April 21, 1964 W. S. TURNER 3,129,453

HYDRAULIC DOOR CLOSER

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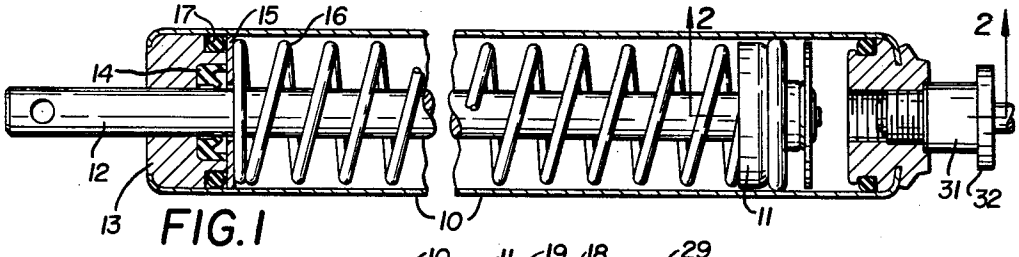


FIG. 1

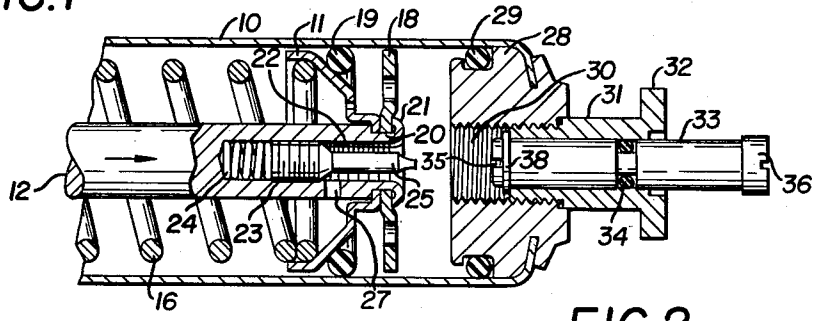


FIG. 2

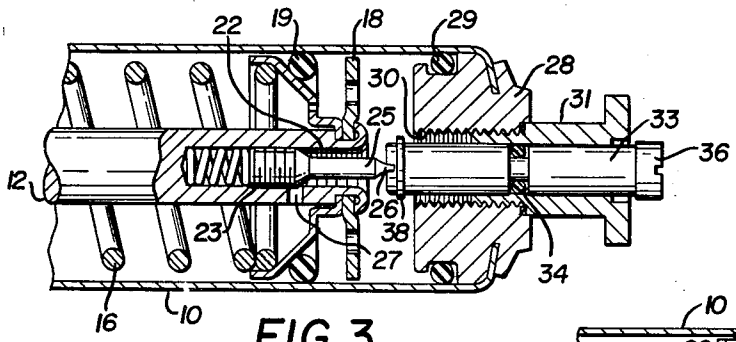


FIG. 3

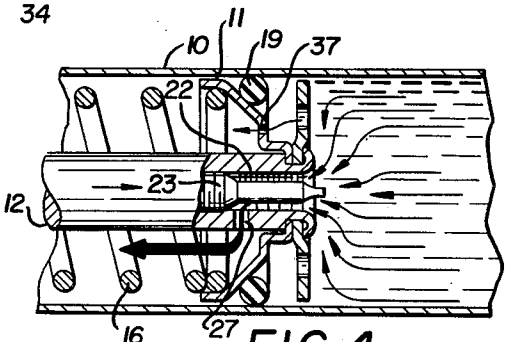


FIG. 4

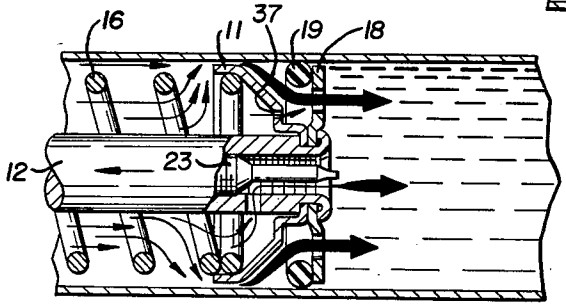


FIG. 5

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HYDRAULIC DOOR CLOSER

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This invention relates to door closers and more particularly to door closers for storm doors and the like.

The principal object of the invention is the provision of a hydraulic door closer of a relatively small and inexpensive construction suitable for use on a storm door and the like.

A further object of the invention is the provision of a hydraulic door closer of the elongated cylinder type incorporating a piston and valve means for controlling the flow of hydraulic fluid relative thereto.

