of the cam 65 and passes through the hole 80 of the pawl pin 73. The screw 20 is provided along its axial direction with two one-way pawl groove 81 formed by a vertical surface 83 and an oblique surface 82 (see fig. 24 and 27). The front end plate of movable body 64 is provided with two holes in which the spring 71 are located, the springs 71 can ensure that there is a gap " δ " between the front end wall and the gasket 70, and may bring the screw 20 to have a little axial movement and then a suitable engagement can be achieved. A gasket 93 is located inner side of front end wall of movable body and prevents the screw 20 from sliding off.

In case of releasing a workpiece (see fig. 16), turning the screw 20 along left-hand direction (N-direction), the pawl pin 73 falls into the pawl groove 81 of screw 20 under the action of ring extension spring 76, thus the screw 20 drives the eccentric cam 65 through two contacted vertical surfaces 83 and 79 respectively on the pawl groove 81 and the pawl 73 (see fig. 24), thus the eccentric cam 65 rotates under the limit of two cam support surfaces 94 and 95 and causes the screw 20 to ascend vertically along two parallel side walls 87 of the holes of the nut seat 68, until the head of the positioning pin 74 contacts with the limit surface 84 of nut seat 68 (see fig. 23), with the axis of screw 20 ascending from its lowest position O_2-O_2 to its highest position O_1-O_1 , the threads 25 of screw 20 disengages from the threads 15 of nut seat 68 (see fig. 22) thus the movable body 64 may be pushed or pulled manually such that the opening "S" of the vice jaws can be adjusted fast (see fig. 16).

In case of clamping a workpiece, turning the screw 20 along a right-hand direction (M-direction) to cause the oblique surface 82 of the pawl groove 81 of screw 20 to bear against the oblique surface 78 of pawl pin 73 (see fig. 27), thus brings the eccentric cam 65 to rotate under the pull action of the ring extension spring 76, until the head of positioning pin 74 contacts with the upper limit surface 85 of the nut seat 68. (see fig. 26). In the same time, the rotation of eccentric cam 65 causes the screw 20 to descend along two parallel walls 87 of long-circular hole of nut seat 68, with the axis of screw 20 dropping from its highest position O_1-O_1 to its lowest position O_2-O_2 , thus the threads 25 of screw 20 engage with the threads 15 of nut seat 68 each other (see fig. 25). Continuing to turn the screw 20, the oblique surface 78 of pawl pin 73 will slide along the oblique surface 82 of pawl groove 81 of screw 20 when the component acting on two oblique surfaces is greater than the extension force of the ring spring 76, until the pawl pin 73 leaves out from the pawl groove 81 (see fig. 27); then the screw 20 can turn continuously. Since the outer

thread 25 of screw 20 have engaged with the inner threads 15 of nut seat 68 with the seat 68 is fixed on the stationary body 63, the screw 20 will move forward along the axial direction "K" while it turns to right, and pushes the movable body 64 through the gasket 70 to clamp the workpiece.

Figs. 28-32 show the third embodiment according to the present invention wherein the structures of the pawl pin, the eccentric cam and the nut seat are basically identical to those of the second embodiment, but the nut seat 68 is provided on its bottom surface with a guide pillar 96 which can slide vertically along a guide hole 97 on the base 100 of stationary body 63. The screw 20 supported on two holes of two end walls of the movable body 64 can not move vertically up and down and can only turn, while the nut seat 68 can move vertically under the action of eccentric cam 65, so that the threads 25, 15 of screw 20 and nut seat 68 may engage with or disengage from each other.

In case of clamping a workpiece, turning the screw 20 along a righthand direction (M-direction), the screw 20 drives the eccentric cam 65 through the pawl groove and pawl pin 73, thus the eccentric cam 65 rotates under the limit of two surfaces 94 and 95, and causes the nut seat 68 to ascend vertically over a distance "h", because the screw 20 is fixed in the radial direction, (see fig. 29, and fig. 32); thus the threads 15 of nut seat 68 engage with the thread 25 of screw 20. Continuing to turn the screw 20 until the pawl pin 73 slides off from the pawl groove of the screw 20, then the screw 20 can move along the axial direction "K" while it continues to turns to right, and pushes the movable body 64 through the gasket 70 to clamp the workpiece (see fig. 29).

In case of releasing a workpiece, turning the screw 20 to left (N-direction), the screw 20 drives the eccentric cam 65 by the contacted vertical surfaces 83 and 79 respectively on the pawl groove 81 and the pawl pin 73, thus the cam 65 rotates to causes the nut seat 68 to descend vertically relative to the radially fixed screw 20, so that the threads 25 of screw 20 disengage from the threads 15 of nut seat 68, the movable body can move freely in the axial direction (see fig. 28).

The mechanism may have a variety of modifications, which should be considered within the scope of the present invention.

Claims

1. A screw drive mechanism comprising a stationary body, a movable body, a screw, a screw nut seat having two arms, an eccentric cam positioned between two arms of said screw nut seat, said screw passes through the holes of said screw

nut seat and said eccentric cam, said cam can slide on the cam support surfaces of said nut seat characterized in that the mechanism further comprises an one-way pawl device, said screw drives said eccentric cam to rotate by said one-way pawl device, which causes a vertical relative movement between said screw and said screw nut seat, whereby the threads of said screw can engage with or disengage from the threads of said screw nut seat.

2. The screw drive mechanism according to claim 1 characterized in that said one-way pawl device adopts a ratchet sleeve, which is positioned between one arm of said screw nut seat and an end surface of said eccentric cam and is connected with the screw through the guide key; and that there is provided on the end surface of said ratchet sleeve with a one-way pawl matching correspondingly a one-way pawl groove on the end surface of said eccentric cam, said pawl being formed by a vertical surface and an oblique surface, a spring presses said ratchet sleeve and the end surface of said cam together along an axial direction.

3. The screw drive mechanism according to claim 1 and 2 characterized in that said eccentric cam has a one-way pawl groove formed by a vertical surface and an oblique surface; and a positioning projection, when on touching with a horizontal limit plane of the stationary body, it just causes the lowest point on a downward stroke curve of said cam getting downwards such that said screw attains its lowest position " O_2 " in its downward movement, bringing the threads of said screw to disengage from the threads of said nut seat; there is provided also on said cam a position plane, when on touching with a vertical limit side surface of said movable body, the highest point on a upward stroke curve of said cam just turns downwards to contact with the cam support surface on said screw nut seat to force said screw ascending to its highest position " O_1 " and cause the outer threads of the screw to engage with the inner threads of said nut seat in a rotatable manner.

