Aug. 11, 1964 E. R. GLENN 3,143,773

SLIDING DOOR ACCESSORY

Filed March 5, 1962

FIG. 1

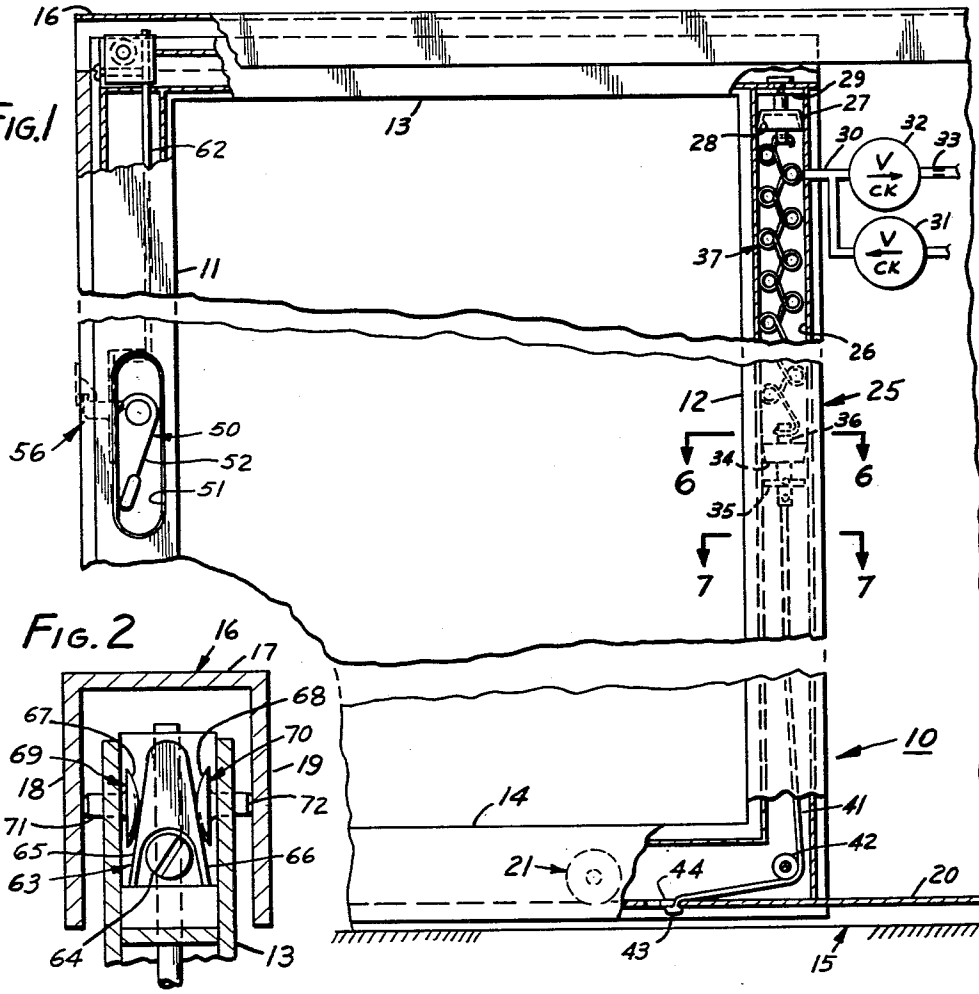


FIG. 2

FIG. 3

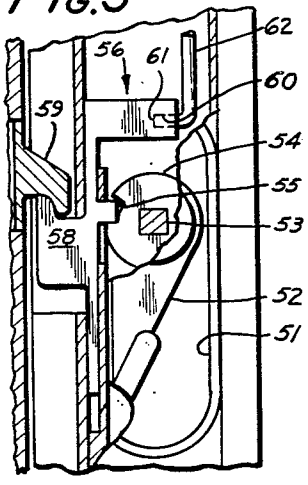


FIG. 6

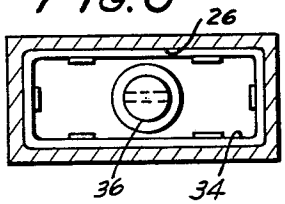


FIG. 7

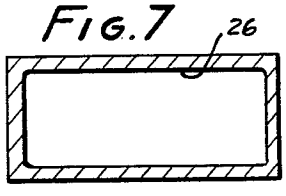


FIG. 4

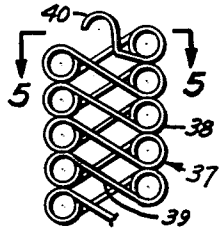
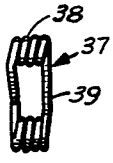


FIG. 5



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SLIDING DOOR ACCESSORY

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8 Claims. (Cl. 20—19)

This invention relates to means for controlling the position and movement of sliding doors, such as screen doors.

Sliding doors in general, and lightweight screen doors in particular, are often closed with too much force by standard door closures. There is a continuing need for a door closer which will close a door gently and reliably.

There also is a need for a door lock which can hold the door locked not only at the fully closed position, but also at intermediate positions, so that a door can be locked partially open.

It is an object of this invention to provide a door closer which closes a door at a substantially constant rate of motion and at rates which are subject to close control, so that the door will be closed gently.

It is another object of this invention to provide door lock means which enable the door to be locked at intermediate positions as well as to provide extra locking means at the closed position.

This invention is carried out in combination with a sliding door which slides within a frame. Closer means are provided which comprise a cylinder mounted either to the door or the frame, preferably to the door. The cylinder has a closed end. A piston makes a fluid sealing, sliding fit in the cylinder, and spring means are connected to the piston which tend to force the piston toward the closed end of the cylinder.