A still further object of the invention is the provision of a hydraulic door closer having simple and effective adjustment means operative from the exterior of the door closer.

A still further object of the invention is the provision of a hydraulic door closer having a cylindrical body member and a piston arranged for longitudinal travel therein and incorporating a movable member acting to permit relatively free flow of hydraulic fluid around the piston when it is moved in one direction and acting to control the flow of fluid around the piston when it is moved in the opposite direction.

The hydraulic door closer disclosed herein comprises an improvement in the door closer art in that a hydraulically controlled mechanism is disclosed which is operative in the size and shape of the heretofore commonly used pneumatic door closers. The wide adoption of storm doors has necessitated the development of door closers capable of safely closing such storm doors which include a considerable amount of glass. Heretofore such door closers have comprised spring urged units with a simple air cylinder and piston arrangement and a controlled air vent by means of which the action of the pneumatic door closer was controlled. Such door closers have notoriously short life and require frequent adjustment and are generally unsatisfactory in operation. Heretofore, hydraulic door closers have comprised constructions which are relatively large and expensive and they have not therefore been used on storm doors. The present invention discloses a door closer utilizing hydraulic fluid as a control means and taking the form and size of the heretofore conventional pneumatic door closer. The hydraulic door closer disclosed herein incorporates novel hydraulic fluid valving means and means for adjusting the valving means as well as a novel fluid bypass for the piston to permit rapid travel of the piston in one direction as when a door is opened.

With the foregoing and other objects in view which will appear as the description proceeds, the invention resides in the combination and arrangement of parts and in the details of construction hereinafter described and claimed, it being the intention to cover all changes and modifications of the example of the invention herein chosen for purposes of the disclosure, which do not constitute departures from the spirit and scope of the invention.

The invention is illustrated in the accompanying drawing, wherein:

FIGURE 1 is a cross sectional side elevation of the hydraulic door closer in closed position.

FIGURE 2 is an enlarged detailed section on line 2—2 of FIGURE 1 showing the piston traveling toward the right.

FIGURE 3 is an enlarged detailed cross section similar

to FIGURE 2 showing the engagement and operation of a valve adjusting mechanism.

FIGURE 4 is an enlarged detailed sectional view of a portion of the door closer showing the piston traveling to the right with arrows indicating the fluid flow.

FIGURE 5 is a view similar to FIGURE 4 showing the piston traveling to the left and arrows indicating the fluid flow.

By referring to the drawings and FIGURE 1 in particular, it will be seen that the hydraulic door closer comprises an elongated cylinder 10 having a piston 11 positioned therein on one end of an elongated piston rod 12. The piston rod 12 passes through an end fitting 13 which closes one end of the cylinder and is sealed relative thereto by a resilient gasket 14. An apertured disc 15 is positioned about the piston rod 12 and adjacent the fitting 13 and provides a base for a coil spring 16 and to incidentally cage an O-ring seal 17. The other end of the coil spring 16 is engaged within the piston 11 one portion of which is cup-shaped as best seen in FIGURES 2, 3, 4 and 5 of the drawings and it will be observed that the other portion thereof comprises an apertured disc 18 spaced with respect to the cup-shaped portion 11 of the piston and acting therewith to cage an O-ring 19. The cup-shaped portion 11 and disc 18 of the piston are secured to the inner end of the piston rod 12 which has a tubular end extension 20 of reduced diameter, the outermost end of which is rolled back upon itself as at 21 to engage the apertured disc 18. The tubular end 20 of the piston rod 12 communicates with a bore 22 inwardly of the inner end of the piston rod 12 and which bore 22 is threaded to receive an adjustment valve 23 and a coil spring 24. The adjustment valve 23 has an axial extension 25 of relatively smaller diameter, the outermost end of which has a screwdriver tip 26 formed thereon. It will be seen that by rotating the screwdriver tip 26, the adjustment valve 23 will move relative to the bore 22 and relative to an orifice 27 in the piston rod 12 extending between the bore 22 and the exterior thereof. It will be seen that the major fluid flow through the piston, when it moves to the right, as when the spring 16 is closing the storm door to which the device is attached, will be through the bore 22 and the orifice 27.

The opposite or righthand end of the cylindrical body member 10 is closed by a fitting 28 and an O-ring 29 partially caged thereby acts as a seal between the same and the cylinder 10. The fitting 28 has an axially aligned opening therethrough defining an opening 30 in which a bushing 31 is threadably engaged. The outer end of the bushing 31 has an annular flange 32 which is adapted to be engaged by a mounting bracket (not shown) positioned on a door frame to movably mount one end of the hydraulic door closer relative thereto.