4. The screw drive mechanism according to claim 1, 2 and 3 characterized in that said screw nut seat is in the form of a saddle and is fixed on the stationary body, the two arms of which have concentric axial holes having an upper circular arc and a lower circular arc, the central angle of the upper circular arcs is no more than 180° and the radius of upper circular arc equals to the radius of the outer threads on the screw, the fitting surface of the upper circular arc have inner threads suitable to engage with outer threads on said screw, the center O_2 of the lower circular arc is positioned beneath the center O_1 of the upper circular arc, the radius of the lower circular arc is greater than the

radius of outer threads on the screw and the eccentric distance between the centers O_1 , O_2 of the two circular arcs is greater than the tooth depth of the said threads.

5. The screw drive mechanism according to claim 1, 2, 3 and 4 characterized in that two neck journals, each on the left end and right end of said screw, are respectively supported in two holes of long-circular shape on front and back end plates of said movable body, said hole have two vertical parallel side walls, the width of holes is substantially equal to the diameter of said screw, said screw is able to move up and down along a vertical direction.

6. The screw drive mechanism according to claim 1, characterized in that said one-way pawl device adopts a radial pawl pin positioned within the radial hole of said eccentric cam, the pawl of which is formed by a vertical surface and an oblique surface; a ring extension spring is positioned within said groove on the outer circumference of said eccentric cam and passes through said hole on said pawl pin.

7. The screw drive mechanism according to claim 1, 6, characterized in that said screw is provided along its axial direction with the pawl grooves formed by a vertical surface and an oblique surface.

8. The screw drive mechanism according to claim 1, 6, 7 characterized in that said nut seat further has a upper cam support surface; the holes of said nut seat is of long-circular shape having two vertical parallel walls; the width of said long-circular holes is substantially equal to the diameter of said screw, the lower arc portion of said long-circular holes has threads suitable to engage with the threads of said screw.

9. The screw drive mechanism according to claim 1, 6, 7, 8, characterized in that the curve portion of said eccentric cam is circular, said cam is provided with a radial hole for receiving said pawl pin and with a groove for receiving said ring extension spring around its circumference, a positioning pin is fixed on said eccentric cam; said eccentric cam is so arranged that when it causes said screw to ascend from a lowest position (O_2) to a highest position (O_1), the threads of said screw disengage from the threads of said nut seat; and when said cam causes said screw to descend from its highest position (O_1) to its lowest position (O_2), the threads of the screw engage with the threads of said nut seat.

10. The screw drive mechanism according to claim 1 characterized in that said nut seat is provided on its bottom surface with a guide pillar suitable to slide vertically along a guide hole on the base of said stationary body.

11. The screw drive mechanism according to

claim 1 and 10, characterized in that said screw is fixed in the radial direction, said eccentric cam causes said nut seat to move vertically relative to said radially fixed screw, so that the threads of said nut seat can engage with or disengage from the threads of said screw. 5

12. A screw drive mechanism for two relatively movable bodies, comprising a rotatable threaded screw (20) axially constrained to one of the bodies (22) and a screw nut seat (19) axially constrained to the other of the bodies (21), the nut seat (19) having arms (40) with holes (38) wherethrough the screw (20) passes and which have threaded portions (15) engageable by the screw (20) for screw drive between the bodies (21, 22), and there being engagement/disengagement mechanism including a cam (17, 65) mounted eccentrically around the screw (20) between the arms (40) of the nut seat (19), whereby rotation of the cam (17, 65) effects a transverse shift of the screw axis relative to the nut seat (19) to move the screw (20) and nut seat threaded portions (15) controllably into or out of engagement, characterized in that the cam (17, 65) is drivable in rotation by the screw (20), through a one-way pawl device (9, 73). 10 15 20 25

13. A screw drive mechanism according to claim 12 wherein the axial shift occurs in one plane relative to the screw nut seat (19).

14. A bench vice, or tool incorporating a sliding table, comprising a screw drive mechanism according to any one of claims 1 to 13. 30

