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Tansley

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[54] **LATCHING AND RELEASE ASSEMBLY FOR HYDRAULICALLY RETARDED DOOR CLOSERS**

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[52] **U.S. Cl.** **16/48.5,** 49/1, 251/141, 16/62

[51] **Int. Cl.** **E05f 15/20**

[58] **Field of Search** 16/51, 62, 64; 70/264; 49/1, 31; 251/141

[56] **References Cited**

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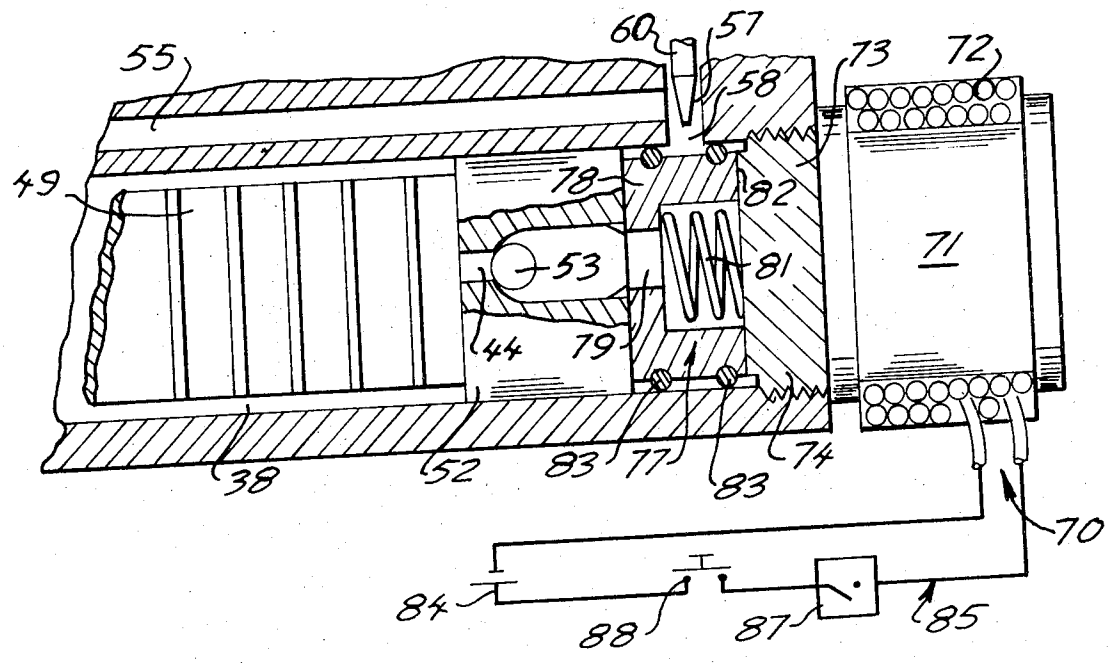
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Assistant Examiner—Peter A. Aschenbrenner
Attorney—Brian J. Wood

[57] **ABSTRACT**

A door closer having an oil reservoir communicating with a tail end of a cylinder which is closed at its head end by a normally energized electromagnet. A piston which is operably linked to a door to be closed is normally at the head end of the cylinder when the door is closed is moved against the action of a return spring towards the tail end of the cylinder when the door is opened so that the door under the action of the return spring is normally urged to a closed position. The piston has a fluid passage having a check valve which permits free flow of fluid from the reservoir into the cylinder head end. A restricted fluid return passage ported at one end through the wall of the cylinder at the cylinder head end and communicating with the reservoir permits unrestricted flow of fluid from the cylinder to the reservoir when the door is swung to its closed position under the action of the return spring. A fero-magnetic valve element slidable in th cylinder is moved by the piston, when the door is opened, to a locking position against the electromagnet and closing the fluid return passage. The electromagnet, which is normally energized, maintains the valve element in said locking position to hydraulically lock the piston against return movement under the action of the return spring so as to maintain the door open. A compression spring between the valve element and electromagnet moves the valve element to a release position to open the fluid return passage when the magnet is de-energized and thus enable the return spring to close the door.

