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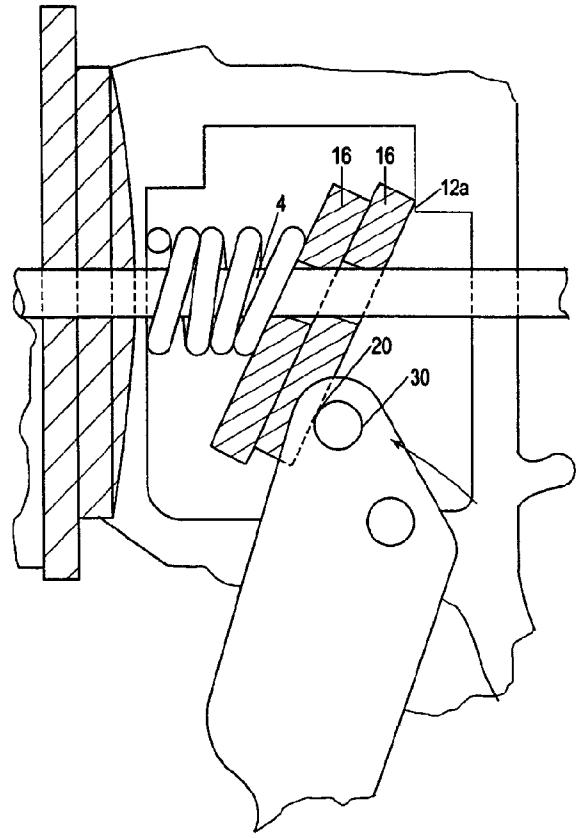
(54) Title: CARTRIDGE DISPENSING GUNS



(57) Abstract: A cartridge dispensing gun comprises a pusher mechanism for incrementally displacing a dispensing piston of the cartridge, said pusher mechanism comprising a pusher rod (4) incrementally advanced by actuation of a trigger to tilt and displace a gripper associated with the rod. The gripper is formed by two or more gripper plates (16) mounted in parallel, and each having a passage through which the rod passes. The passage in the gripper plate is bounded at one side of the gripper plate by an arc of part-circular shape to define a part-circular edge which grips the rod when the gripper plate is tilted upon actuation of the trigger and also by a surface which is inclined to the axis of the passage and which contacts the surface of the rod when the gripper plate is tilted to thereby restrict the extent to which the edge can penetrate into the rod and cause damaging scoring of the rod.

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CARTRIDGE DISPENSING GUNS

The present invention relates to cartridge dispensing guns for cartridges containing viscous material.

Disposable cartridges containing various viscous products such as adhesives and sealants are used in many industries. Conventionally the contents are expelled from the cartridge by means of a gun in which the cartridge is mounted and which acts against a piston mounted within the body of the cartridge to expel the contents through a dispensing aperture at a forward end of the cartridge. A dispensing gun for this purpose typically comprises a support to retain the cartridge and a piston pusher mechanism comprising a trigger operative to advance a piston pusher which extends into the cartridge to bear against the piston. The piston pusher is mounted at the forward end of a pusher rod which is incrementally advanced by repeated actuation of a trigger. In such a gun, the mechanism conventionally comprises a gripper member operative to grip the pusher rod to advance the rod upon actuation of the trigger, with the gripper member then releasing from gripping engagement while being retracted along the rod upon release of the trigger.

Conventionally, the gripper member comprises a plate formed with a circular hole through which the pusher rod passes. When the gripper member is tilted upon actuation of the trigger the gripper member grips the rod along a part of the edge of the hole and thereby advances the pusher rod. In practice it is found that the arc length over which gripping takes place is relatively small and the high contact pressure which arises over this arc length scores the rod and raises serration-like projections from the surface of the rod, and after a number of uses the gripper member can become caught or locked by these serrations with the result that it will not properly return along the rod when the trigger is released.