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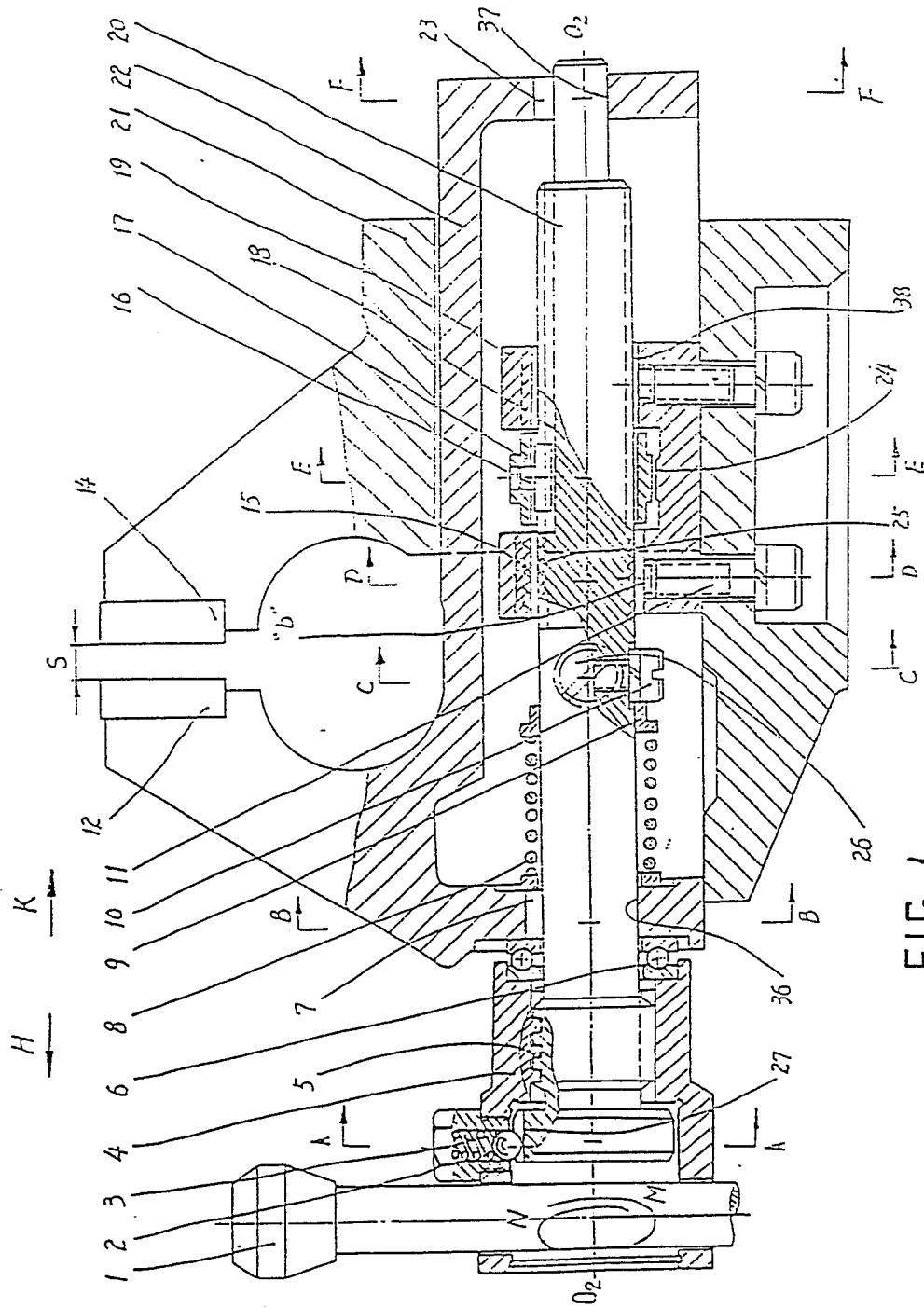
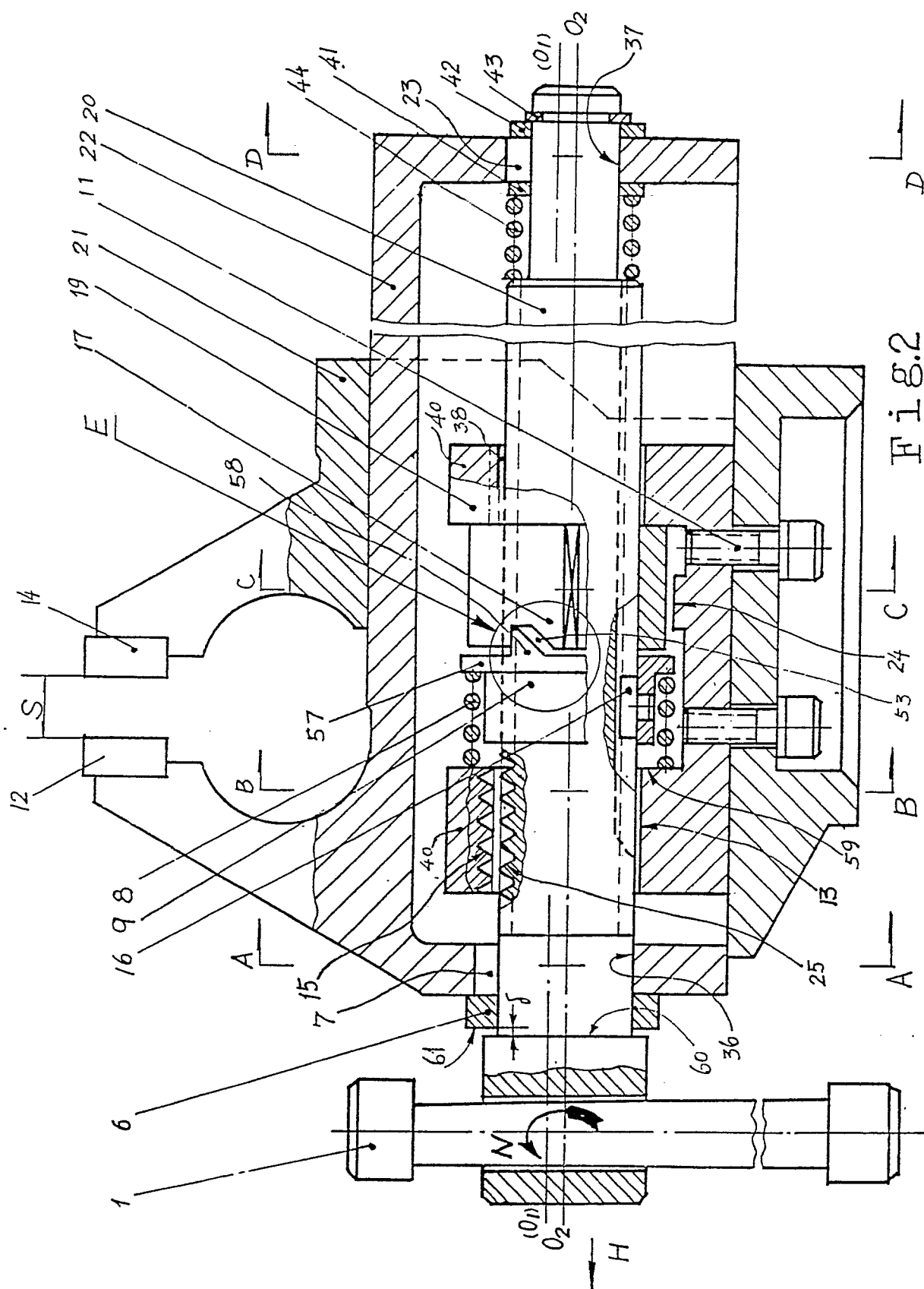