4 Claims, 4 Drawing Figures



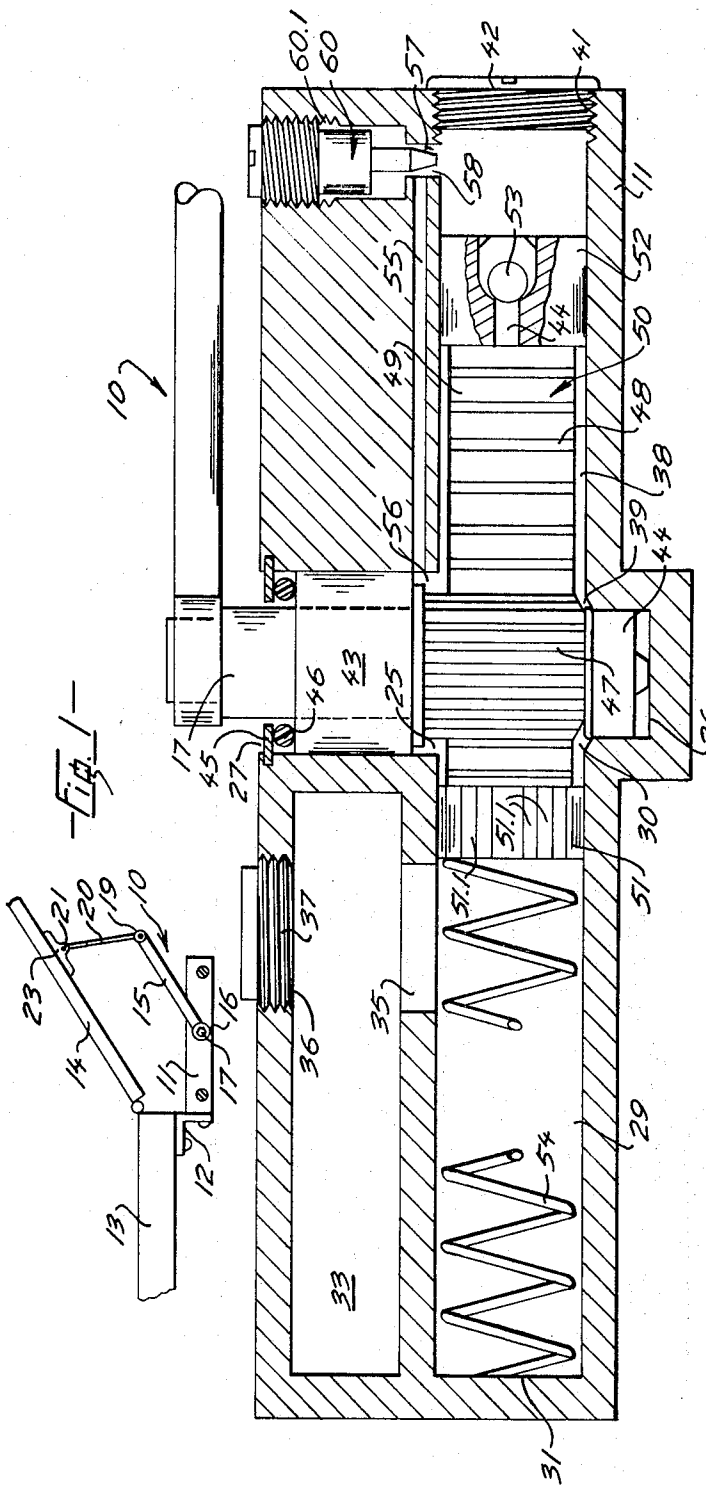

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Fig. 1

Fig. 2

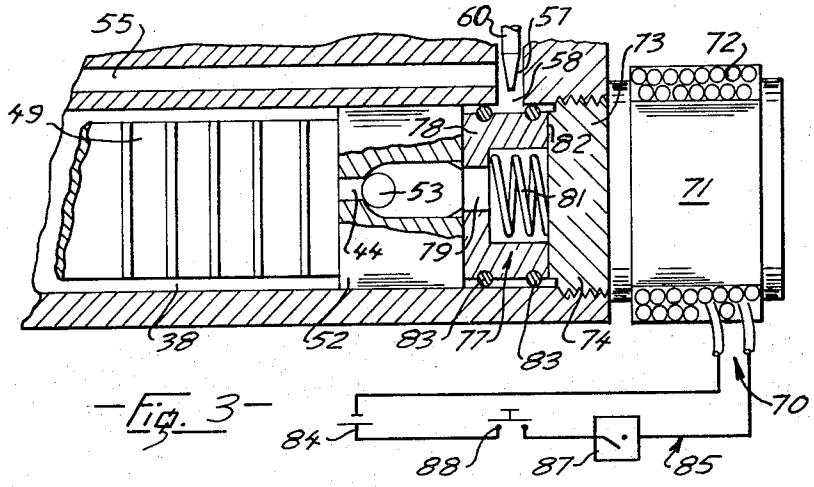

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Fig. 3

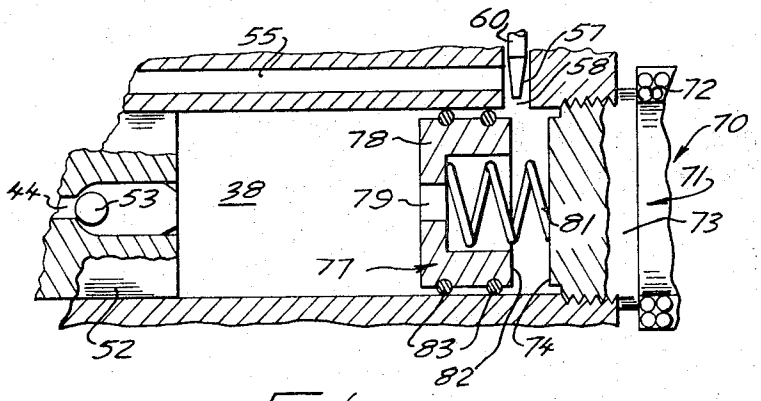

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Fig. 4

LATCHING AND RELEASE ASSEMBLY FOR HYDRAULICALLY RETARDED DOOR CLOSERS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to hydraulically retarded door closers and in particular to a latching and release assembly therefore.

2. Prior Art

Hydraulically retarded door closers generally incorporate a return spring which is compressed when the door is swung from a closed to an open position and which normally swings the door to a closed position when the door is released. Regulation of the speed of closure of the door is usually obtained through operation of a piston operably connected to the door for movement in a fluid filled cylinder which forces hydraulic fluid from the cylinder through a restricted passage back to a reservoir, when the door is released, to allow the spring to return the door to the closed position.

Most door closers of the above type do not maintain the door open. Consequently, in public buildings, such as hospitals and the like, it is usual practice to use latching devices which hold the doors open and which under predetermined ambient conditions of smoke and heat automatically release to allow the doors to close.

Such automatically releasable latching devices generally incorporate a normally energized electromagnet which engages an armature mounted on the door, when the door is swung to an open position, so as to prevent the door from swinging to a closed position. Electromagnet circuitry usually incorporates a heat and smoke sensing switch device which automatically opens the circuit under predetermined conditions of heat and smoke, so as to de-energize the magnet and allow the door to close.

In prior art devices the electromagnet and armature are extraneous of the door closer and are somewhat unsightly. Further, jarring of a door can break the magnetic grips and allow the door to close.

SUMMARY OF THE INVENTION

The present invention provides an electromagnetic latching and release assembly for a hydraulically retarded door closer which is incorporated within the door closer and which effects a hydraulic lock so as to release likelihood of inadvertent release when the door is jarred.