A gripper member which seeks to overcome this problem is disclosed in UK patent specification 2194989. As disclosed in this prior specification, the gripper member includes a cylindrical aperture through which the pusher rod passes, the edge of the

aperture being shaped to define an elliptical arc which grips the pusher rod over an increased arc length when the gripper member is tilted. Although the elliptical edge results in reduced contact pressure between the gripping edge and the rod, nevertheless scoring of the rod still takes place forming serrations on the rod and these serrations extend over an arc length corresponding to the increased arc of gripping and may still cause interference to the return movement of the gripper member over a period of time. In a practical application the elliptical gripping edge is formed by an arcuate indentation in the face of the gripper member and which intersects the edge of the cylindrical aperture, the gripper member with the cylindrical aperture and arcuate indentation being formed either by a sintering process or casting process. Both processes are relatively complicated and expensive.

According to the invention, there is provided a cartridge dispensing gun comprising a pusher mechanism for incrementally displacing a dispensing piston of the cartridge, said pusher mechanism comprising a pusher rod incrementally advanced by actuation of a trigger to tilt and displace a gripper associated with the rod, said gripper comprising a plurality of gripper plates mounted in parallel, each gripper plate having a passage through which the rod passes, the rod being at least partially of substantially circular cross-section, and the passage in the gripper plate being bounded at one side of the gripper plate by an arc of part-circular shape to define a part-circular edge which grips the rod when the gripper plate is tilted upon actuation of the trigger and also by a surface which is inclined to the axis of the passage and which contacts the surface of the rod when the gripper plate is tilted.

The contact between the said surface of the plate and the surface of the rod reduces the localised contact pressure between the gripping edge and the rod leading to reduced scoring of the rod, while the use of a plurality of gripper plates acting in parallel ensures even distribution of transmission force to the pusher rod.

Advantageously, said surface is a part-cylindrical surface which corresponds to the surface of the rod whereby the adjacent part of the rod is cradled by the said surface when

the plate is tilted or alternatively said surface is defined by a series of mutually inclined flats which similarly cradle the rod when the plate is inclined.

Advantageously, the plate comprises two such part-circular edges spaced by said surface.

Further according to the present invention, there is provided a gripper plate for use in a pusher mechanism of a cartridge dispensing gun to incrementally advance a pusher rod of the mechanism upon tilting of the plate and displacement of the plate in the longitudinal direction of the rod, said plate comprising a passage for receiving the rod, a gripping edge adjacent the passage and operative to grip the rod when the plate is tilted, and a surface adjacent the passage to contact an adjacent surface of the rod when the plate is tilted whereby to restrict the depth to which the gripping edge can penetrate into the surface of the rod.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

Figure 1 is a schematic side elevation of a cartridge dispensing gun in accordance with a preferred embodiment of the invention;

Figure 2 is a front elevation of a gripper plate of a gripper of the gun;

Figure 3 is a section taken on line A-A of Figure 2;

Figure 4 is an enlarged view showing a detail B of Figure 3;

Figure 5 is a perspective view of the plate;

Figure 6 is an enlarged schematic view showing the plates of the gripper prior to actuation of a trigger lever of the gun; and

Figure 7 is a view similar to Figure 6 but showing the gripper plates in gripping relationship with a pusher rod of the gun after actuation of the trigger lever.

As shown in the accompanying drawings a cartridge dispensing gun in accordance with the preferred embodiment of the invention comprises a cradle 2 in which the cartridge is mounted and a pusher mechanism for incrementally displacing a dispensing piston of the

cartridge. The pusher mechanism comprises a pusher rod 4 of circular cross-section incrementally advanced by actuation of a trigger lever 6 operable to tilt and displace a gripper 8 associated with the rod 4, this action occurring in opposition to the bias of a compression spring 10 acting on the gripper 8 in a sense to return the gripper 8 to a non-gripping position in which it is in a plane substantially at right angles to the axis of the rod 4. The trigger lever 6 is pivotally mounted on the handle structure 12 of the gun which also mounts a release latch 14 which frictionally engages the rod 4 in order to prevent rearwards movement of the rod during operation of the gun, the latch 14 being releasable against the bias of a compression spring 16 to facilitate manual retraction of the pusher rod 4 and permit removal of the cartridge from the cradle 2. The general construction and operation described thus far is substantially conventional.