FIG. 1

Prior Art



2.3.1 F

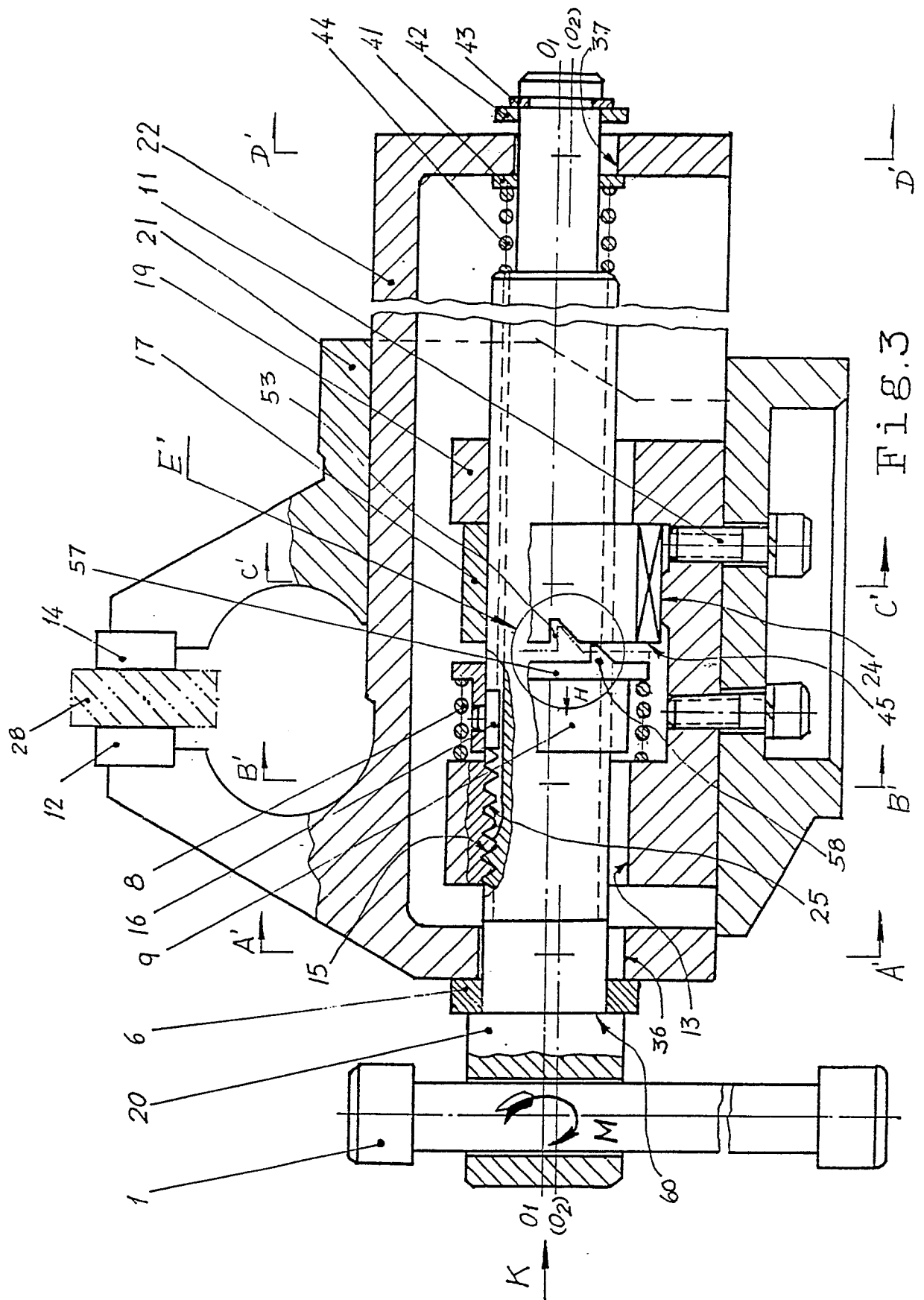
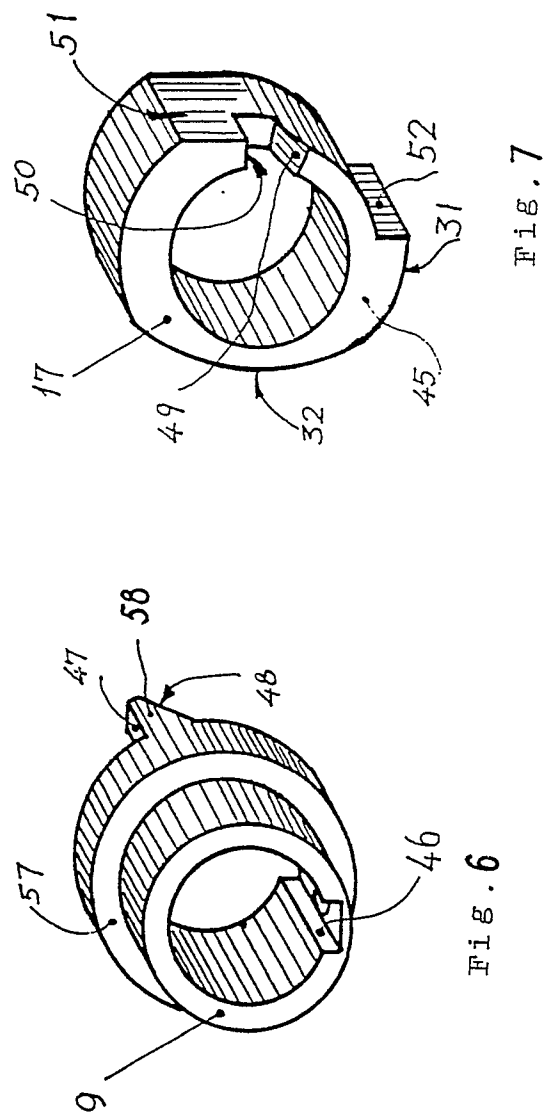
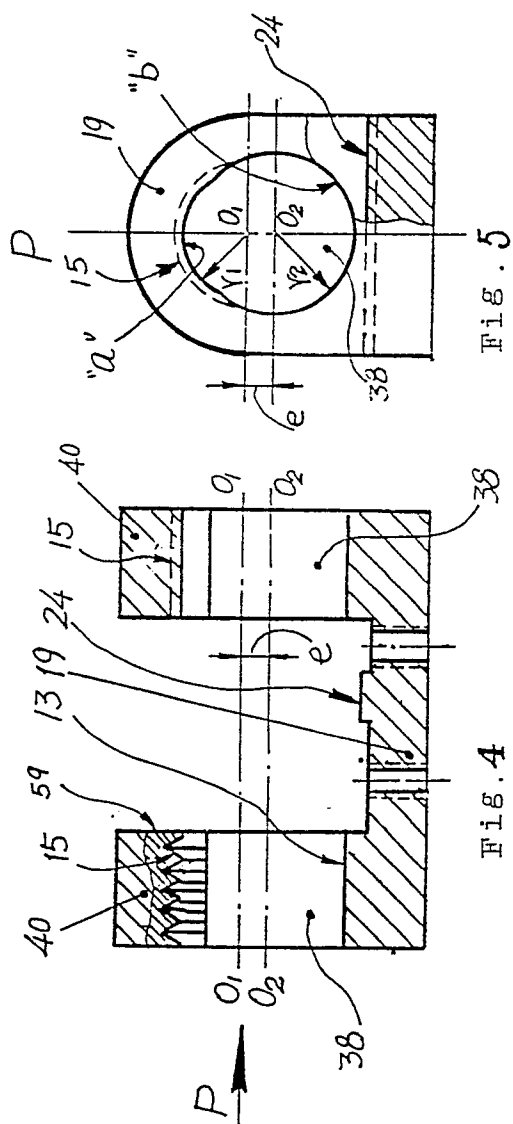


Fig. 3



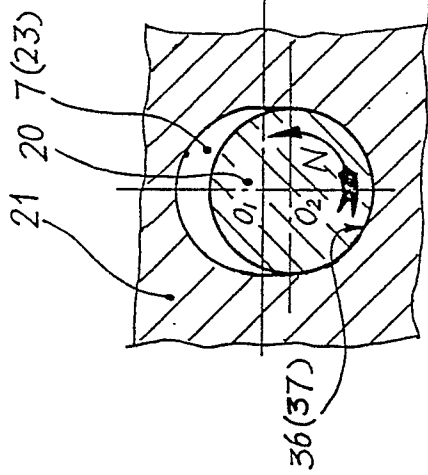


Fig. 8 A-A (D-D)

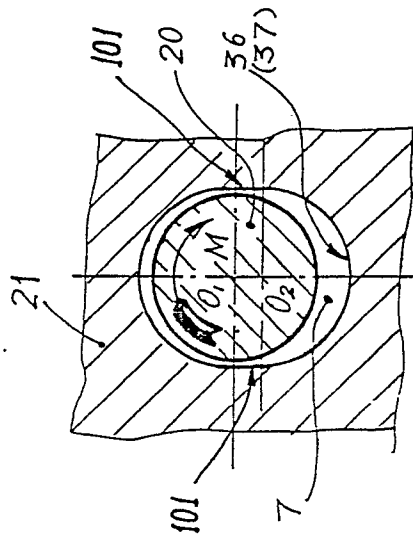


Fig. 12 A'-A' (D'-D')

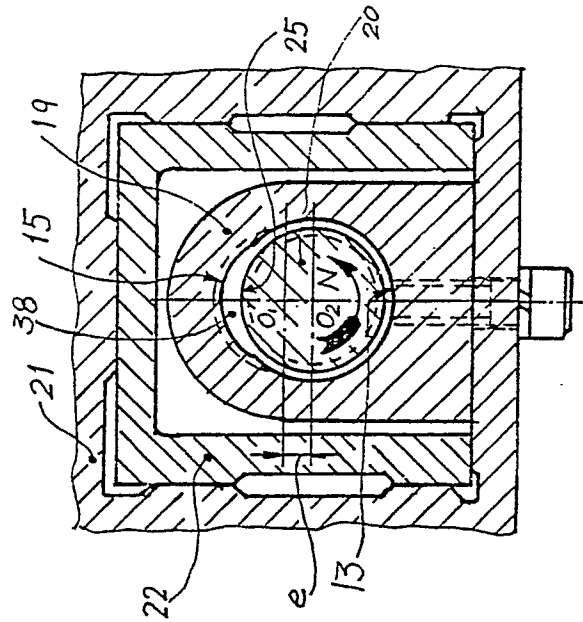


Fig. 9 B-B

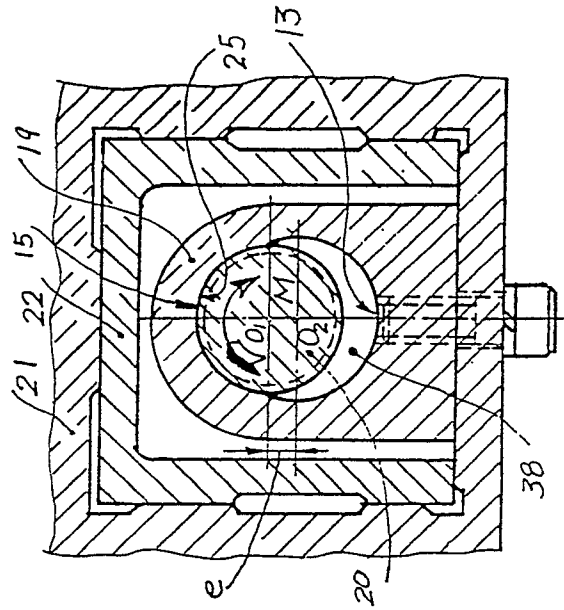


Fig. 13 B'-B'

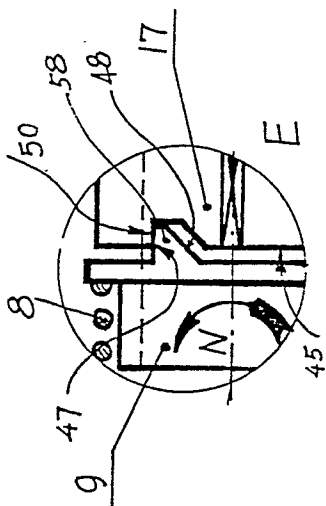


Fig. 10 (E)

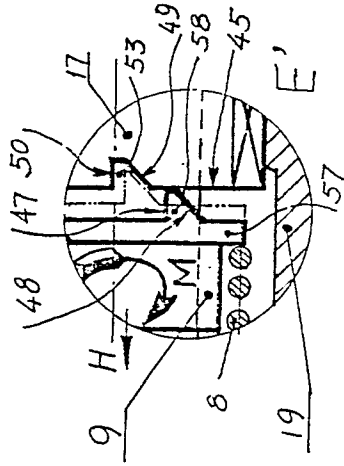


Fig. 14 (E')

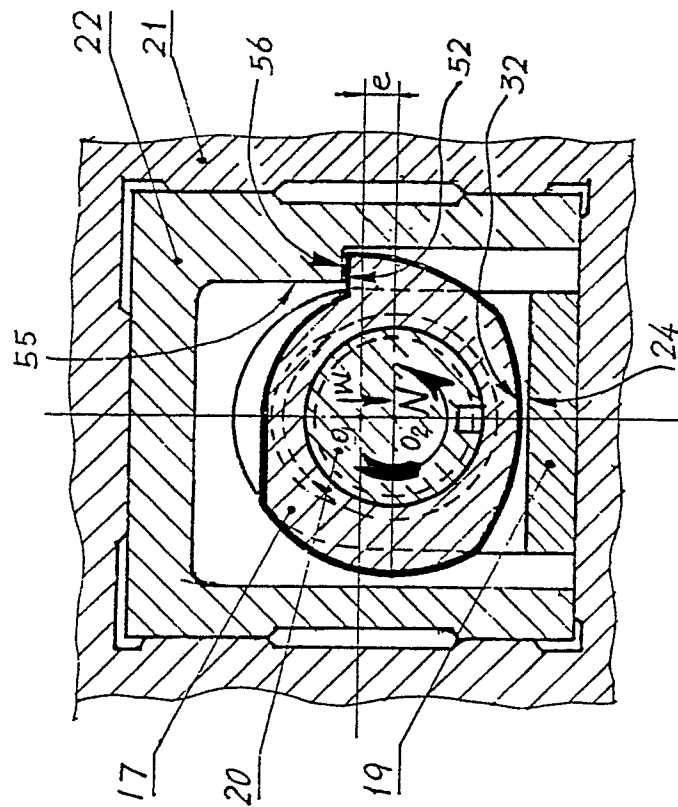


Fig. 11 C-C

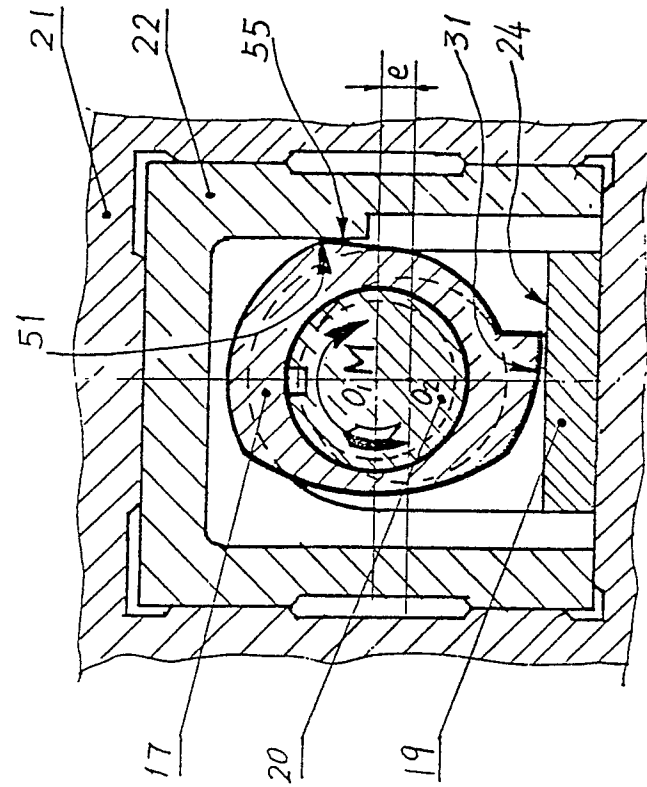


Fig. 15 C'-C'