The assembly of the present invention is for a door closer having a cylinder having a tail end opening into a fluid reservoir a piston in the cylinder moved when the door is opened against action of a return spring so as to close the door, a fluid return passage ported at one end to the cylinder wall adjacent the cylinder head end and communicating with the fluid reservoir for enabling return of fluid from the cylinder to the reservoir when the door, under the action of the return spring, is moved to its closed position, the assembly including:

a feromagnetic valve element slidable in the cylinder between a locking position adjacent the head end of the cylinder and closing the fluid return passage and a release position spaced from said head end and opening said passage,

an electromagnet adapted to be secured to and enclosing the cylinder head end being adapted when energized for attracting the valve element and maintaining the latter in the locking position,

and a compression spring between the electromagnet and the valve element for moving the valve element to the release position when the magnet is de-energized to permit fluid flow through the fluid return passage so as to enable the door to close under the action of the return spring.

In an additional aspect of the invention normally closed manual and heat and smoke responsive switches are incorporated in circuit with the electromagent for automatically or manually de-energizing the magnet.

A detailed description following related to drawings gives exemplification of preferred embodiment of the invention which, however, is capable of expression in structure other than that particularly described and illustrated.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view showing a typical hydraulically controlled door closer mounted on a door casing and connected to a door,

FIG. 2 is an enlarged central sectional side view of the door closer,

FIG. 3 is an enlarged central sectional view of a portion of the door closer and latching and release assembly of the invention showing relative position of components of the assembly when the door is closed,

FIG. 4 is a view similar to FIG. 3 showing relative position of components when the door is closed.

DETAILED DESCRIPTION

FIG. 1

Referring to FIG. 1 a typical hydraulically retarded door closer **10** has a casing **11** securable by a bracket **12** to a wall **13** in which a door **14** is hinged for swinging movement between an open and a closed position.