In accordance with the present invention, the gripper comprises a number of gripper plates 16 mounted in parallel on the rod 4. As shown there are two gripper plates 16 although it is to be understood that there may be more than two gripper plates. The detailed construction of each of the gripper plates 16 is shown in Figures 2 to 5. Each gripper plate 16 is formed with a cylindrical aperture 18 defining a passage through which the rod 4 can pass in a slipping relationship when the plate 16 is in a plane at right angles to the axis of the rod 4. A stem part 20 of the gripper plate 16 beneath the aperture 18 is adapted to couple the gripper plate to the trigger lever 6 as will be described subsequently. When the plate 16 is tilted on actuation of the trigger lever 6, the plate 16 grips the pusher rod 4 by engagement of the lower part of the circular end edge of the aperture 18 at the forward side of the plate 16. This part-circular gripping edge is interrupted by an inwardly-inclined relief or chamfer 22 preferably positioned mid-way between the opposite ends of the parts of the arc along which the rod 4 is gripped whereby gripping takes place along two short, part-circular arcs 24 separated by the relief 22. In practice the arcs 24 may be about 25-45° (corresponding to an arc length of 1.5-3.0 mm for a nominal diameter of the pusher rod of 8.0 mm). The relief 22 provides a surface of part-cylindrical form of a corresponding diameter to that of the rod 4 and which contacts the surface of the rod 4 when the gripper plate 16 is tilted. The axis of this part-cylindrical surface 22 is inclined to the axis of the aperture 18 and, as shown, the inclination is substantially 30°

although it is to be understood that in practice the actual angle will depend on the detailed geometry of the mechanism.

As a result of this configuration, when the gripper plate 16 is tilted it engages the pusher rod 4 by means of the relatively short part-circular edge portions 24 at either side of the part-cylindrical relief surface 22 and also by means of the part-cylindrical relief surface itself. The part-cylindrical relief surface 22 thus provides a contact area which limits the contact pressure applied by the two part-circular edge portions 24 and also restricts the extent to which these edge portions can penetrate into the rod 4 to produce scoring and hence the formation of serrations on the surface of the rod.

At the rear face of the gripper plate 16, the rear edge of the aperture 18 is formed with a similar relief 22a diametrically opposed to that on the forward face in order to accommodate the tilting movement of the plate.

Due to the small arcs of gripping contact provided between the gripping edge of the gripper plate 16 and the rod 4 and also due to the reduced depth of penetration of the gripping edge into the rod 4, it is unlikely that a single gripper plate 16 of the form described will be able to impart sufficient forward thrust to the pusher rod without excessive scoring occurring to the pusher rod, particularly if the contents of the cartridge have a relatively high viscosity, and which would result in malfunctioning of the gun. Accordingly, two or more substantially identical plates 16 are mounted on the pusher rod 4 in order to act in parallel so that the gripping plates 16 act collectively on the rod 4 upon actuation of the trigger lever 6 with the gripping edges of the respective plates 16 separately gripping the rod 4.

The operation is illustrated in greater detail in Figures 6 and 7. Figure 6 shows the configuration of the two plates 16 prior to actuation of the trigger lever 6. As shown in this Figure, the two plates 16 lie side-by-side with the rear end of the compression spring 10 engaging the forward face of the forward plate and biasing the two plates rearwardly so that an upper part of the rear plate engages an abutment 12a on the handle structure 12. An

actuating cam 30 of roller-like form on the trigger lever 6 lies adjacent the rear face of the stem 20 of the rear plate 16. In this condition the planes of both plates 16 lie normal to the axis of the pusher rod 4 and hence neither plate is in gripping engagement with the rod. Figure 7 shows the condition after actuation of the trigger lever 6 in which the actuating cam 30 of the trigger lever 6 has moved forwardly to displace the stem 20 of the rear plate 16 forwardly and hence also the stem of the forward plate forwardly due to the direct engagement of the rearward plate with the forward plate, whereby the two plates incline as a result of the engagement of the upper end of the rear plate with the abutment 12a of the handle structure 12. The manner in which both plates 16 separately grip the rod 4 during this action will be apparent from Figure 7. It is to be noted that the spring 10 in addition to providing the bias required for operation of the gripper 8, maintains in contact the two or more plates 16 forming the gripper and ensures that they move in unison. Due to the geometry of the system just described, when the two plates 16 are tilted, slippage will occur between the two plates in the plane of the contacting faces of the plates, this slippage being clearly illustrated in Figure 7. To facilitate smooth operation, a lubricant may be applied between the contacting faces of the two plates 16. This may readily be achieved by applying a permanent lubricating coating of, for example, PTFE as sold under the trade mark TEFLON. To increase the distribution of the gripping force provided between the gripper 8 and the rod 4, all that is necessary is to mount one or more further plates 16 on the rod 4 between the compression spring 10 and the abutment 12a on the handle structure 12.

It is to be noted that although some scoring of the rod 4 may still arise due to the interaction between the gripping edge portions 24 of the gripping plates 16 and the rod 4, such scoring as may arise will occur over a relatively small arc length and will be of limited depth due to the action of the part-cylindrical relief surfaces 22, and as a result the serrations which arise due to the scoring will themselves be of limited arc length and of limited height insufficient to inhibit the proper operation of the mechanism.

In the embodiment just described the relief 22 provides a surface of part-cylindrical form in which the adjacent part of the pusher rod is cradled when the gripper plate is tilted.

In an alternative form the relief is provided by a series of mutually-inclined flat zones which similarly define a cradle for the adjacent part of the rod when the plate is tilted.

Instead of incorporating at the rear face of the plate a relief diametrically-opposed to that on the forward face in order to accommodate the necessary tilting, the edge of the aperture at the rear face can be chamfered around its entire periphery to achieve the same effect.

The plates 16 can be formed inexpensively by a relatively simple stamping operation using carbon steel followed by an appropriate heat treatment.

The embodiment has been described by way of example only and modifications are possible within the scope of the invention.

Throughout this specification and claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers or steps but not the exclusion of any other integer or group of integers.

CLAIMS:-

1. A cartridge dispensing gun comprising a pusher mechanism for incrementally displacing a dispensing piston of the cartridge, said pusher mechanism comprising a pusher rod incrementally advanced by actuation of a trigger to tilt and displace a gripper associated with the rod, the rod being at least partially of substantially circular cross-section, said gripper comprising a plurality of gripper plates mounted in parallel, each gripper plate having a passage through which the rod passes, the passage in the gripper plate being bounded at one side of the gripper plate by an arc of part-circular shape to define a part-circular edge which grips the rod when the gripper plate is tilted upon actuation of the trigger and also by a surface which is inclined to the axis of the passage and which contacts the surface of the rod when the gripper plate is tilted.

2. A cartridge dispensing gun according to claim 1, wherein said surface is a part-cylindrical surface which corresponds to the surface of the rod whereby the adjacent part of the rod is cradled by the said surface when the plate is tilted.

3. A cartridge dispensing gun according to claim 1, wherein said surface is defined by a series of mutually inclined flats whereby the adjacent part of the rod is cradled by said surface.

4. A cartridge dispensing gun according to any one of claims 1 to 3, wherein each said plate has two such part-circular edges spaced by said surface.

5. A cartridge dispensing gun according to any one of claims 1 to 4, wherein the plates are mounted in face-to-face contact and a permanent lubricating coating is applied to at least one of said contacting faces to facilitate slippage between the contacting faces when the plates are tilted.

6. A gripper plate for use in a pusher mechanism of a cartridge dispensing gun to incrementally advance a pusher rod of the mechanism upon tilting of the plate and

displacement of the plate in the longitudinal direction of the rod, said plate comprising a passage for receiving the rod, a gripping edge adjacent the passage and operative to grip the rod when the plate is tilted, and a surface adjacent the passage to contact an adjacent surface of the rod when the plate is tilted whereby to restrict the depth to which the gripping edge can penetrate into the surface of the rod.

7. A gripper plate according to claim 6 for use in a pusher mechanism having a pusher rod of substantially circular cross-section, wherein the said surface of the plate is of substantially part-cylindrical form of a diameter corresponding to that of the pusher rod.

8. A gripper plate according to claim 6 or claim 7, wherein the gripping edge extends over two arcs separated by the said surface of the plate.

9. A gripper plate according to any one of claims 6 to 8, wherein the plate is stamped from carbon steel and then heat treated.

10. A gripper plate according to any one of claims 6 to 9, wherein at least one surface of the plate has a lubricant coating to permit slippage between two like gripper plates operating in parallel on the pusher rod.

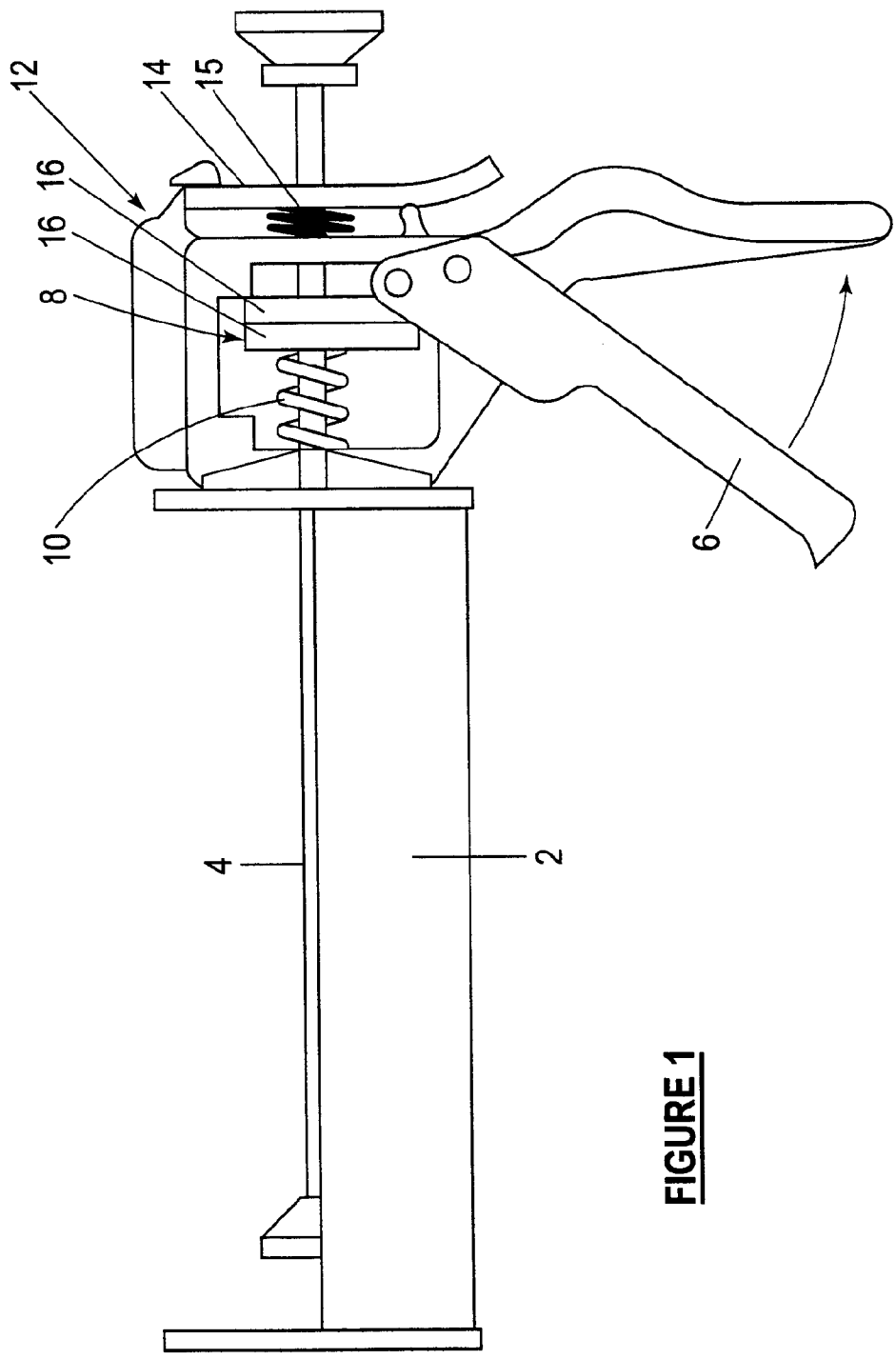

FIGURE 1

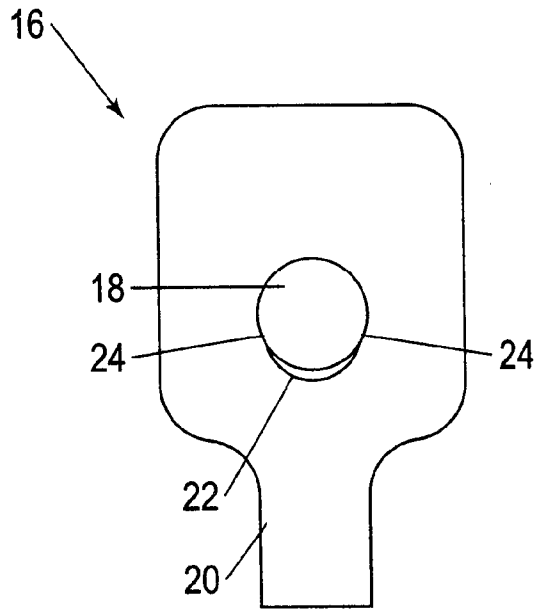

FIGURE 2

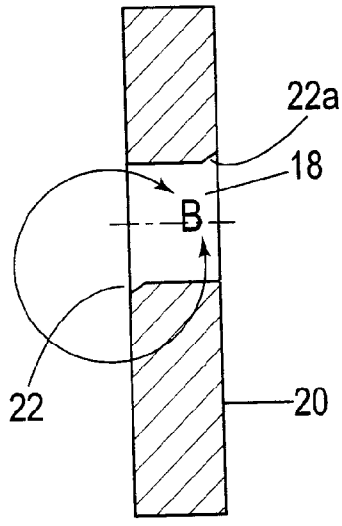

FIGURE 3

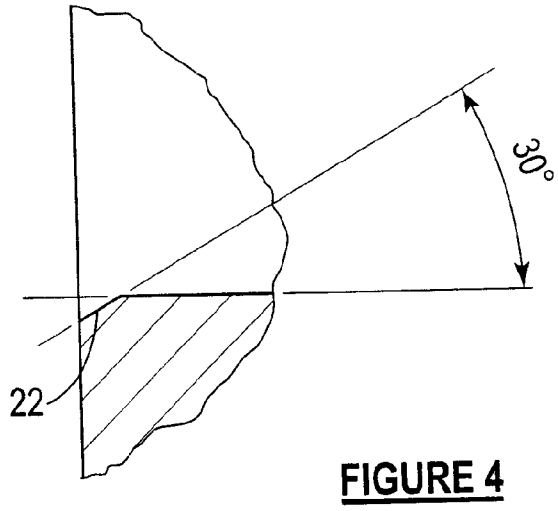

FIGURE 4

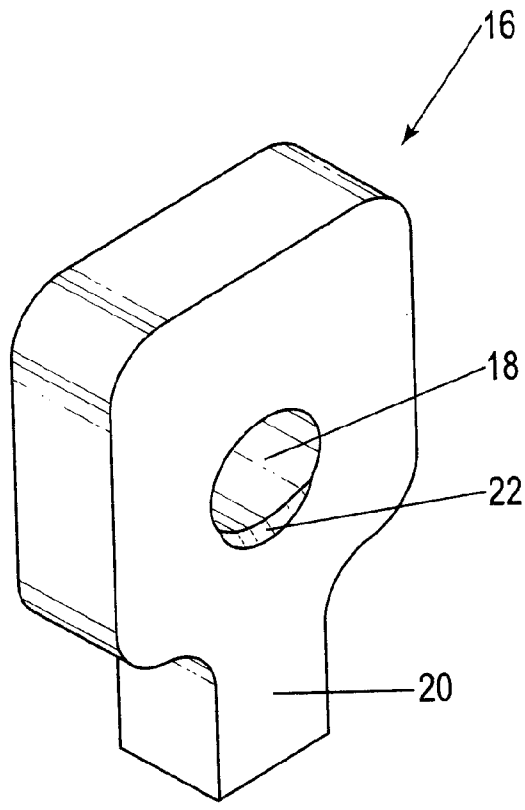

FIGURE 5

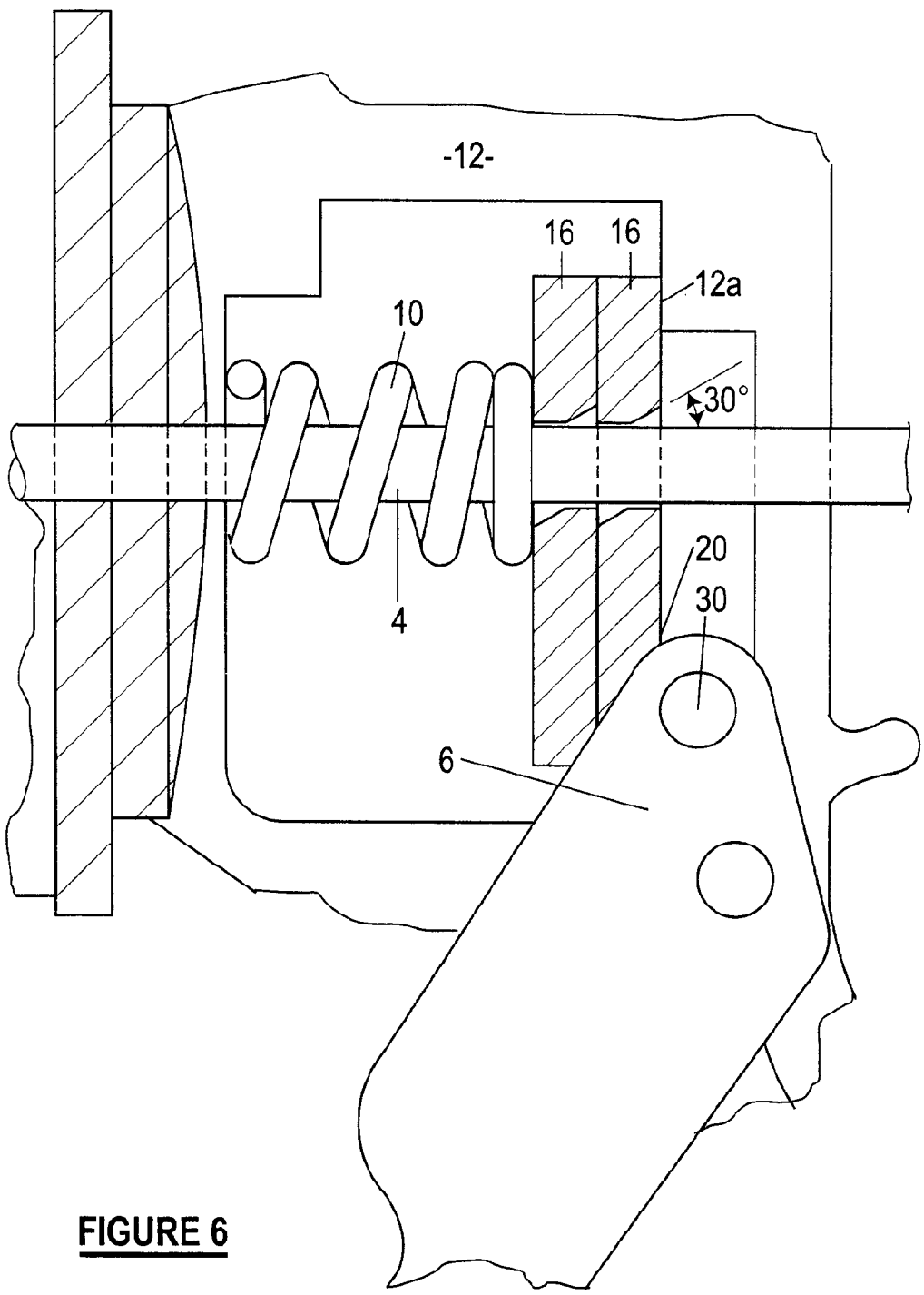

FIGURE 6

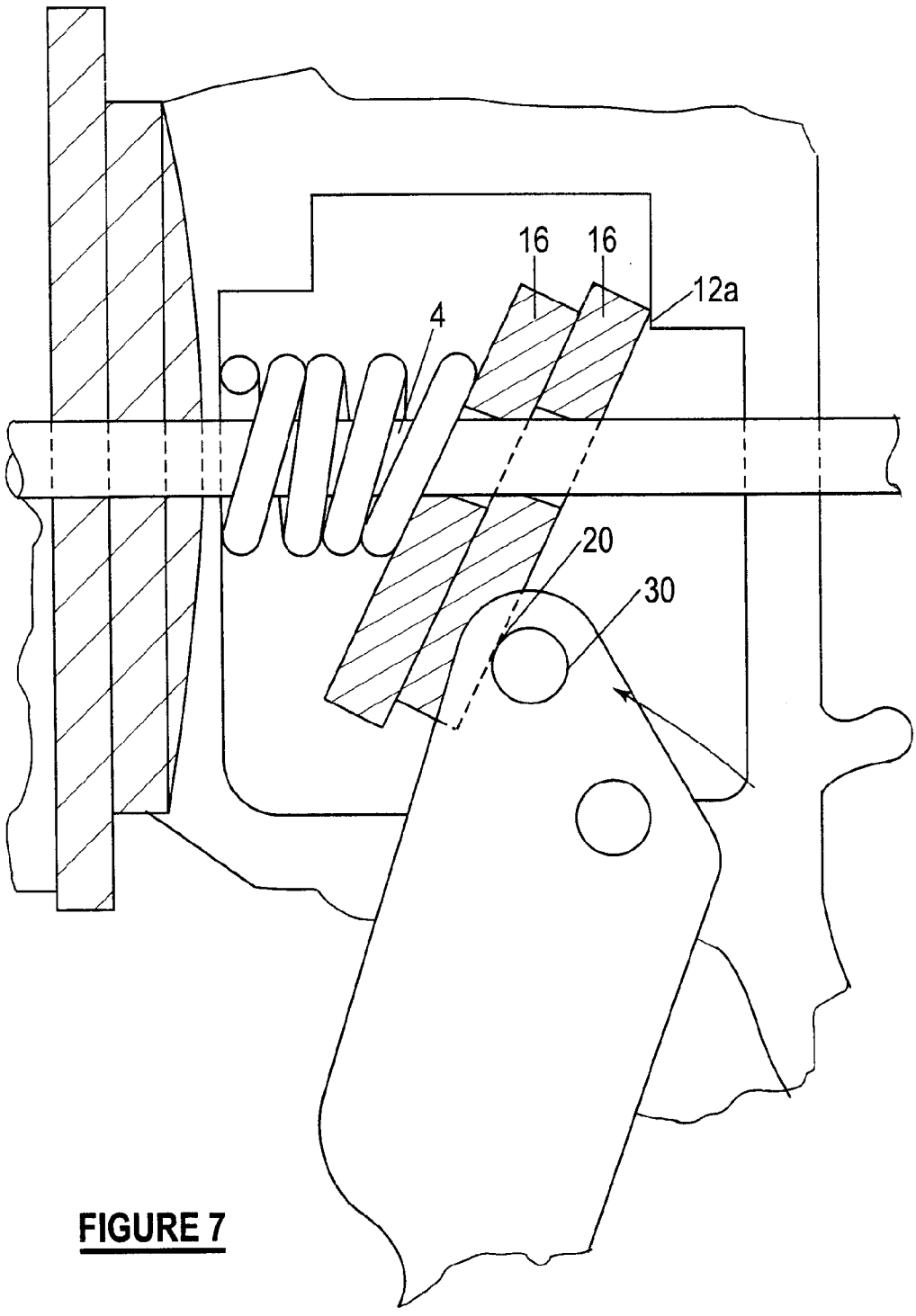

FIGURE 7