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(54) **Adjustment mechanism on a seamer**

(57) An adjustment mechanism for a round and irregular seamer useful in the manufacture of tins is disclosed. The seamer has a rotating usually circular plate sandwiched between stationary cam plates above the plate and a seaming chuck below the plate. A seaming assembly is rotationally mounted to the rotating plate proximate its periphery and is provided above the plate

with a cam follower which interacts with the cam plate and beneath the plate with a seaming arm and head which moves towards and away from the seaming chuck depending on the interaction of the cam follower with the cam plate.

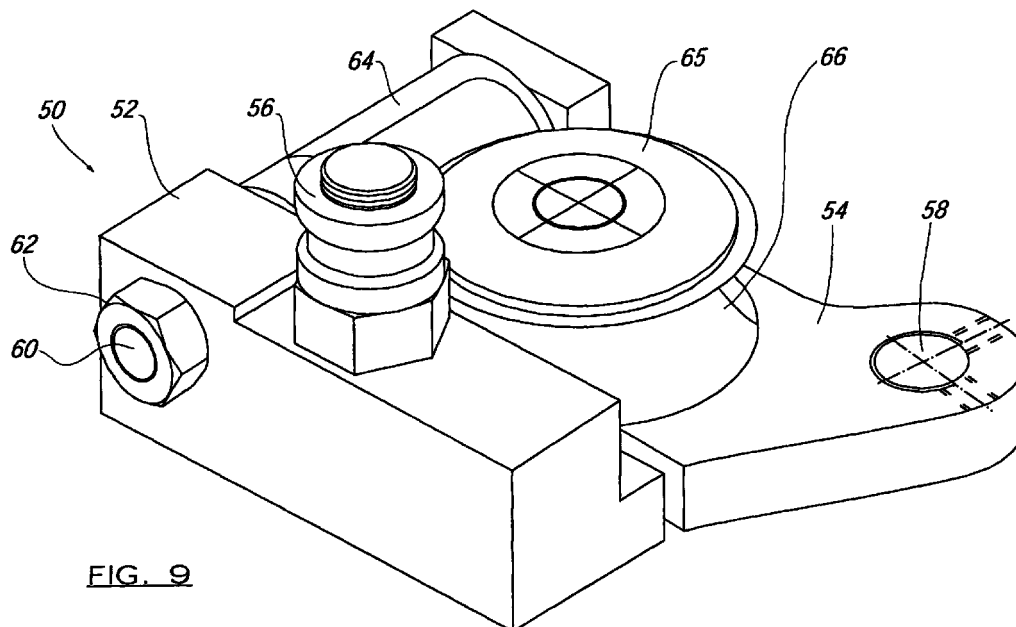


FIG. 9

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Description

[0001] This invention relates to an adjustment mechanism, and more specifically to a seam weight adjustment mechanism specifically adapted for use in machinery for the automated manufacture of tin boxes.

[0002] Automated tin box manufacture is accomplished by juxtaposing several different pieces of machinery and providing transfer means therebetween. Tin boxes can be manufactured in a vast number of different shapes and sizes and accordingly a single piece of machinery is required to be sufficiently versatile to enable manufacture of tin boxes in a large number of said shapes and sizes. It will be understood by those skilled in the art that the machinery used has a number of different components which can be exchanged to facilitate the manufacture of different boxes and currently the length of time taken to exchange all these various components to enable a particular set of machines to manufacture a different box shape can be up to an entire day. The invention hereinafter set forth, and also set forth in our co-pending applications have as their object the reduction of this time. Any reduction achievable in the "changeover" time is especially desirable when it is considered that tin box production rates using the machinery described hereinafter may reach 40 per minute.

[0003] Tin boxes can contain a wide variety of different goods, such as bottles, chocolates, biscuits, tea, coffee and the like. Manufacturers of such products commonly consider the containment of their product in tins because of the rigidity and durability which the sheet steel, from which such tins are commonly made, provides. Additionally, the containment of a product in a tin box may also suggest that the product therein is of a certain quality, especially as ornate and detailed print effects can be obtained on the surface of the metal plates from which the tin boxes are manufactured. Such effects cannot be achieved, or are achieved only to a much lesser degree by the containment of products in cardboard cartons or receptacles of plastics materials. A tin box in which such a product is contained has the further advantage of being reusable to contain other household items such as screws, nuts bolts, pencils and pens, etc. after the product originally contained therein has been consumed or otherwise utilised.

[0004] The various separate machines required in the manufacture of tin boxes are an "Automatic Curling Notching and Beading" machine, a "bodymaker", a "round and irregular seamer", and an "end feeder", each of which has a specific task to perform during the process of tin box manufacture. Each of these is now described.

[0005] The first stage in the process of automated tin box manufacture is the profiling of a simple sheet steel, and generally rectangular, blank from which the walls of the tin box are ultimately constituted. The blank is fed through an "Automatic Notching, Curling and

Beading" machine, referred to hereinafter as an ANCB machine. This machine consists of a plurality of consecutively driven rollers disposed both above and below the blank as it passes therebetween, each of said rollers performing a forming step on the blank. The particular profile of each blank as it exits the ANCB machine depends on the ultimate shape of the tin, but in general the blank is substantially flat with the exception of a hem provided parallel with one of the longer edges of the blank and proximate thereto, a bead is provided on one of said longer edges, a partial curl is provided around the alternate longer edge, and a pair of hooks oppositely disposed with respect to one another on the shorter edges. Additionally, the ANCB machine has cutting means which notch the corners of the blank to preclude any interference effects which may be caused by said corners either when the blank is profiled and provided with the hooks along its shorter edges, when it is formed into the cross-sectional shape of the tin box, or when wrapped around and attached to the base of said tin box.

[0006] The hem provides a surface behind which the beaded lip of a tin lid can engage to inhibit the removal of a lid separately formed and applied around the uppermost edge of the tin box, the bead is provided to hide the sharp longer edge of the blank which ultimately forms said uppermost edge of the tin box, the partial curl on the alternate longer edge of the blank is provided to facilitate the attachment of the blank, after same has been formed into the desired cross-sectional shape, to the base of the tin box, and the hooks provided along the shorter edges of the blank facilitate the connection of said edges to one another after the forming operation.

[0007] The profiled blank is then fed from the ANCB machine into a bodymaker by a feed mechanism which generally comprises a pair of reciprocating feed bars whose motion is best described as being that of a "walking beam" in conjunction with "disappearing guides" which simultaneously urge the profiled blank towards and over a forming mandrel and precisely align said blank thereon. The disappearing guides are rotated away from the blank when it is held in contact with the uppermost portion of the mandrel, which is generally of similar shape to the desired cross-sectional shape of the tin box to be manufactured, by a mandrel clamping arrangement. The removal of the disappearing guides (so-called because they are retracted and seem to "disappear" within the machine during the forming of the blank around the mandrel) allows a pair of forming wings pivotally connected together and disposed above the mandrel to rotate about their pivot and form said blank, which is at this stage still substantially planar, around the said mandrel. The forming operation performed by the wings also constrains the oppositely disposed hooks on the shorter edges of the blank to interlock on the underside of the mandrel whereupon a second forming tool compresses the metal of the blank

in the interlocked region to form the vertical seam within the wall of the tin box. During all forming operations the blank is clamped against the upper surface of said mandrel by said mandrel clamping arrangement.