The door closer has a main arm **15** mounted at one end **16** on a spindle **17** which extends transversely into the casing and is hingedly connected at an opposite end to one end **19** of a longitudinally adjustable link **20.** An opposite end **21** of the link in hingedly connected to a foot **23** which is secured to the door. The spindle, which rotates when the door is moved between an open and a closed position, is operatively connected to mechanism hereinafter to be described which effects hydraulically retarded spring closure of the door from its open position.

FIG. 2

Referring to FIG. **2,** the casing **11** has a transverse spigot socket **25** which is blind at a lower end **26** and opens at an upper end **27** out of the casing. A longitudinally extending bore **29** opens at one end **30** into the socket and is closed at an opposite end **31.** A fluid reservoir and expansion chamber **33** extends parallel to and above the bore and communicates with the bore through an opening **35.** The reservoir is filled with hydraulic fluid through a filler opening **36** which is closed by a threaded plug **37.**

A cylinder **38** extends longitudinally of the casing in axial alignment with the bore **29,** the cylinder opening at a tail end **39** into the socket **25** and opening at a head end **41** out of the casing. The head end of the cylinder is internally threaded and is normally closed by a threaded cap **42.**

The spindle **17,** which rotably seats in the socket **25,** has upper and lower bearings **43** and **44** and is held in

position in the socket by means of a snap ring **45** which is forced against an O-ring **46** compressing the O-ring against the upper bearing **43.** The spindle has a pinion gear **47** which confronts the bore **29** and the cylinder **38.**

The pinion gear meshes with teeth **48** of a gear rack **49** of a plunger **50** which has a guide piece **51,** at one end, slidably riding in the bore **29** and a piston **52,** at an opposite end, which rides in and has a slidable sealing fit in the cylinder **38.** The guide piece has flats **51.1** which provide fluid communication between the reservoir and the socket.

The piston has a central longitudinal fluid passage **44** opening out of both ends thereof. The fluid passage is provided with a ball check valve **53** which permits a unidirectional flow of fluid through the piston towards the head end of the cylinder but which prevents return flow of fluid through the piston. The cylinder it is seen is in fluid communication with the reservoir through the piston passage **44.**

A return spring **54** extends under compression between the closed end **31** of the bore and the guide piece **51** and normally urges thhe plunger towards the cylinder head end. Return flow of fluid from the cylinder ahead of the piston is provided by way of a fluid return passage generally **55.** The fluid return passage extends longitudinally of the casing and opens at one end **56** into the socket adjacent the pinion gear and is intersected at an opposite end by a transverse passage **57** which has a port **58** opening through the cylinder wall adjacent the cylinder head end. Fluid flow through the return passage is regulated by appropriate adjustment of a valve **60** which is threaded into a threaded outer end **60.1** of the transverse passage **57.**

In operation of the door closer the link **20** is adjsuted so that, with the door closed, the piston is positioned adjacent the cylinder head end and clear of the port **58,** solid outline FIG. **2.** When the door is opened to swing the main arm, rotation of the pinion moves the plunger against the action of the return spring **54** to a position in which the piston is adjacent the tail end of the cylinder. During this movement hydraulic fluid flows freely through the piston check valve. When the door is released the return spring, reacting against the plunger, moves the piston towards the head end of the cylinder thus rotating the spindle and the main arm and swinging the door to a closed position. The check valve, during closure of the door, prevents return flow of fluid through the piston, the fluid returning to the reservoir only through the fluid return passage so that by appropriate adjustment of the valve **60** speed of closure of the door can be regulated.

FIGS. **3** and **4,** with reference to FIG. **2**

FIGS. **3** and **4** show latching and release assembly in accordance with the invention designated, generally **70.** The assembly includes an electromagnet **71** having a solenoid **72** and a core **73.** One end **74** of the core is threaded for threadedly engaging and closing the threaded head end of the cylinder when the threaded cap **42** is removed. Length of the threaded end of the core is such that with the electromagnet firmly secured to the casing the threaded end is clear of the port **58.**

The assembly **70** also includes a valve element **77** which has a slidably sealing fit in the cylinder between the end **74** of the electromagnet and the piston **52.** The valve element has a ferromagnetic disc **78** having a central opening **79** which is countersunk to receive a light helical spring **81.** The countersunk opening provides an annular face **82** which, when the helical spring **81** is fully compressed, engages the end **74** of the magnet core.