The bushing 31 has an axial bore therethrough and an adjustment plunger 33 is movably positioned therein. An O-ring 34 positioned in an annular groove in the plunger 33 forms a fluid seal. Both ends of the plunger 33 have transverse slots 35 and 36 respectively therein. The transverse slot 35 in the inner end of the plunger 33 is adapted to engage the screwdriver tip 26 on the extension 25 of the adjustment valve 23 heretofore described. When the adjustment valve is moved into engagement with the plunger 33, the transverse slot 36 in the outer end of the plunger 33 is adapted to receive a screwdriver by which the plunger 33 may be revolved in adjusting the adjusting valve 23.

By referring now to FIGURE 3 of the drawings, the piston carrying the adjustment valve 23 may be seen in innermost position relative to the cylinder 10 of the hydraulic door closer and the plunger 33 will be seen to have been moved inwardly of the bushing so that the

transverse slot 35 is engaged on the screwdriver tip 26 of the extension 25 on the adjustment valve 23, and it will be seen that it has been used to rotate the adjustment valve 23 to bring the same to partially closing registry with the orifice 27. When so adjusted, the hydraulic door closer will close a storm door very slowly as practically all of the fluid must flow through the bore 22 and the orifice 27 as illustrated in FIGURE 4 wherein arrows show the fluid flow and the volume thereof.

It will be observed that the O-ring 19 is in engagement against an angular part of the cup-shaped portion 11 of the piston and the inner wall of the cylinder 10 thereby forming a closure between these parts and that with the exception of a relatively small bleeding orifice 37 all of the hydraulic fluid must flow through the bore 22 and the orifice 27. A snap ring 38 positioned in an annular groove adjacent the inner end of the plunger 33 limits the travel of said plunger.

In FIGURE 5 of the drawings, the piston is shown moving to the left as when the storm door, to which the outer end of the piston rod 12 is secured, is opened. It will be seen that the O-ring 19 has moved against the apertured disc 18 of the piston and that a major portion of the hydraulic fluid may therefore flow around the periphery of the cup-shaped portion 11 of the piston thereby permitting the hydraulic door closer to accommodate rapid opening of the door to which the device is attached.

It will thus be seen that the hydraulic door closer possesses a novel structure particularly the piston and the adjustment valve incorporated therein and the means for moving the adjustment valve. The door closer will operate efficiently for a long life and may be easily reset to vary its door colsing rate by moving the plunger 33 to engage the adjustment valve whereby the same may be rotated, and having thus described my invention, what I claim is:

1. A hydraulic door closer comprising a cylindrical body member having apertured fittings closing its opposite ends, a piston rod positioned through one of said apertured fittings and having a piston on its inner end, a coil spring positioned between said apertured fitting and said piston inwardly of said cylinder, said piston rod having a bore in its inner end and a solid adjustment valve threadably positioned in said bore and arranged to control an orifice communicating with said bore at a point outwardly of said solid adjustment valve therein and with the piston rod containing portion of said cylinder, a portion of smaller diameter of said solid adjustment valve extending axially of and beyond said bore in spaced relation thereto and beyond said piston, a plunger movably positioned in the other of said apertured fittings, said plunger having a transverse slot in its inner end arranged to be moved into engagement with said extending portion of said solid adjustment valve to rotate the same.

2. A hydraulic door closer comprising an elongated cylinder having apertured fittings closing its opposite ends, a piston rod reciprocally mounted in one of said apertured fittings, a two-part piston positioned on the inner end of said piston rod, said inner end of said piston rod having an axial bore therein and an axial tubular extension of lesser diameter than said rod, said two-part piston comprising one part which is cup-shaped and an apertured disc positioned on said tubular extension with the cup-shaped part overlying the end of said piston rod, the outer end of said tubular extension being rolled back upon itself into engagement with said apertured disc of said piston to secure the same on said piston rod, an adjustment valve threadably engaged in said bore and acting to control an orifice in said piston rod extending between said bore and the exterior of said rod, an axial extension on said adjustment valve extending outwardly of said tubular extension of said piston rod and having a screwdriver-like tip on its outermost end, a bushing engaged in the other one of said apertured fittings closing said cylinder ends, said bushing having an annular flange serving as a mounting member for said hydraulic door closer, a plunger movably mounted axially of said bushing and said fitting, a transverse slot in the inner end of said plunger arranged to register with said screwdriver tip of said extension on said adjustment valve when said piston rod and piston are adjacent thereto and on O-ring positioned between said cup-shaped piston member and said apertured disc for movement toward and away from said cup-shaped member when said piston rod and piston are moved back and forth in said cylinder.

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