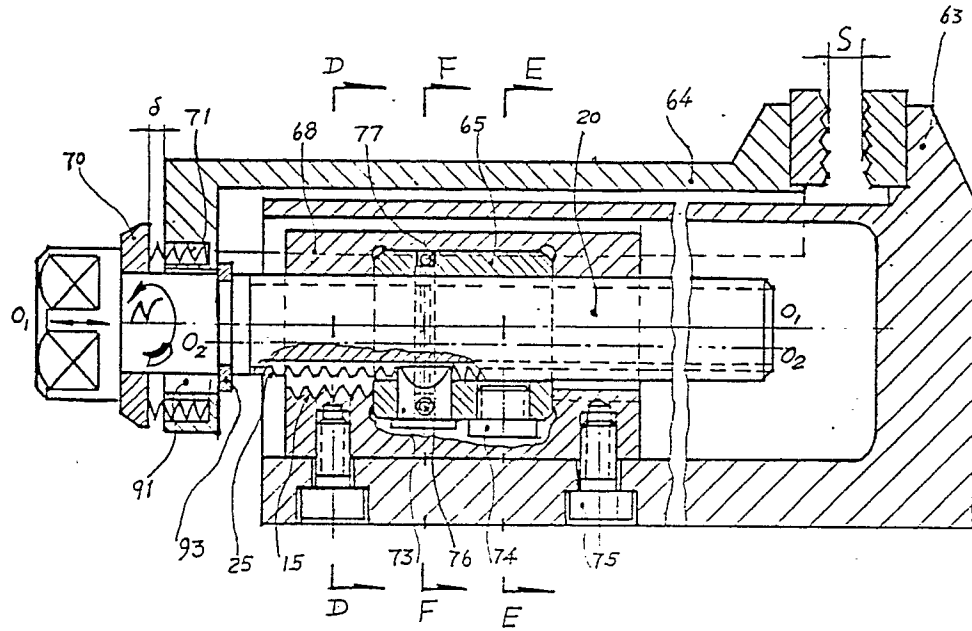


FIG. 16

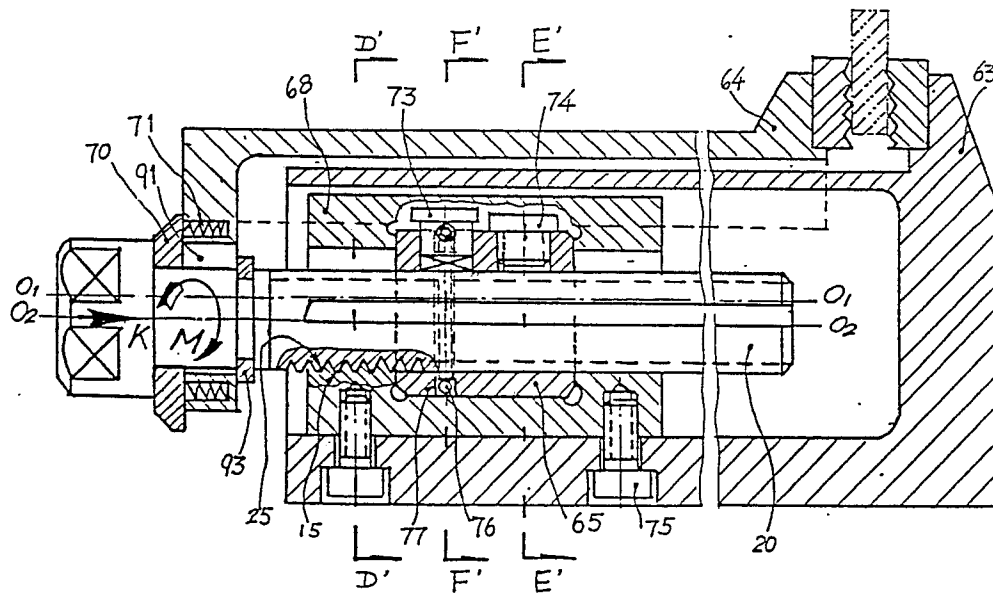


FIG. 17

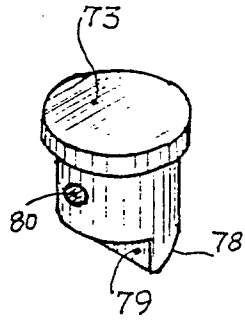


FIG. 18

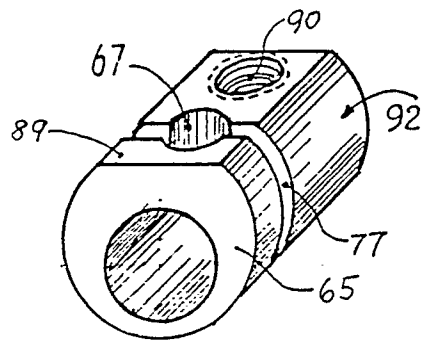


FIG. 19

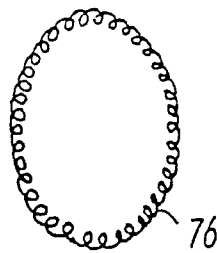


FIG. 20

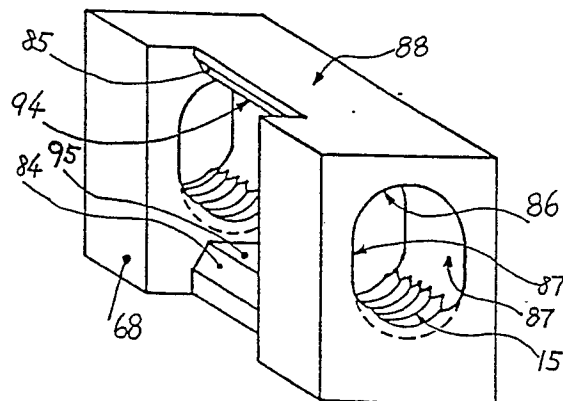


FIG. 21

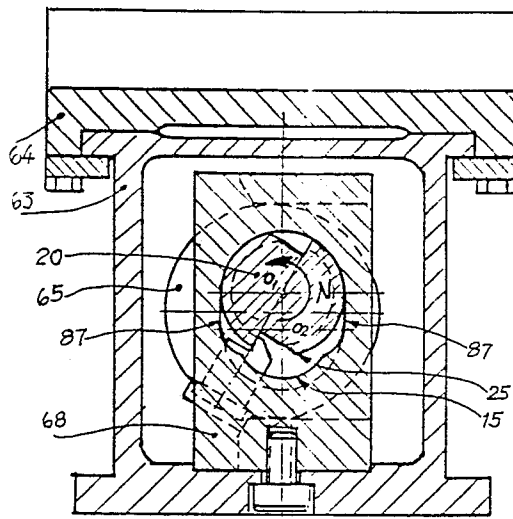


FIG. 22 (D-D)

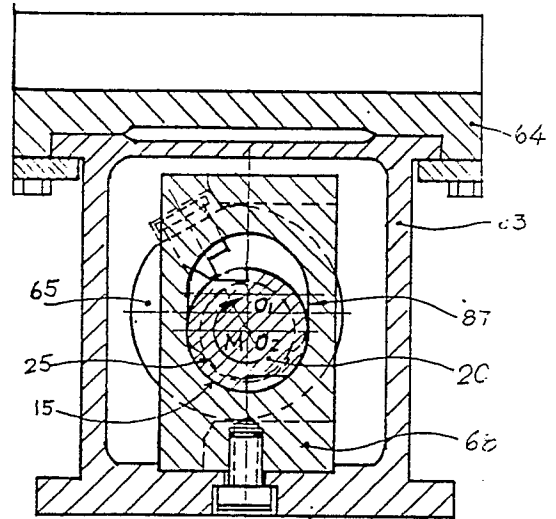


FIG. 25 (D'-D')

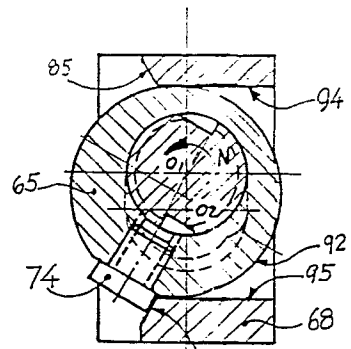


FIG. 23 (E-E)

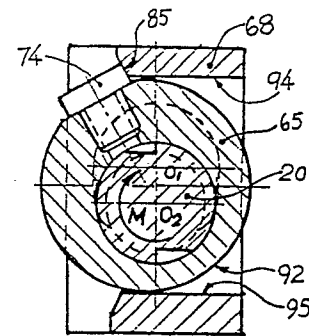


FIG. 26 (E'-E')

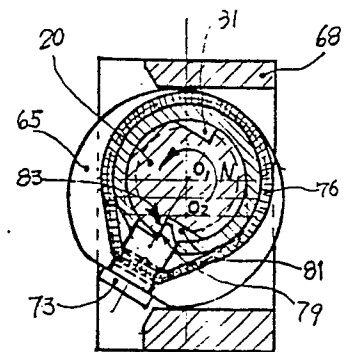


FIG. 24 (F-F)

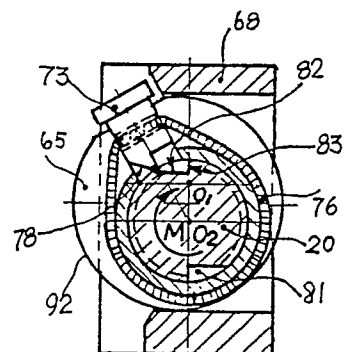


FIG. 27 (F'-F')

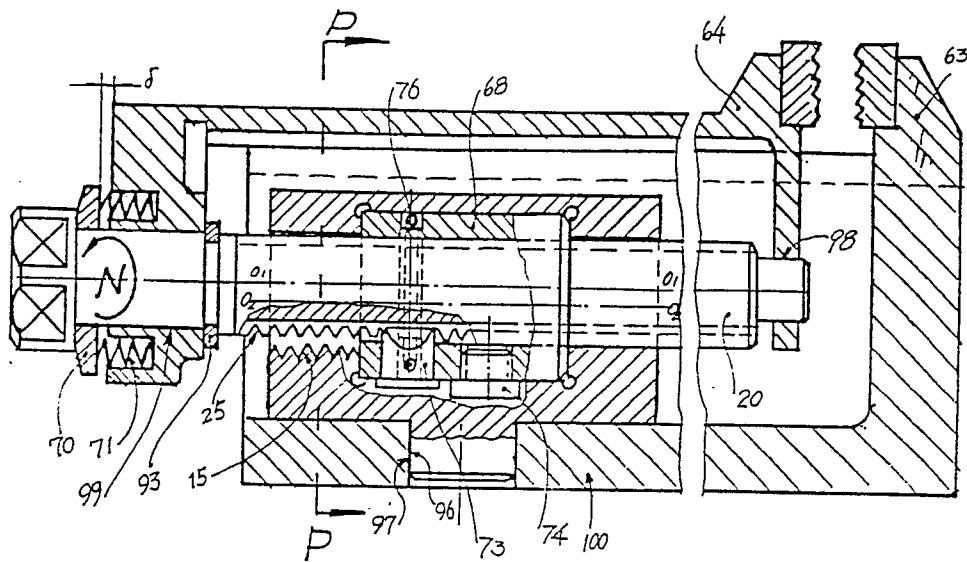


FIG. 28

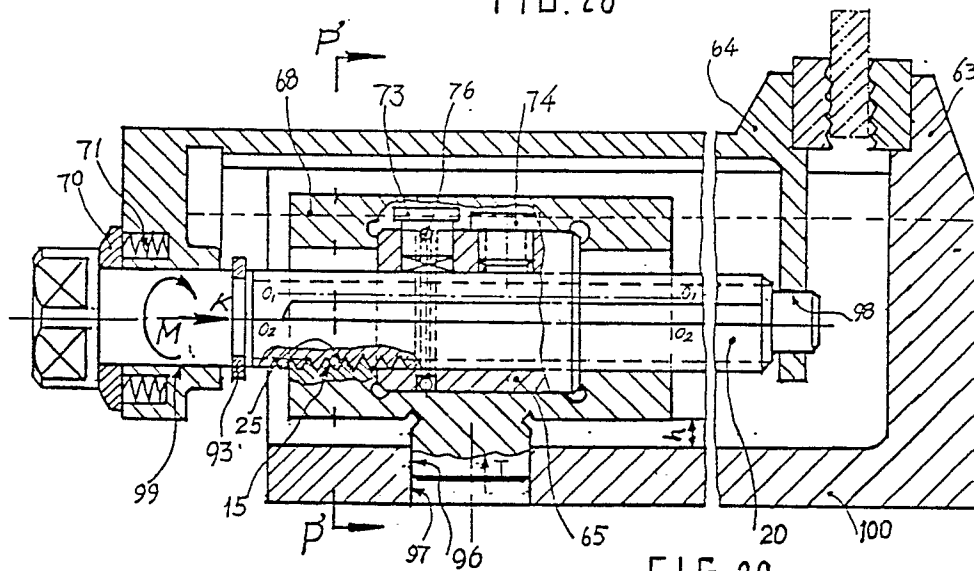


FIG. 29

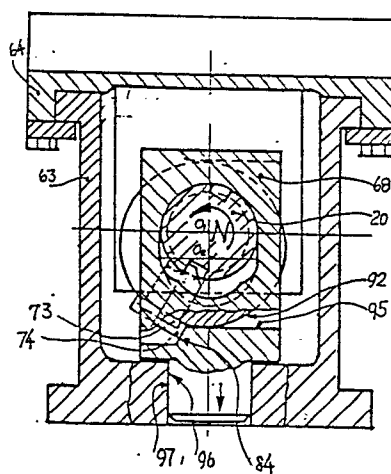


FIG. 31 (P-P)

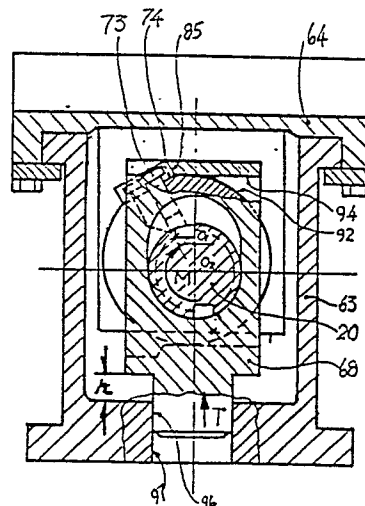


FIG. 32 (P'-P')

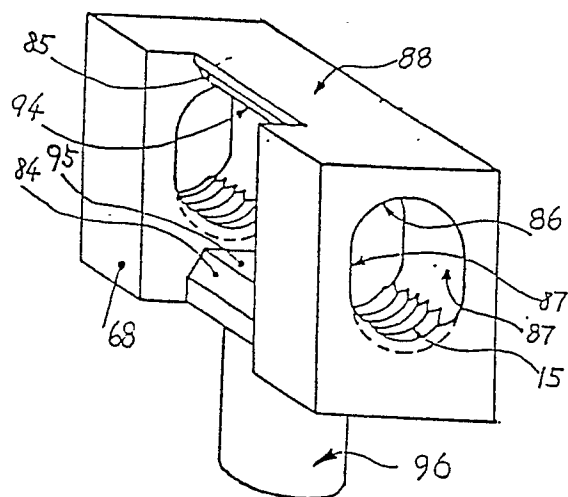


FIG. 30