The disc **78** has a pair of spaced peripheral grooves which accept O-rings, severally **83,** which are spaced apart a distance slightly greater than the diameter of the port **58** of the fluid return passage **55** and are positioned so that with the annular face **82** of the valve element **77** against the end **74** of the magnet the valve element assumes a locking position, FIG. **3,** in which the O-rings straddle and effectively seal the port **58.**

Strength of the coil spring **81** is such that when the magnet is de-energized with the door opened the valve element is moved to a release position, as seen in FIG. **4,** clear of the port **58.** Strength of the electromagnet is such that it can, when energized, maintain the valve element in the locking position, FIG. **3,** against the action of the spring **81.**

OPERATION

The electromagnet solenoid is connected in circuitry **85** to a suitable source of electric power **84.** The circuitry includes a normally closed heat and smoke responsive switch **87** which is operated to an open position when predetermined ambient conditions of heat and smoke prevail.

A manually operable normally closed push button switch **88** is also included in the circuitry in series with the switch **87** and is operable when pressed to open the circuit. The magnet it is seen is normally energized except when the circuit is opened by operation of the switches **87** or **88.**

In normal operation with the magnet energized the valve **77** is normally in the locking position closing the port **58** to the passage of fluid through the fluid return passage **55.** With the door in the closed position the piston is at the head end of the cylinder engaging the valve element **77.** The door can be swung to the open position as previously described but cannot return to the closed position as the piston check valve prevents return flow of fluid through the piston and the valve element **77** prevents return flow of the fluid through the fluid return passage. The door, therefore, remains open until the magnet is de-energized by opening of the switch **87** under pre-determined conditions of heat or smoke or when the pushbutton **88** is pressed to momentarily open the circuit and thus permit movement of the valve element to the release position under the action of the spring **81** so as to permit return flow of fluid to the reservoir through the fluid return passage and enable the piston to return to the cylinder head end under the action of the return spring.

When the door closes the piston returns the valve element to the locking position so as to render the assembly operable for releasably latching the door in an open condition when the magnet is again energized.

I claim:

1. In a door closer having a fluid reservoir, a cylinder opening at a tail end to the reservoir and having a head end, a piston slidable in the cylinder and having a fluid passage provided with a check valve for uni-directional flow of fluid from the reservoir to the cylinder head end, means operably connecting the piston to a door for moving the piston towards the tail end of the cylinder when the door is moved from a closed to an open position, a return spring reacting against the piston nor-

mally urging the latter towards the cylinder head end, and a restricted fluid return passage having a port at one end opening through a wall of the cylinder adjacent the cylinder head end and communicating at an opposite end with a reservoir for enabling return of fluid from the cylinder to the reservoir so as to enable the door to close under the action of the return spring: a latching and release assembly including:

a. an electromagnet adapted to be secured at and close the head end of the cylinder and adapted to be connected to a source of electric power,

b. a ferromagnetic valve element having a slidably sealing fit in the cylinder between the piston and the electromagnet moveable by the piston, when the door is closed, to a locking position against the electromagnet and blocking the return fluid passage and being adapted to be maintained in said locking position by the magnet when the latter is in an energized condition to hydraulically lock the piston at the tail end of the cylinder when the door is opened so as to prevent closure of the door, said valve element including a ferromangnetic disc having a fluid passage and a pair of longitudinally spaced peripheral 0-rings embracing the disc for effecting fluid sealing engagement with the walls of the cylinder, the 0-rings being spaced so as to straddle the port of the fluid return passage when the valve element is in the locking position.

2. An assembly as claimed in claim **1** in which the electromagnet has a core, the core being threaded at one end for threaded engagement with and closing the head end of the cylinder.

3. An assembly as claimed in claim **1** including a normally closed switch means in circuit with the electromagnet responsive to predetermined ambient conditions of heat and smoke to open the circuit and de-energize the magnet.

4. An assembly as claimed in claim **1** including a normally closed manually operated pushbutton switch connected in series with the heat and smoke responsive switch operable for momentarily opening the electromagnet circuit.

* * * * *

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,771,195 Dated 13 November 1973

Inventor(s) Henry William TANSLEY

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Claim 1 should be amended by adding; after Column 6, Line 6; the following:

-- c. a spring extending under compression between the valve element and electromagnet normally urging the valve element to a release position clear of the return fluid passage when the magnet is de-energized to enable return flow of fluid from the cylinder to the reservoir so as to enable the door to close under the action of the return spring. --

Signed and Sealed this

thirtieth Day of *December 1975*

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks