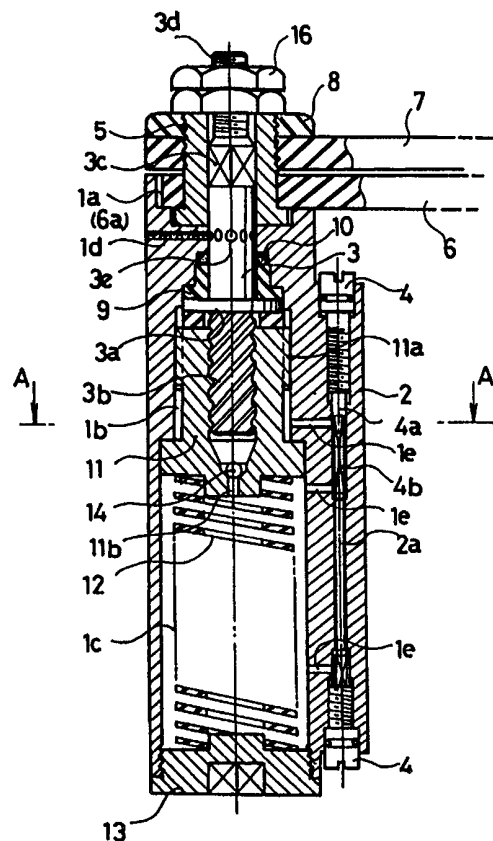


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(54) Title: HINGE TYPE AUTOMATIC DOOR CLOSER**(57) Abstract**

A hinge type automatic door closer has a cylindrical housing mounted on a door via a door mounting plate, a hinge shaft mounted on a door frame via a door-frame mounting plate. The hinge shaft is inserted within the cylindrical housing. The door closer has a piston engaged around the hinge shaft movable vertically locked to the housing in its rotational movement. When the housing rotates, the piston is moved up and down depending upon a rotational direction of the housing.



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HINGE TYPE AUTOMATIC DOOR CLOSER

Field of the Invention

5 The present invention relates to an automatic door closer; and, more particularly, to a hinge type automatic door closer employing a hydraulic mechanism to increase an efficiency in closing and opening a door and to provide a user with a convenience.

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Description of the Prior Art

Generally, a conventional hinge type automatic door closer for automatically closing a door is provided with a
15 coil spring whose resilient force determines a closing speed and a latching speed of the door. In the automatic door closer, however, a certain lever or the like connected to the coil spring is normally used to adjust the closing and the latching speed of the door, causing the whole door
20 closer to be bulky, since it is not easy to change a modulus of elasticity of the coil spring. To avoid this problem, various types of door closers have been proposed.

There is shown in Fig. 1 Korean Patent Application No. 97-7637 entitled "a hinge for a door". As shown, the hinge
25 comprises a housing 500 mounted on a door 1, a driving member 400 positioned above a stroke control part integrally formed with an inner surface of an inner hollow portion of the housing 500 and a buffer unit 600, a hinge

shaft 300 positioned within the inner hollow portion of the housing on the driving member 400 and fixed to a door frame 2, and a slider 700 fitted into the stroke control part to move up and down. The slider 700 is movable up and down
5 along the hinge shaft 300 via a thread-engagement with the hinge shaft 300. When the slider 700 moves down, it compresses a spring thereunder. The buffer unit 600 which serves to avoid slamming shock when the door 1 is closed uses an air pressure generated by a restoring force of the
10 spring under the slider 700.

While the above prior art door closer is capable of performing its assigned task, needs have continued to exist for an enhanced door closer. Particularly, since the buffer unit has numerous components mechanically combined
15 with one another, it is cumbersome to manufacture and assemble those components into a unit. Further, the air pressure does not fully avoid slamming due to a spacial limitation within the housing. Furthermore, according to a construction of the buffer unit, it is difficult to adjust
20 the buffering force thereof.

Summary of the Invention

It is, therefore, a primary object of the invention to
25 provide a hinge type automatic door closer designed to use a hydraulic mechanism in stead of the mechanical buffer unit employed in the prior art, which enables to avoid slamming and makes it easy to adjust the buffering force, thereby

increasing an efficiency in closing and opening a door and providing a user with a convenience.