[0008] The bodymaker thus forms the walls of the tin box into the desired cross-sectional whereafter the hollow wall section is fed into the round and irregular seamer which seemingly attaches a base provided with a peripheral flange by simultaneously compressing and deforming said peripheral flange and the partial curl provided on one of the edges of the blank together to form a seam. In practice, the bodymaker is responsible for the formation of the hooks on the shorter edges of the blank to facilitate connection of said edges to one another.

[0009] The seamer is conventionally juxtaposed with the bodymaker and an end feeder, these two pieces of machinery providing the body of the tin box and its base respectively which are connected together by the seamer.

[0010] This invention is specifically concerned with the provision of a novel adjustment mechanism on the seamer which allows a much wider range of seam weights to be used during the seaming process on different shapes and sizes of tin box.

[0011] Existing seaming machinery is best described with reference to diagrams, and accordingly Figure 1 shows a side elevation of the components of a seaming head axially bisected, Figure 2 shows a side elevation of an adjustment mechanism, Figure 3 shows an end elevation of the adjustment mechanism of Figure 2, Figure 4 shows a plan view of the adjustment mechanism of Figures 2 and 3, and Figures 5-8 show a complete spindle unit with seaming arm attached thereto, a spindle unit without the seaming arm attached thereto, as sectional view of the lower bearing assembly of the spindle unit, and a seaming arm.

[0012] Referring firstly to Figure 1 there is shown one half a seaming head 1, said seaming head being axially symmetrical about a central axis 2 and comprising engagement cams 4A, 4B, 4C, 4D and a shaping cam disposed above and below a circular table 8 which can rotate about the axis 2, the cams being generally stationary. The circular table 8 shown in the Figure is provided with only a single spring loaded adjustment mechanism 10 and a seaming mechanism 12, but four such mechanisms are typically provided both above and below the circular table 8 and substantially equidistantly around the circumference thereof. The remaining mechanisms are not shown in the interests of clarity.

[0013] The adjustment mechanism 10 is provided with a spring attachment lug 14 which stands proud of the remainder of the mechanism and allows for the connection of a coil spring (not shown) between the adjustment mechanism and an upright member rigidly secured to the upper surface of the circular table (also not shown).

[0014] The adjustment mechanism comprises an

upper portion 16 and a lower portion 18 which are mounted on a keyed spindle which can rotate in the table 8 and both protrudes from the upper surface and depends from the lower surface of the circular table. The upper portion 16 is provided with keying slots 20, 22 which receive the keys in the spindle to ensure that any angular rotation of said upper portion is transmitted to the seaming mechanism 12. The lower portion 18 of the adjustment mechanism is free to rotate on the spindle but the relative angular orientation of the upper and lower portions is adjusted by means of the abutment of a screw 24 disposed within an apertured lug 26 of the lower portion with a flat face 28 disposed on the upper portion. A locking nut 30 is also provided to lock the screw 26 in place.

[0015] It will be understood by those skilled in the art that once the coil spring is tensioned between the upright member and the adjustment mechanism, the whole mechanism and the spindle within the circular plate rotate until a cam follower 32 comes into contact with its respective cam wheel 4C. The coil spring thus serves to ensure contact between said cam follower and said cam wheel.

[0016] To the portion of the spindle which depends beneath the circular table 8 there is attached a seaming arm 34 to which a seaming head 35 is freely rotatably attached and a seaming cam follower 36, all of which form part of the seaming mechanism 12. The seaming head 35 is profiled such that on being brought to bear against a stationary complementarily profiled seaming chuck 38, a seam is formed around a base element and a hollow body element interposed there between.

[0017] In use, the circular table rotates, and the cam followers of all the adjustment mechanisms are biased into contact with their respective cam wheels 4A, B, C, D. The profile of said cam wheels is such that intermittently, the lower portion of said adjustment mechanism having the cam follower is forced to rotate in a clockwise manner around the spindle, and by virtue of the interaction of said lower portion with said upper portion through the screw 24 and face 28, the whole adjustment mechanism rotates concomitantly causing the spindle to rotate by virtue of the direct connection of the upper portion to the spindle. Hence the seaming arm rotates towards the seaming chuck causing the seaming head to bear thereagainst to clamp and form a seam between any components interposed between the seaming head and chuck.

[0018] Hence, the force with which the seaming head is brought to bear against the seaming chuck can be altered by altering the degree of relative angular orientation of the lower portion 14 with respect to the upper portion 16 with the adjustment mechanism. For example, if the screw 24 is screwed further into the apertured lug 26, the relative angular orientation of the upper and lower portions is increased, and concomitantly the seaming arm is fractionally rotated towards the seaming chuck. Said seaming head is thus brought

to bear against the mandrel with greater force when the cam wheel 4C urges the adjustment mechanism to rotate.

[0019] The fundamental disadvantage of this arrangement is that the extent to which the angular orientation of the upper and lower portions of the adjustment mechanism can be altered is dependent on the length of the screw 24. When it is considered that adjustment mechanism is rotating together with other components, safety considerations preclude the use of a longer screw than shown in the prior art figures.

[0020] Although the angular orientation of the seaming arms can be altered with respect to the spindle, this is a time consuming and laborious process.

[0021] It is an object of this invention to provide a novel adjustment mechanism for a round and/or irregular seamer which mitigates the above disadvantages.

[0022] According to the invention there is provided an adjustment mechanism for a round and irregular seamer comprising two separate portions whose relative angular displacement is required to be varied infinitesimally but which are maintained in proximate relationship, one or other of said portions being connected to a further component and causing same to rotate infinitesimally, characterised in that one or other of said portions is provided with screw means, the threads of which engage with corresponding threads provided on the other of the two portions such that the components rotate relative to one another thus causing the further component to rotate.

[0023] Preferably the said further component comprises a spindle to which is connected a seaming arm at the extremity of which is provided a seaming head.

[0024] Preferably one or other of the portions are provided with a worm screw, the alternate portion being provided with an interengaging worm gear.

[0025] Preferably the portions are disposed adjacent one another, a first of said portions being biased in a particular position, the second portion being that to which the further component is attached and being allowed to rotate around the said first component as the worm screw is rotated.

[0026] In an alternative aspect of the invention there is provided an adjustment mechanism for round and irregular seaming apparatus comprising a rotating plate to which is eccentrically mounted at least one seaming assembly capable of rotating about its mounting, said rotating plate rotating about a substantially central axis and having a remote edge, at least one cam plate stationary relative to the rotating plate and of lesser lateral dimensions, said seaming assembly being mounted to the rotating plate between the outermost edge of the cam plate and the remote edge of the rotating plate, a seaming chuck stationary relative to the rotating plate mounted substantially axially thereof and having lesser lateral dimensions around which the seaming assembly rotates with the rotating plate said seaming assembly comprising a seaming arm having a

seaming head biased away from the seaming chuck, and an adjustment mechanism connected to the seaming arm, said adjustment mechanism comprising first and second adjacently mounted portions one of which is provided with a cam follower which in coming into contact with the outermost edge of the cam plate causes the seaming assembly to rotate and thus the seaming arm and head to move towards and urged against the seaming chuck against the bias, one of the first and second adjacently mounted portions being connected to the seaming arm and head and angularly displaceable relative to the other adjacently mounted component, relative angular displacement of said portions causing small displacement of said seaming head and arm towards or away from the seaming chuck thus increasing or decreasing the force with which the seaming head is urged against the seaming chuck when the cam follower comes into contact with the cam plate, characterised in that said one of said first and second portions is provided with rotationally actuatable adjustment component which interengages with a corresponding rotary component provided on or as an integral part of the alternate portion, actuation of the adjustment component causing relative angular displacement of the said portions and concomitant rotation of the seaming arm and head towards or away from the seaming chuck.