The above and other objects of the invention are accomplished by providing a hinge type automatic door closer comprising: a housing of a cylindrical shape having an oil pressure control body integrally formed therewith at its one side; a connector having a cap-shaped configuration and engaged around a top of the housing; a door mounting plate mounted on a top end surface of a door and being
10 combined with the housing; a door-frame mounting plate mounted on a door-frame and engaged around the connector by using a thread and fixed to the connector by a nut; a hinge shaft rotatably mounted within the housing and fixed to the door-frame through the connector; a piston engaged with the
15 hinge shaft, being moved up and down within a cylinder chamber charged with fluid, and functioning as a check valve; a spring positioned under the piston to exert a restoring force for moving the piston up; and a pair of control valves for controlling flows of fluid through three
20 passage ways and a passage way formed through the oil pressure control body.

Brief Description of the Drawings

25 The above and other objects and features of the instant invention will become apparent from the following description of preferred embodiments taken in conjunction with the accompanying drawings, in which:

Fig. 1 illustrates a sectional view of a prior art hinge type automatic door closer;

Fig. 2 offers an exploded perspective view of a hinge type automatic door closer in accordance with the present invention;

Fig. 3 depicts a sectional view of the inventive hinge type automatic door closer;

Fig. 4 shows a sectional view of the inventive hinge type automatic door closer shown in Fig. 3, when taken along a line A-A;

Fig. 5 sets forth a partial sectional view of a control rod of the inventive hinge type automatic door closer;

Fig. 6 describes a perspective view of an application of the inventive hinge type automatic door closer to a door;

Fig. 7 presents a sectional view of the inventive hinge type automatic door closer; and

Figs. 8 and 9 represent sectional views of modifications of the present invention.

Detailed Description of the Preferred Embodiments

A preferred embodiment of an inventive hinge type automatic door closer is now described with reference to Figs. 2 through 9.

Figs. 2 illustrates an exploded perspective view of the present invention. As shown, the inventive hinge type automatic door closer includes a housing 1 of a cylindrical

shape having an oil pressure control body 2 integrally formed therewith at its one side, a semi circular wall protruding from a top of the housing 1 and provided with an internal spline gear 1a on an inner surface thereof. A
5 hinge shaft 3 is rotatably mounted within the housing 1. The inventive hinge type automatic door closer further includes a connector 5 having a flange 5a at its lower end, a thread 5b formed at its flank portion, and a hexagonal hole 5c formed through the connector 5 into which an upper
10 portion of the housing 1 is inserted. The inventive door closer further includes a door mounting plate 6 mounted on a top end surface of a door 20 and having a spline gear 6a formed around a protruding portion, and a door-frame mounting plate 7 mounted on a door frame 30 and engaged
15 around the connector 5 by using a thread and fixed to the connector 5 by a nut 8.

Fig. 3 is a sectional view of the housing 1. As shown, the hinge shaft 3 is rotatably mounted within the housing 1. The hinge shaft 3 includes a helical shaft 3b
20 formed under a shaft flange 3a positioned on a middle portion, a hexagonal portion 3c formed on a lower portion and having a hexagonal cross section fitted into the hexagonal hole 5c of the connector 5, and a thread 3d formed on a top portion and engaged into a nut 16. A bushing 9 and
25 a packing 10 are installed on an upper surface of the hinge shaft 3 which contacts the housing 1.

A piston 11 is engaged with the helical shaft 3b and is moved up and down within a cylinder chamber 1c charged

with fluid, depending upon a rotational direction of the helical shaft 3b, since a key 11a retained between an external surface of the piston 11 and a key seat 1b formed on an inner surface of the housing 1. A center passage way 11b through which the fluid enters an inside of the piston 11 when the piston 11 moves down is formed through a lower end of the piston 11. In order to prevent a reversed flow of the fluid into the cylinder chamber 1c through the center passage way 11b when the piston 11 moves up, a ball 14 is retained above the center passage way 11b for a function of a check valve. Retained under the piston 11 is a spring 12 for exerting an elastic force. A cap 13 is engaged with a lower end of the housing 1.

It is preferable that a helix angle of the helical shaft 3b be as large as possible.

A plurality of grooves 3e are formed along a peripheral surface of the hinge shaft 3; and a bolt is retained through a threaded hole 1d which is so positioned and arranged through the housing 1 as to allow the bolt to match the grooves 3e, in order to fix the hinge shaft 3 with respect to the housing 1.

A passage way 2a is formed through the oil pressure control body 2 integrally formed with the housing 1. Three passage ways 1e are formed through the housing to allow an inside of the housing 1 to communicate with the passage way 2a. Two of them are positioned on an upside and a downside about a lower plate of the piston 11 staying in a top dead center, respectively; and rest is positioned on a lower

portion of the housing 1. A pair of control valves 4 are mounted on an upper portion and a lower portion of the oil pressure control body 2, respectively, to control fluid flow through the passage ways 1e.

5 Referring to Figs. 4 and 5, controlling the flows through the passage ways 1e is performed by rotating the adjusting rod 4a of the control valve 4 within the passage way 2a. That is, the adjusting rod 4a has a vertical flat surface 4b which defines a certain space for allowing the
10 fluid to flow therethrough within the passage way 2a along the same 2a.

Referring to Figs. 6 and 7, the inventive hinge type automatic door closer constructed in this manner is assembled as follows:

15 First, the mounting plates 6 and 7 are mounted and fixed to the door 20 and the door-frame 30, respectively. Next, the connector 5 is engaged through the mounting plates 6 and 7 and then the nut 8 is engaged around the connector 5. Next, the hinge shaft 3 protruding from the
20 housing 1 is inserted into the connector 5. During this process, the internal spline gear 1a and the spline gear 6a are engaged with each other. Finally, a nut 16 is engaged with the thread of the hinge shaft 3.

It is preferable that the piston 11 be lowered at
25 predetermined distance from its top dead center before the insertion of the hinge shaft into the connector 5. This can be done by rotating the hinge shaft 3 by a predetermined angle or turn to lower the piston 11 and then retaining the

bolt through the threaded hole 1d into one of the grooves 3e, allowing the hinge shaft 3 to be locked with respect to the housing 1. When the bolt is released from the groove 3e after all the assembling processes are completed, the door 5 20 remains closely contacted to the door-frame 30 by a restoring force by the spring 12 depressed by the piston 11.

In the inventive hinge type automatic door closer assembled in this manner, when an operator opens the door 20, the hinge shaft 3 is not rotated since it is fixed to 10 the door-frame 30 through the connector 5 and the door-frame mounting plate 7, whereas the housing 1 is rotated since it is fixed to the door 20 through the internal spline gear 1a and the door mounting plate 6. At the moment, the piston 11 locked to the housing in the 15 rotational movement by the key 1b rotates around the helical shaft 3b to be lowered, depressing the fluid and the spring 12. That is, the operator opens the door 20 against a proper force, i.e., the force depressing the spring 12 and the fluid.

20 When the piston 11 is lowered, the fluid within the cylinder chamber 1c is introduced into the space within the piston 11 through the center passage way 11b. The fluid introduced into the piston 11 is then introduced into the upper two passage ways 1e and then the passage way 2a 25 through various gaps, e.g., a gap between the helical shaft 3b and the inner surface of the piston 11. At the moment, the opening speed of the door 20 can be adjusted by rotating the adjusting rod 4a to control the cross section area for

the flow of the fluid within the passage way 2a.

When the operator closes the door 20, a reversed rotation of the housing 1 moves up the piston 11, allowing the spring 12 to be restored. The piston 11 slowly moves up, since the center passage way 11b is blocked off by the ball 14 and the fluid charging the inside or the outside of the upper portion of the piston 11 can flow through only the passage way 2a. As a result, the door 20 is slowly and constantly closed. With a similar manner to that in the door opening process, the closing speed of the door 20 can be adjusted.

At the time when the piston 11 arrives at the top dead center, the piston blocks the passage way 1e of the middle one of three passage ways 1e. As a result, the door being closed slowly and constantly is more slowly rotated, since it becomes more difficult for the fluid to be introduced into the passage way 2a. This is needed to reduce a shock or noise which may occurs when the door 20 is contacted to the door-frame 30. In this construction, the door 20 is first closed in a predetermined constant rotational speed and then is decelerated right before it is contacted to the door-frame 30.

Fig. 8 gives a modification of the present invention. As shown, contact between the hinge shaft 3 and the piston 11 is achieved through helical sliding surfaces 31 and 111 which are formed on a lower end of the hinge shaft 3 and an upper surface of the piston 11, respectively, and are fitted into each other. In this modification, when the

housing 1 is rotated, the piston 11 is lowered, with its helical sliding surface 111 being misaligned with the helical sliding surface 31. Remainder components except the hinge shaft and the piston are identical to those in the foregoing embodiment.

Fig. 9 presents another modification of the present invention. As shown, contact between the hinge shaft 3 and the piston 11 is achieved through slanted sliding surfaces 32 and 112 which are formed on a lower end of the hinge shaft 3 and an upper surface of the piston 11, respectively, and are fitted into each other. In this modification, when the housing 1 is rotated, the piston 11 is lowered, with its slanted sliding surface 112 sliding on the slanted sliding surface 32. Remainder components except the hinge shaft and the piston are identical to those in the foregoing embodiment.

On the other hand, though the housing 1 is designed to protrude out of the door 20 on a purpose of allowing the housing to be applicable to the established doors, it is possible that the housing is hidden from an outside view, when it is applied to a new door being manufactured.

In accordance with the present invention constructed in this manner, since the piston is adapted to vertically move under a proper pressure by the fluid, a proper closing and latching speed of the door is obtained. Further, the present invention permits an easy adjustment of the closing and latching speed through only a simple operation. Furthermore, the inventive door closer can be easily

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applied to the established doors without entailing a serious degradation of overall appearance; and can be mounted within a minimized space.

Although the invention has been shown and described
5 with respect to the preferred embodiments, it will be understood by those skilled in the art that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the following claims.

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What is claimed is:

1. A hinge type automatic door closer comprising:
 - a housing of a cylindrical shape having an oil
5 pressure control body integrally formed therewith at its
one side;
 - a connector having a cap-shaped configuration and
engaged around a top of the housing;
 - a door mounting plate mounted on a top end surface of
10 a door and being combined with the housing;
 - a door-frame mounting plate mounted on a door-frame
and engaged around the connector by using a thread and fixed
to the connector by a nut;
 - a hinge shaft rotatably mounted within the housing and
15 fixed to the door-frame through the connector;
 - a piston engaged with the hinge shaft, being moved up
and down within a cylinder chamber charged with fluid, and
functioning as a check valve;
 - a spring positioned under the piston to exert a
20 restoring force for moving the piston up; and
 - a pair of control valves for controlling flows of
fluid through three passage ways and a passage way formed
through the oil pressure control body.
- 25 2. The hinge type automatic door closer of claim 1,
wherein a semi circular wall provided with an internal
spline gear on an inner surface thereof protrudes from a top
of the housing and the door mounting plate fixed on a door

has a spline gear.

3. The hinge type automatic door closer of claim 1,
wherein said piston is moved up and down depending upon a
5 rotational direction in such a manner that said piston and a
helical shaft formed under the hinge shaft are meshed
through a helical engagement therebetween.

4. The hinge type automatic door closer of claim 1,
10 wherein a plurality of grooves are formed along a
peripheral surface of the hinge shaft and a bolt is retained
through a threaded hole which is so positioned and arranged
through the housing as to match the grooves, in order to fix
the hinge shaft with respect to the housing.

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5. The hinge type automatic door closer of claim 1,
wherein said control valve includes an adjusting rod having
a vertical flat surface which defines a space for allowing
20 the fluid to flow therethrough within the passage way
formed through the oil pressure control body.

6. The hinge type automatic door closer of claim 1,
wherein a contact between the hinge shaft and the piston is
25 achieved through helical sliding surfaces which are formed
on a lower end of the hinge shaft and an upper surface of
the piston, respectively, and are fitted into each other.

7. The hinge type automatic door closer of claim 1,
wherein contact between the hinge shaft and the piston is
achieved through slanted sliding surfaces which are formed
on a lower end of the hinge shaft and an upper surface of
5 the piston, respectively, and are fitted into each other

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FIG. 1

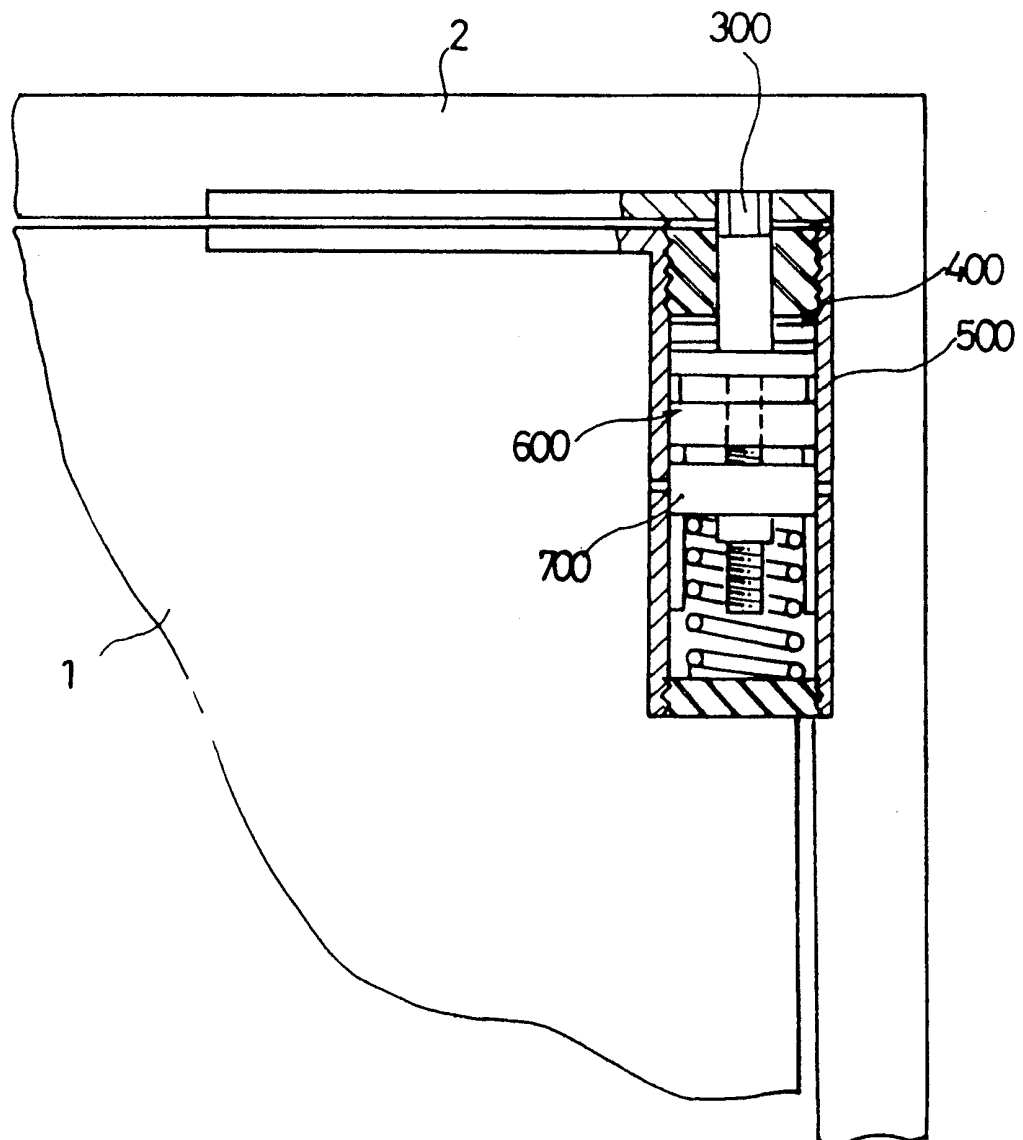


FIG. 2

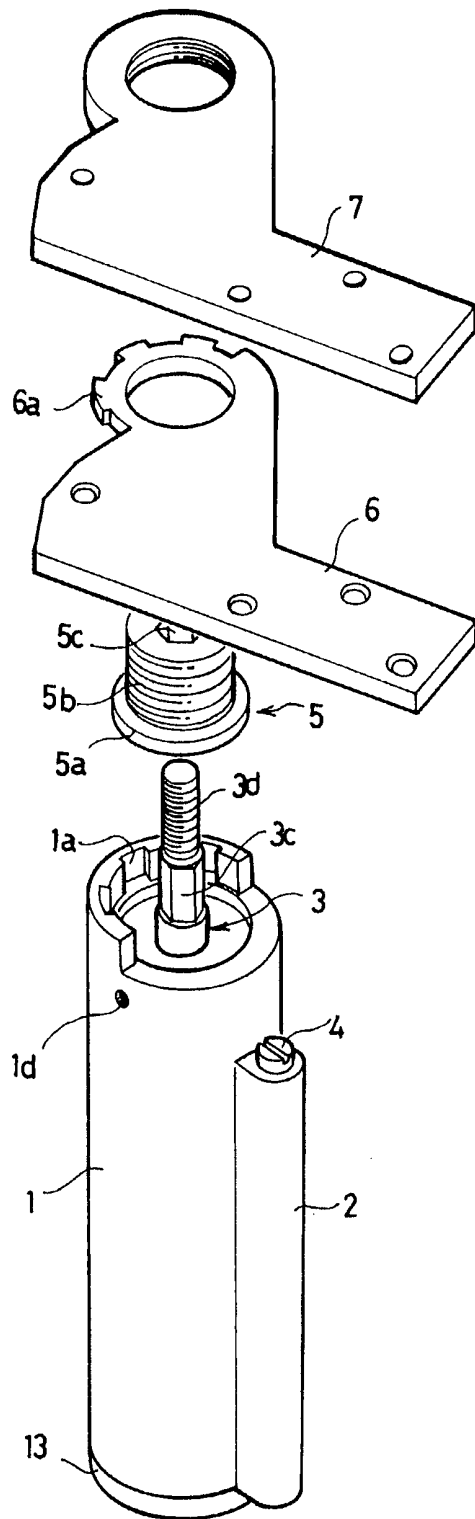


FIG. 3

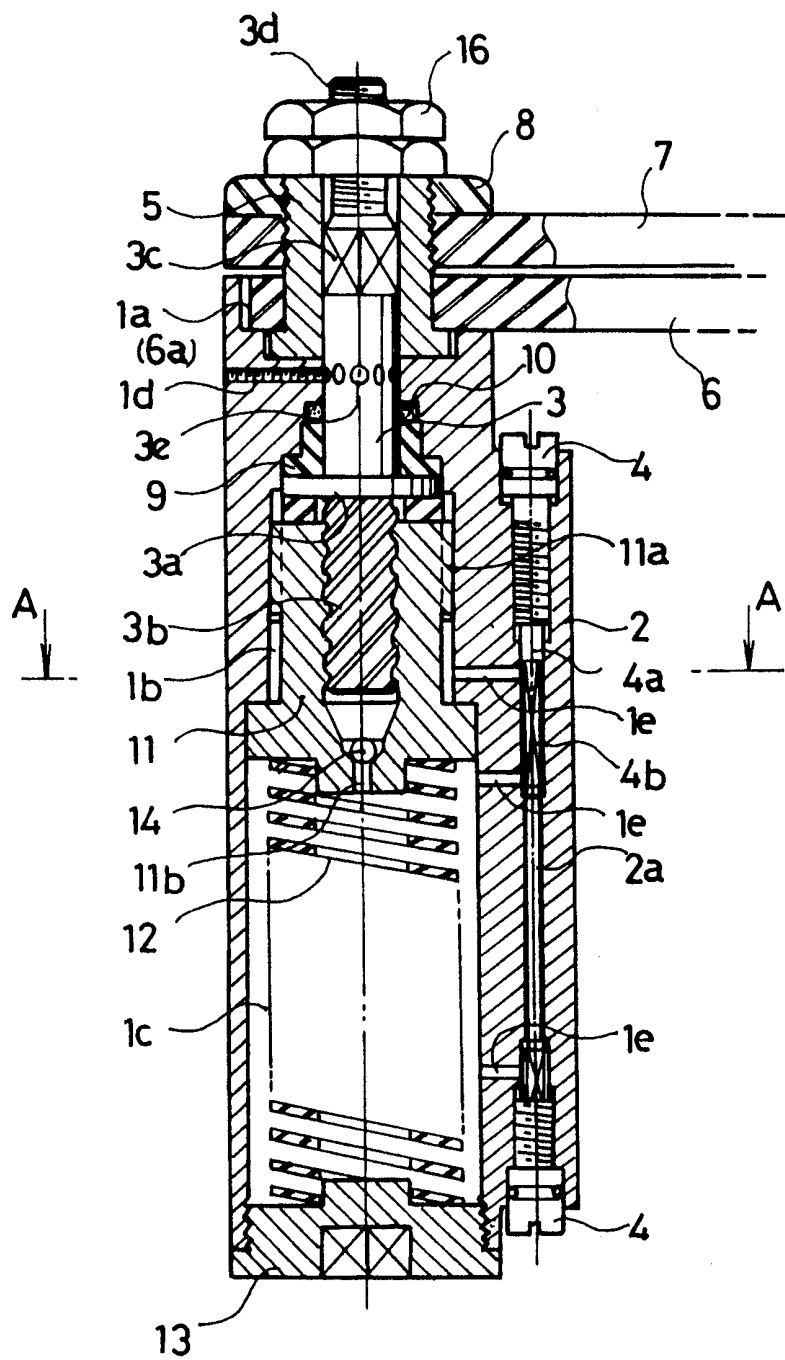


FIG. 4

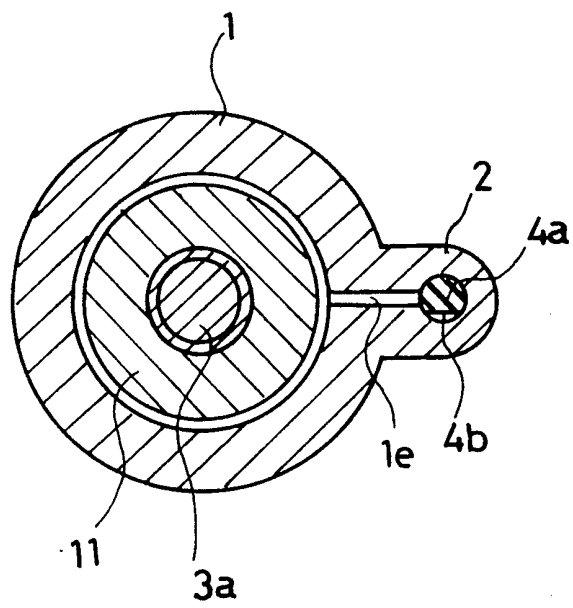


FIG. 5

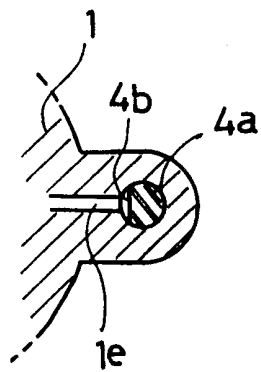


FIG. 6

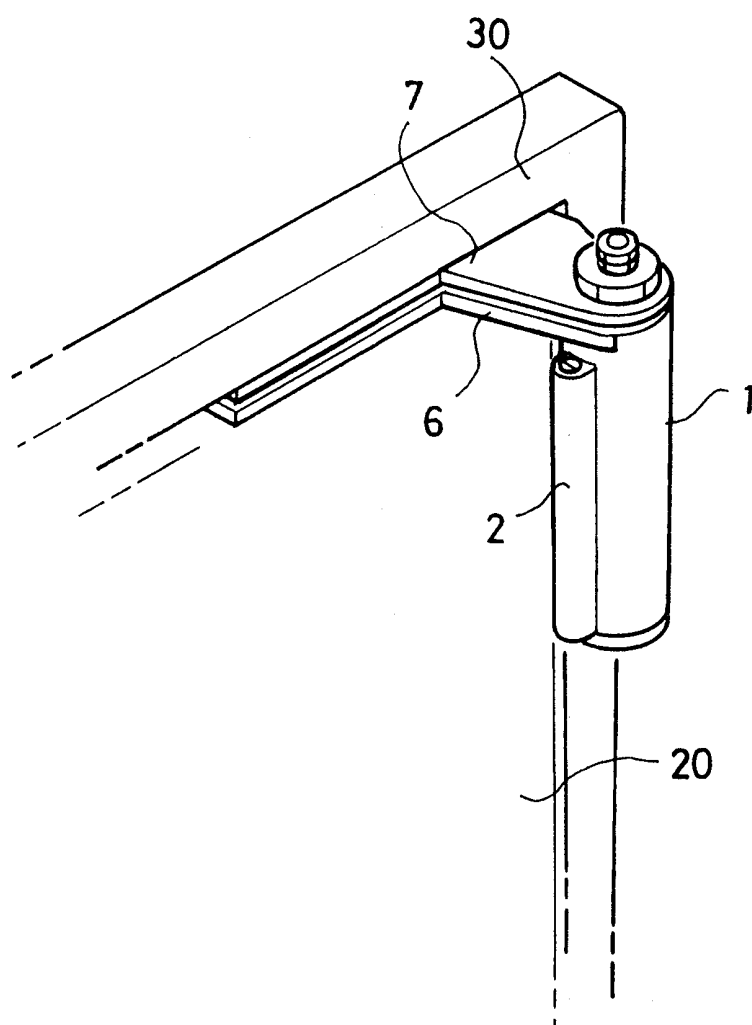


FIG. 7

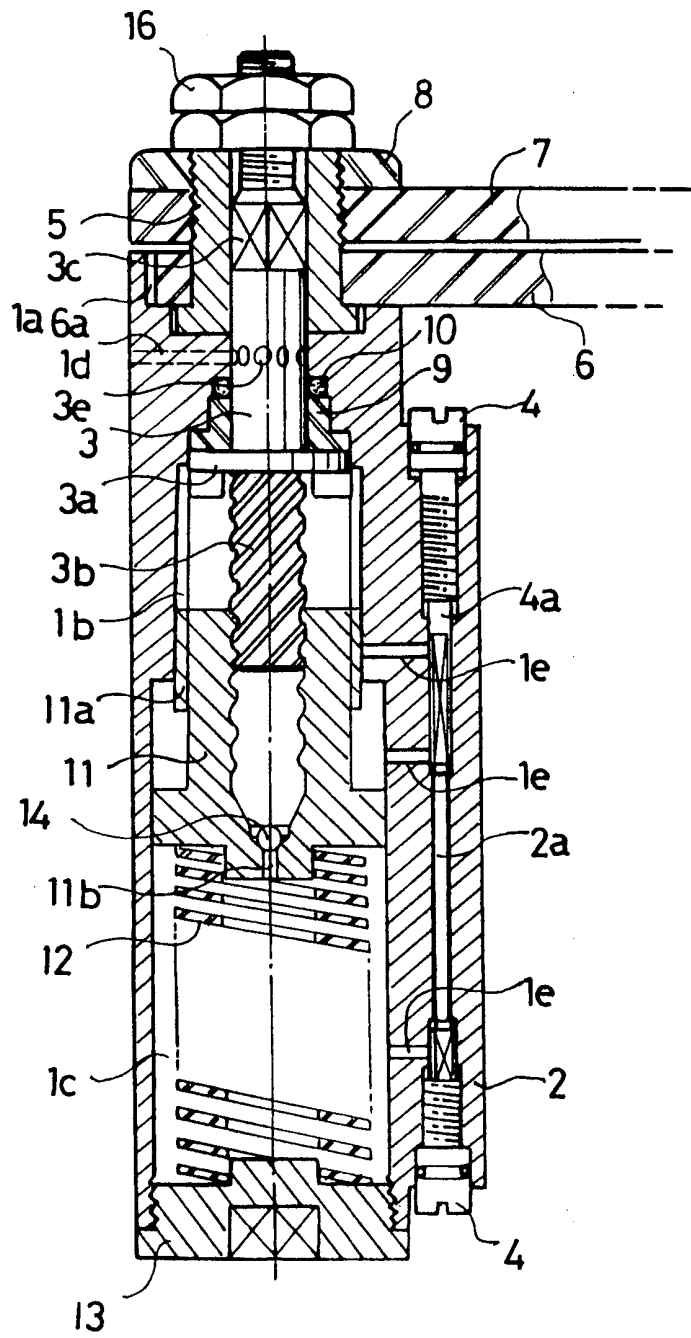


FIG. 8

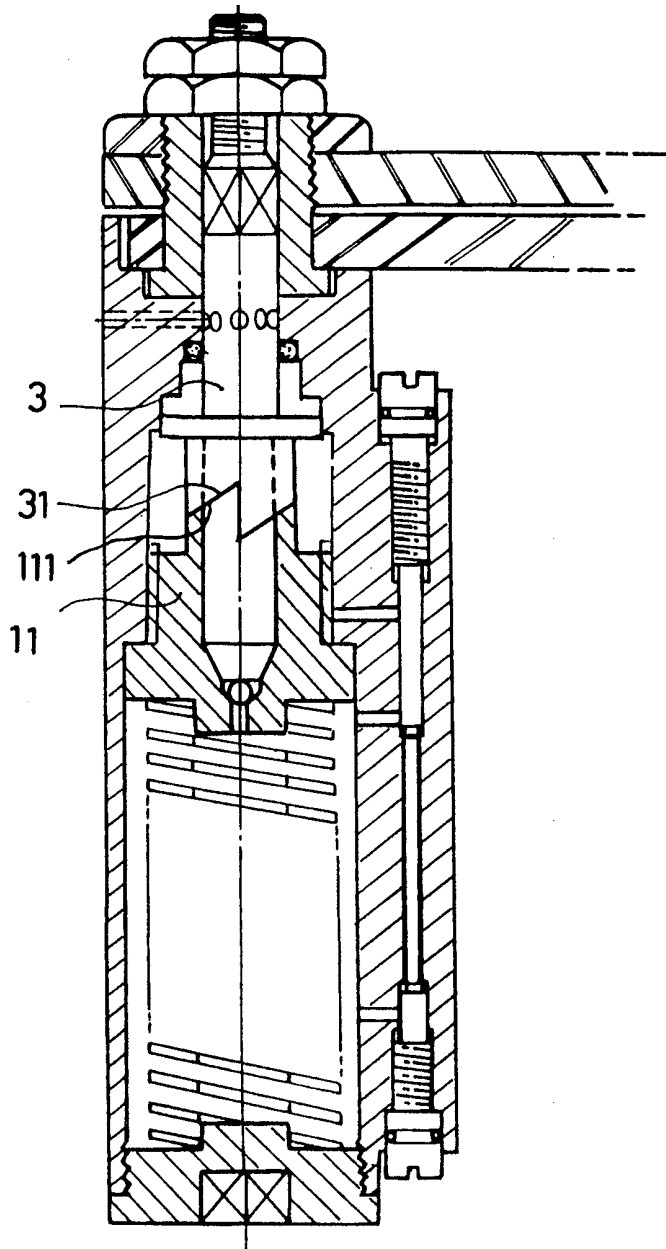


FIG. 9