[0027] The invention will be better understood with reference to the accompanying diagrammatic illustrations which are provided by way of example only, wherein:

Figure 1 shows a side elevation of the components of a seaming mechanism of the prior art configuration axially bisected,

Figure 2 shows a side elevation of an adjustment mechanism of the prior art,

Figure 3 shows an end elevation of the adjustment mechanism of Figure 2,

Figure 4 shows a plan view of the adjustment mechanism of Figures 2 and 3,

Figure 5 shows a complete spindle unit with seaming arm attached thereto,

Figure 6 shows a spindle unit without the seaming arm attached thereto,

Figure 7 shows a sectional view of the lower bearing assembly of the spindle unit,

Figure 8 shows a seaming arm,

Figure 9 shows a perspective view of an adjustment mechanism according to the invention,

Figures 10 shows a perspective view of the adjustment mechanism of Figure 9 provided with cam following means,

Figures 11-13 show elevations of the adjustment mechanism of Figure 10 in the directions of AA, BB, CC respectively,

Figure 14 shows a plan view of the adjustment mechanism of Figure 10,

Figure 15 shows a side elevation of the components of a seaming mechanism of the incorporating the adjustment mechanism according to the invention and axially bisected, and

Figure 16 shows a sectional view of the portion of the seaming mechanism of Figure 15 encased in dotted lines.

[0028] Figures 1-8 have been discussed as prior art hereinabove, and the description pertinent thereto is not reiterated.

[0029] Referring to Figure 9, there is shown an adjustment mechanism 50 consisting of two separate portions 52, 65 which are capable of being angularly displaced relative to one another. The rotatable portion 65 corresponds to the upper portion 16 described in the prior art Figures 1-8 and it is this portion 65 to which the spindle (not shown) is attached. The stationary portion 52, of which portion 54 is an integral part, is also provided with a spring attachment boss 56 to which the coil spring mentioned above is attached and which biases a cam follower 70 (not shown in Figure 9 but shown in Figures 10-16 and attached at 58 to the second portion 54) against a particular cam wheel 72 (shown in Figure 15).

[0030] As shown in Figure 16, a spindle 74 is rigidly attached to the portion 66 and therefore rotates therewith when a worm screw 60 capped by locking nut 62 and contained within an open-sided barrel 64 is rotated. The rotation of the worm screw causes relative rotation of the two portions because said worm screw engages with corresponding threads which may be provided either on a worm wheel 66 or formed integrally with and on the outer surface of the portion 65 in the region of the open side of said barrel. As in the prior art, the use of a screw allows infinitesimal adjustment of the seam weight which is ultimately applied along the corner of the tin box during construction thereof. However, the use of a worm gear allows for a far greater degree of adjustment because of the degree of angular rotation of the spindle is not limited by the screw as in the prior art configuration.

[0031] It will be seen from figures 10-16 that the portion 54 is provided with a cam follower 70 and generally corresponds to the lower portion 18 of the prior art adjustment mechanism configuration.

[0032] In summary therefore, an adjustment mech-

anism for a round and irregular seamer useful in the manufacture of tins is disclosed. The seamer has a rotating usually circular plate sandwiched between stationary cam plates above the plate and a seaming chuck below the plate. A seaming assembly is rotationally mounted to the rotating plate proximate its periphery and is provided above the plate with a cam follower which interacts with the cam plate and beneath the plate with a seaming arm and head which moves towards and away from the seaming chuck depending on the interaction of the cam follower with the cam plate. The adjustment mechanism of the invention comprises a pair of adjacently mounted portions disposed above the rotating plate, one of which is directly connected to a spindle which links the adjustment mechanism with the seaming arm and head. The two portions can be angularly displaced relative to one another by means of a worm screw provided in one of the portions and a worm gear which interengages with the worm screw provided on the alternate portion. This arrangement allows for firstly fine adjustment of the seaming arm and head towards and away from the seaming chuck so that the seaming head can be urged with greater or lesser force against the chuck. Secondly, the provision of a rotary component on one of the portions in the form of a worm gear means that the extent of relative angular displacement of the two portions is practically limitless-continued rotation of the worm screw simply causes further angular displacement of the worm gear and thus the portion to which it is attached, and ultimately the seaming arm and head.

Claims

1. An adjustment mechanism for a round and irregular seamer comprising two separate portions whose relative angular displacement is required to be varied infinitesimally but which are maintained in proximate relationship and mounted on a rotating plate of the seamer, one or other of said portions being connected to a further component resulting in rotation of said further component when the said portion is rotated, characterised in that one or other of said portions is provided with a rotationally actuable adjustment component which interengages with a corresponding rotary component provided on or as an integral part of the alternate portion, actuation of the adjustment component causing relative angular displacement of the said portions and concomitant rotation of the said further component.

2. An adjustment mechanism according to claim 1 characterised in that the rotationally actuable adjustment component is a screw, the threads of which engage with corresponding threads provided on the other of the two portions such that the portions rotate relative to one another thus causing the further component to rotate.

3. An adjustment mechanism according to claim 1 characterised in that the rotationally actuatable adjustment component is a screw, the threads of which engage with a rotary component attached to the other of the two portions such that the portions rotate relative to one another thus causing the further component to rotate. 5

4. An adjustment mechanism according to claim 1 characterised in that the said further component comprises a spindle to which is connected a seaming arm at the extremity of which is provided a seaming head. 10

5. An adjustment mechanism according to any preceding claim characterised in that one or other of the portions are provided with a worm screw, the alternate portion being provided with an interengaging worm gear. 15

6. An adjustment mechanism according to any preceding claim characterised in that the portions are disposed adjacent one another, a first of said portions being biased in a particular position, the second portion being that to which the further component is attached and being allowed to rotate over the said first component and relative thereto as the worm screw is rotated. 20 25

5. An adjustment mechanism for round and irregular seaming apparatus comprising 30

a rotating plate to which is eccentrically mounted at least one seaming assembly capable of rotating about its mounting, said rotating plate rotating about a substantially central axis and having a remote edge, 35
at least one cam plate stationary relative to the rotating plate and of lesser lateral dimensions, said seaming assembly being mounted to the rotating plate between the outermost edge of the cam plate and the remote edge of the rotating plate, 40
a seaming chuck stationary relative to the rotating plate mounted substantially axially thereof and having lesser lateral dimensions around which the seaming assembly rotates with the rotating plate said seaming assembly comprising a seaming arm having a seaming head biased away from the seaming chuck, and an adjustment mechanism connected to the seaming arm, 45
said adjustment mechanism comprising first and second adjacently mounted portions one of which is provided with a cam follower which in coming into contact with the outermost edge of the cam plate causes the seaming assembly to rotate and thus the seaming arm and head to 50 55

move towards and urged against the seaming chuck against the bias,

one of the first and second adjacently mounted portions being connected to the seaming arm and head and angularly displaceable relative to the other adjacently mounted component, relative angular displacement of said portions causing small displacement of said seaming head and arm towards or away from the seaming chuck thus increasing or decreasing the force with which the seaming head is urged against the seaming chuck when the cam follower comes into contact with the cam plate, wherein said one of said first and second portions is provided with rotationally actuatable adjustment component which interengages with a corresponding rotary component provided on or as an integral part of the alternate portion, actuation of the adjustment component causing relative angular displacement of the said portions and concomitant rotation of the seaming arm and head towards or away from the seaming chuck.

6. An adjustment mechanism according to claim 5 wherein the rotationally actuatable adjustment component rotates about a first axis and interengages with the corresponding rotary component to cause rotation thereof about an axis perpendicular to said first axis, said perpendicular axis being parallel to the axis of rotation of the rotating plate.

7. An adjustment mechanism according to claim 5 wherein one or other of the first and second adjacently mounted portions is provided with a worm screw, the alternate portion being provided with a worm gear with which the worm screw interengages.

8. An adjustment mechanism according to any of claims 5-7 characterised in that the seaming assembly is springingly biased such that the seaming arm and head are biased away from the seaming chuck.

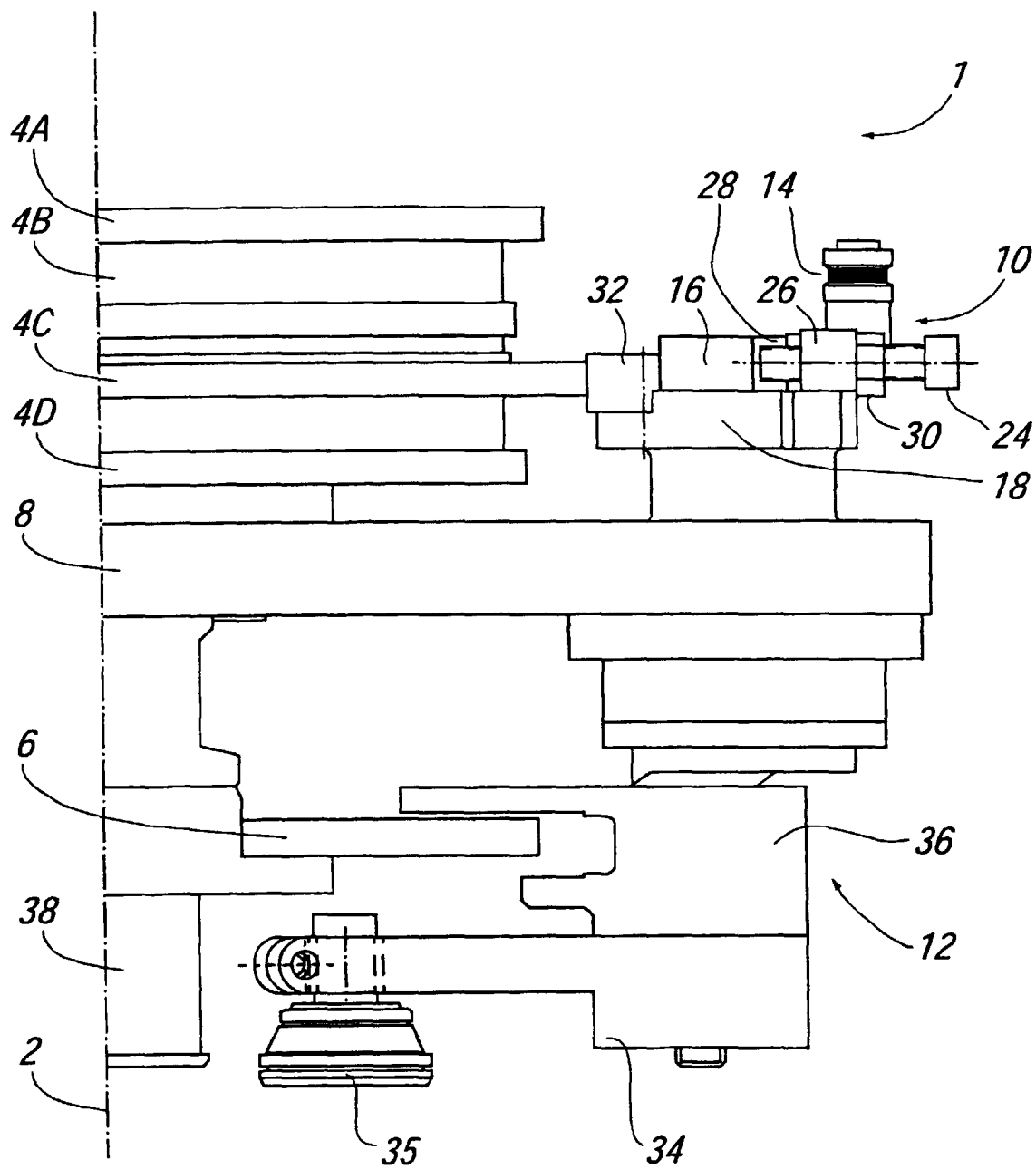


FIG. 1

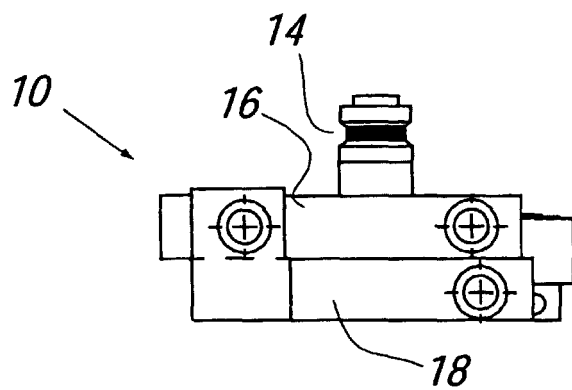


FIG. 2

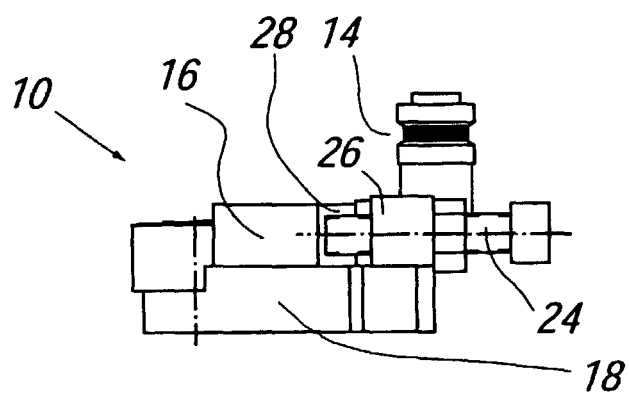


FIG. 3

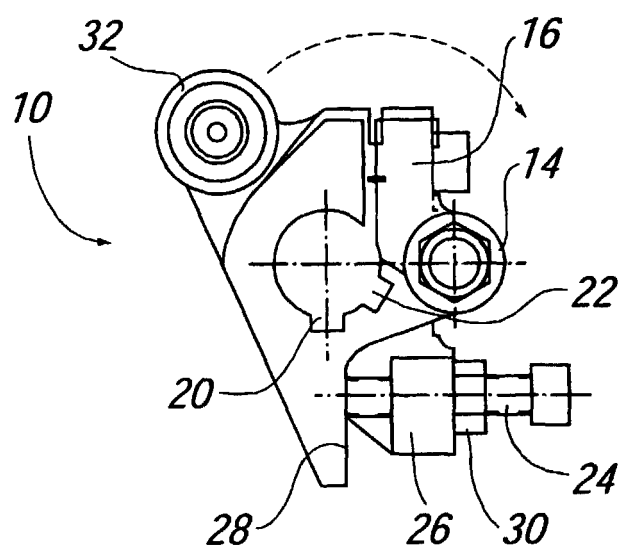


FIG. 4

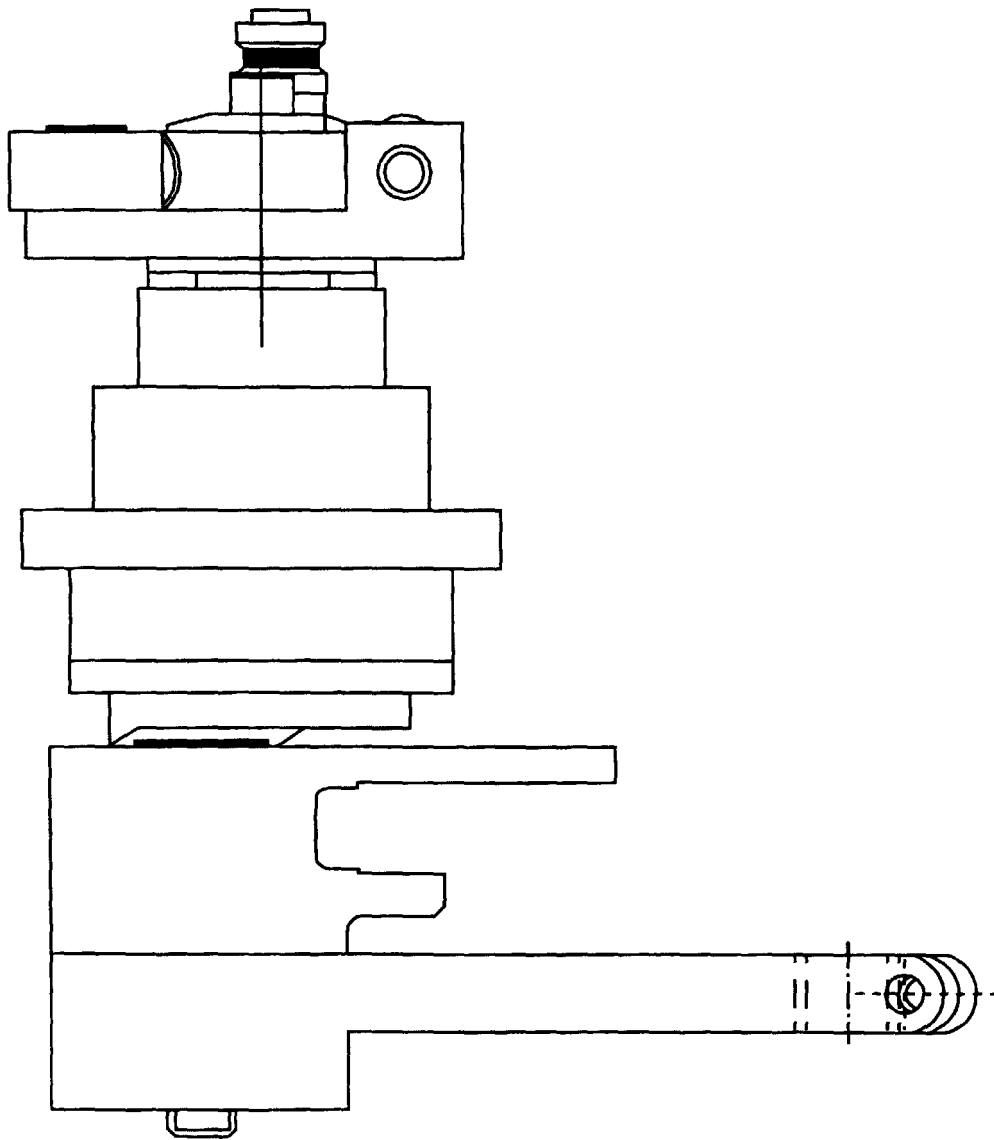
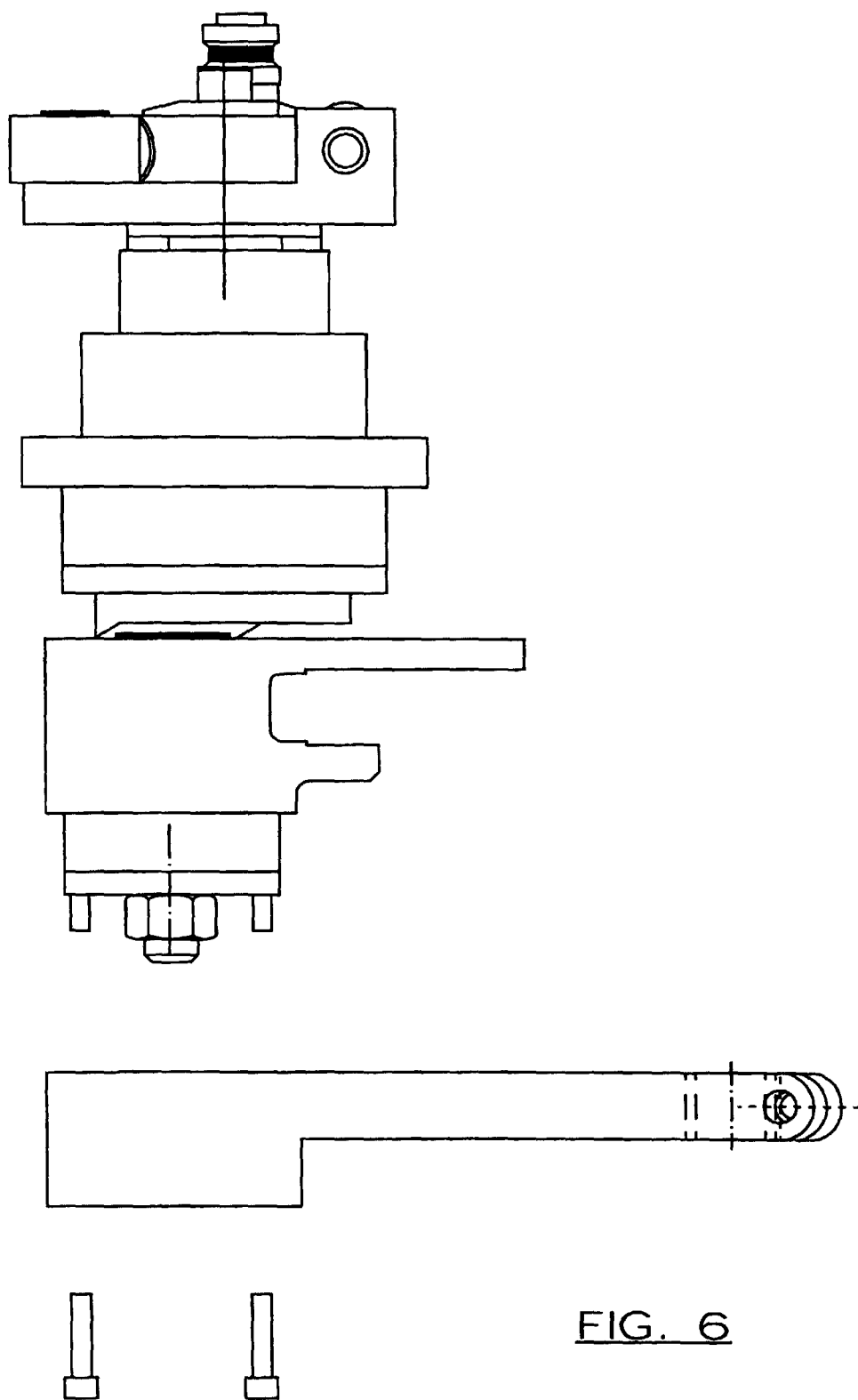


FIG. 5



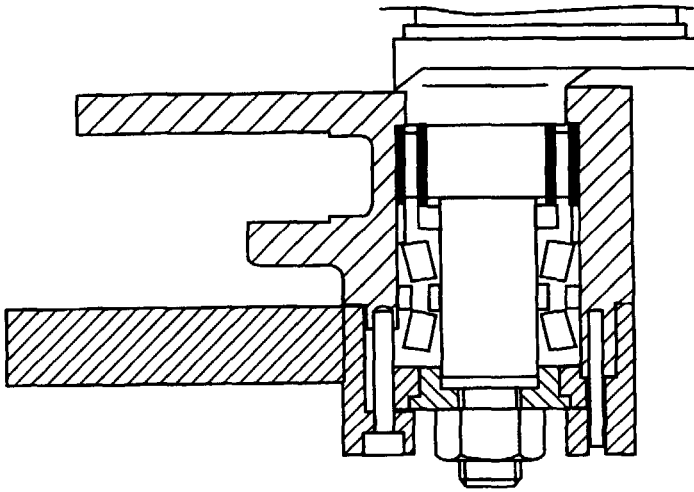


FIG. 7

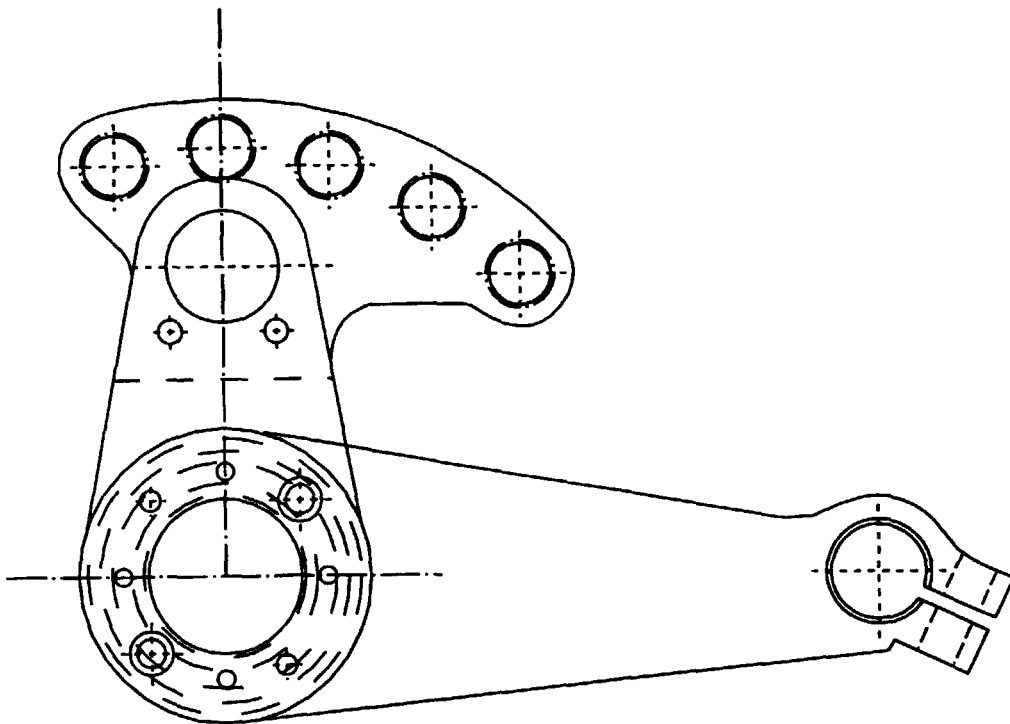
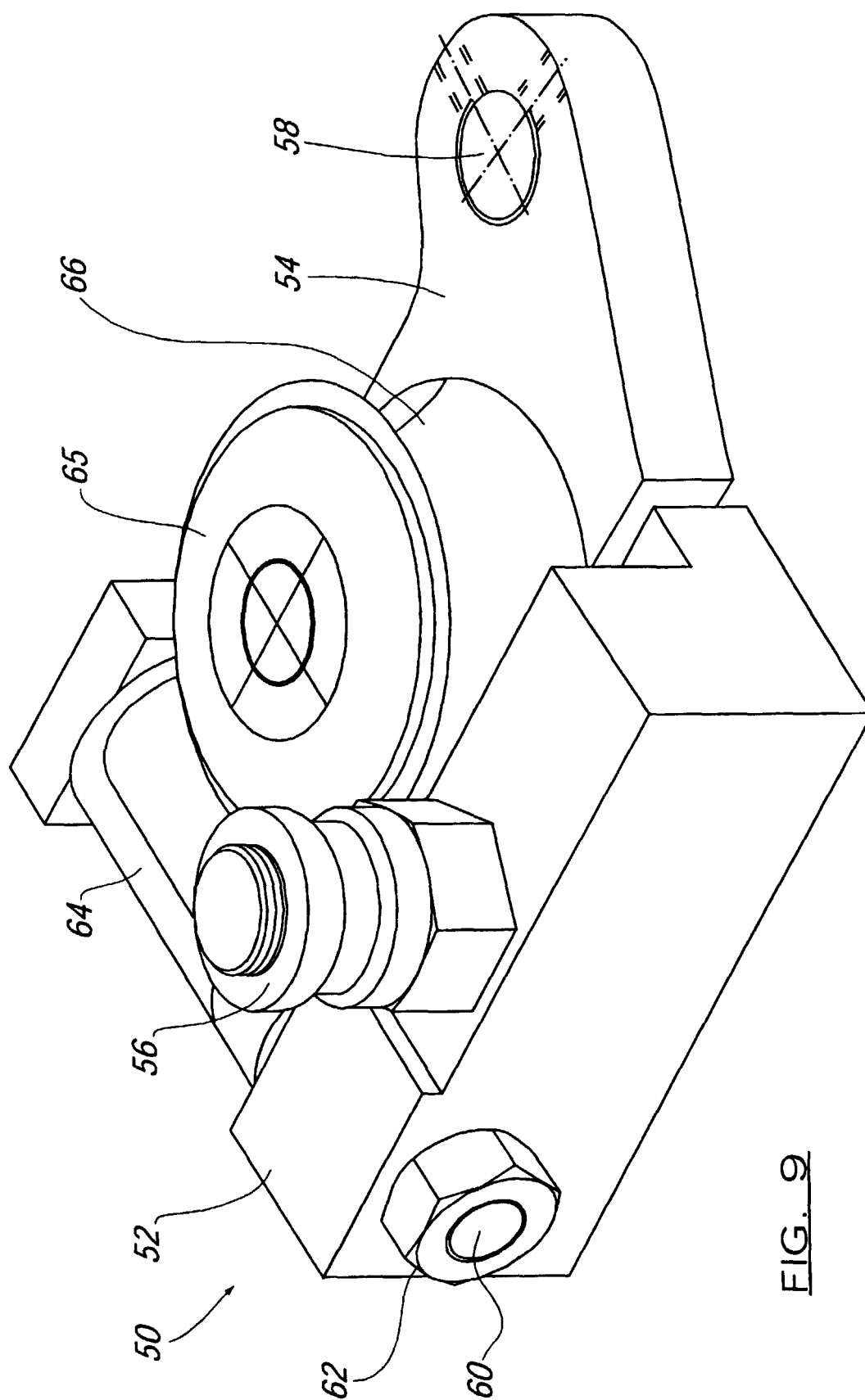


FIG. 8



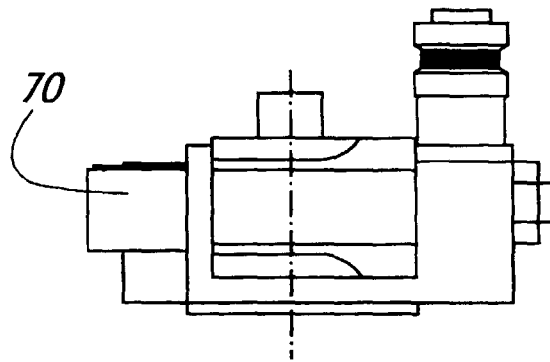


FIG. 11

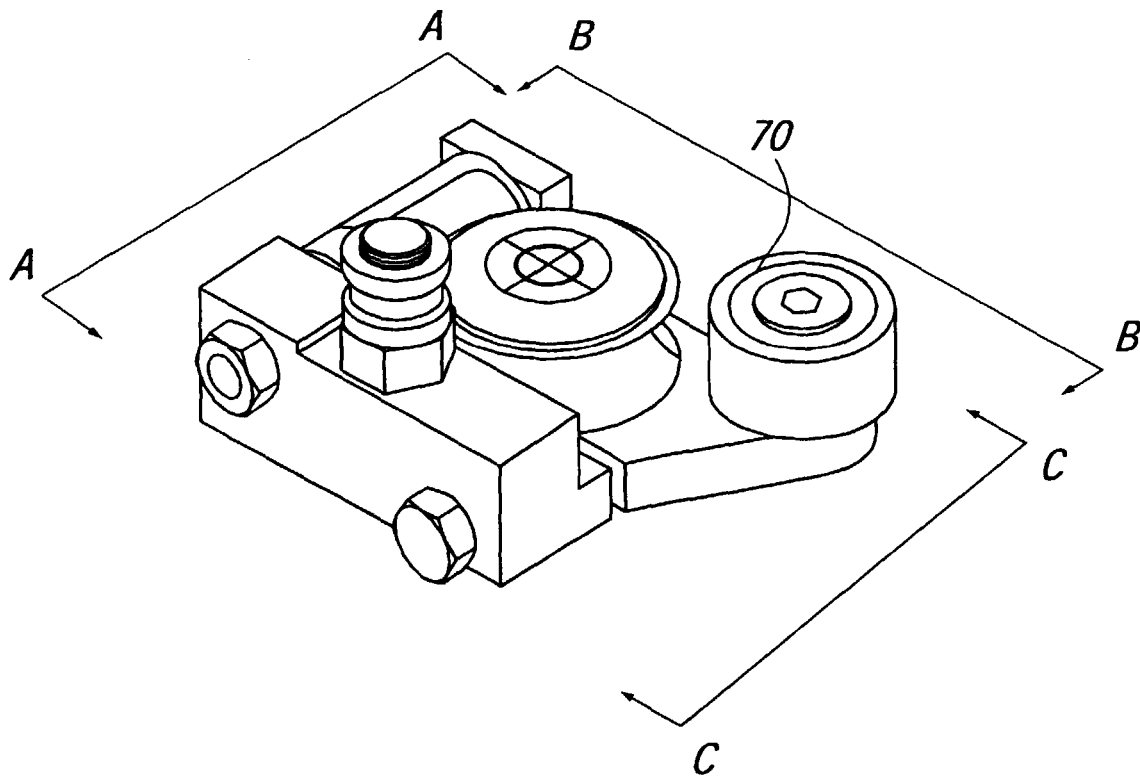


FIG. 1Q

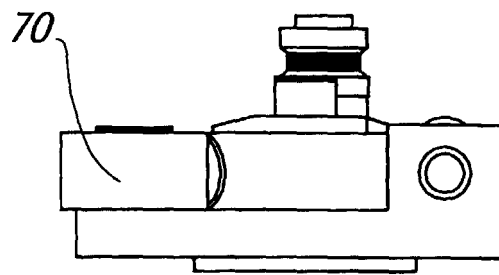


FIG. 1 2

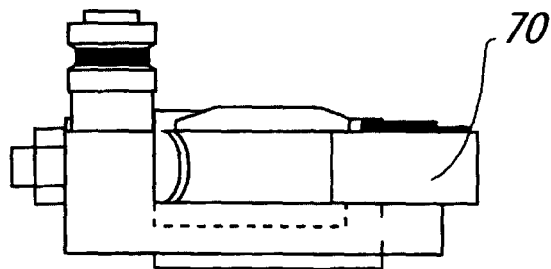


FIG. 1 3

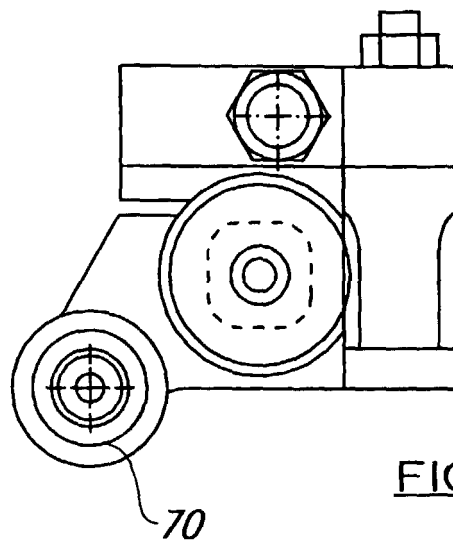


FIG. 1 4

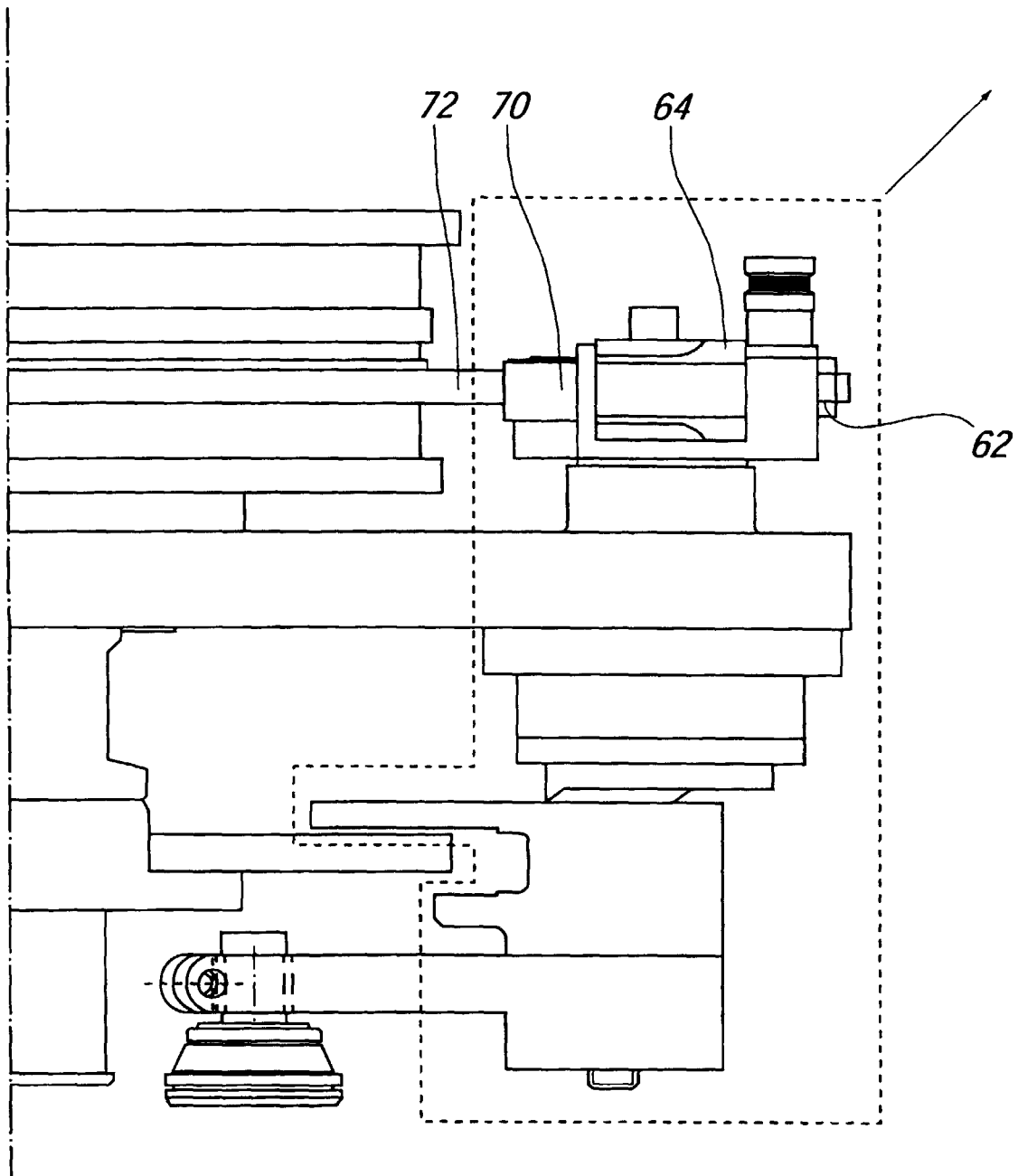


FIG. 15

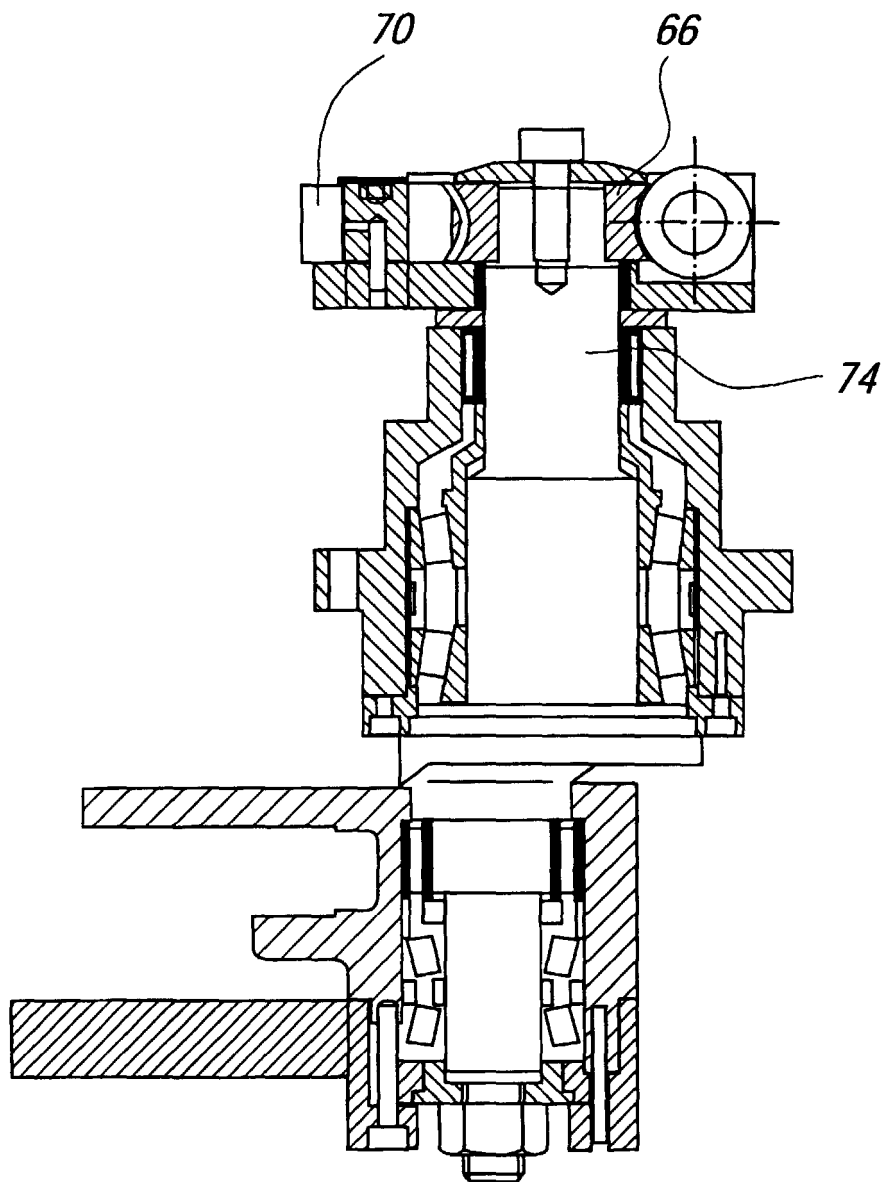


FIG. 16