A fluid flow passage leads out of the cylinder from a point between the piston and the closed end. Fluid flow restrictor means is placed in the passage to limit the rate of fluid flow out of the cylinder when the piston is moving toward the closed end, and thereby to limit the speed at which the door closes. Interconnecting means interconnect the piston and either the frame or the door (whichever one the cylinder is not attached to) so that sliding movement of the door changes the position of the piston in the cylinder, the piston's closest approach to the closed end occurring when the door is closed.

As a prefered but optional feature of the invention, lock means is provided for the door which comprises a push rod adapted to move a wedge member mounted to it against a lateral member. The lateral member, in turn, is forced against the frame by the wedge member to restrain the door against movement at any position of the door. Rod-activating means is provided to move the rod and thereby move the wedge. If desired, hook means may be also actuated by the activating means for engaging complementary means on the frame to hold the door locked at its closed position.

According to still another preferred but optional feature of the invention, a spring with a low rate is provided to exert a nearly constant tension pull on the piston, regardless of the amount of extension of the spring.

The above and other features of this invention will be fully understood from the following detailed description and the accompanying drawings in which:

FIG. 1 is a side elevation, partly in cutaway cross-section, showing the presently preferred embodiment of the invention;

FIGS. 2 and 3 are fragmentary cross-sections of portions of the invention;

FIG. 4 is a side elevation of a spring used in the invention;

FIG. 5 is a cross-section taken at line 5—5 of FIG. 4; and

FIGS. 6 and 7 are cross-sections taken at lines 6—6 and 7—7, respectively, of FIG. 1.

FIG. 1 shows a sliding door 10 which has a pair of vertical members 11, 12 and a pair of horizontal members 13, 14 which give the door a rectangular shape. In conventional screen doors made with aluminum frames, it is conventional practice to make these members of extrusions having a hollow rectangular cross-section, an example being shown in FIGS. 6 and 7.

The door is slidable in a frame 15 which includes an upper track 16 (see FIG. 2). The upper track has a bight 17 and a pair of depending flanges 18, 19 which at least partially overhang the the upper horizontal member of the door, and thereby forms a channel within which the upper horizontal member of the door slides. A lower track 20 provides a surface upon which wheels 21 roll, the wheels supporting the door for sliding movement relative to the frame.

The door includes closer means 25, portions of which are placed within a cylinder 26 formed within vertical member 12. Because the vertical member 12 as shown in the drawings is a seamless extrusion with a continuous internal side wall, it can be used for a cylinder by attaching a rectangular end plug 27 therein to form a closed end for the cylinder. The end plug has a tapered flange 28 to make a fluid-tight seal at the closed end. It is held in place by a cross-member 29 secured to the vertical member as the opposite side of the end plug from the portion used for a cylinder.

The wall of the cylinder is pierced to form a fluid flow passage 30. Flow through this passage is controlled by a first check valve 31 which permits flow only into the cylinder from the atmosphere, and also by a second check valve 32 which permits flow only from the cylinder to atmosphere. Flow through the second check valve is additionally controlled by an adjustably variable orifice 33 which regulates the rate of fluid flow from the cylinder.

A piston 34 of the same construction as the end plug makes a sliding fluid sealing fit with the wall of the cylinder. An aligning plate 35 is attached to a post 36 on the piston. The aligning plate has lesser transverse dimensions than the wall of the cylinder so that it does not bind, but it is large enough to keep the piston from cocking excessively within the cylinder.

A spring 37 interconnects the end plug and the piston. It tends to force the piston toward the closed end of the cylinder. Spring 37 (FIGS. 4 and 5) is especially suited for this device because the spring has a very low rate, or spring constant. As an example, it is found that a spring of the type shown with a twelve inch length when fully relaxed as shown in FIG. 4, can be extended to twenty-four inches length by a force of two pounds, and thereafter to seventy-two inches in length with a pull of only one more pound. Such a spring may be made from spring wire .037" diameter, the convolution having an outer diameter of 3/16", and the reaches a length between their tangent points of 11/16". Therefore, the rate of a spring of this nature is extremely low and the force which it exerts is sensibly constant, changing by only one pound in an extension from two to six feet. A door can thereby be opened four feet with only one pound of effort, and the gentle pull returning the door remains nearly constant. Furthermore, it never has a large initial value such as a standard coil spring has, which would excessively accelerate the door. It is preferable of course, to stretch the spring slightly by preloading it, such as by the two pound stretch described above, at the closed position of the door. The spring involves a plurality of convoluted coils 38 in staggered array, each

interconnected with adjacent coils by reaches 39, and terminating in hooks, such as hook 40. The hooks are passed through holes in the posts of the end plug and piston to attach the spring to these elements.

Interconnecting means 41 comprises a flexible cord attached to post 36, and which passes over an idler wheel 42 mounted in the sliding door. The end of the cord away from the piston includes a knot 43 or other enlargement which is passed through a keyhole-shaped slot 44 in the frame. If it is desired to disconnect the closer, it is only necessary to take the knot out of the keyhole slot.

The tendency of the closer is to close the door, because the spring pulls the piston upward, thereby moving the door to the left in FIG. 1. When the door opens, air is admitted to the cylinder through check valve 31 and when it closes, air is exhausted through check valve 32 at a rate established by orifice 33.

The door also includes lock means 50 attached to vertical member 11. This lock means includes a recessed cover-plate 51 within which there is fitted a rotatable handle 52 which functions as actuator means for the lock means. The handle is mounted to a square shaft 53 which carries a rotatable disc 54 with a notch 55 on its periphery.

A hook member 56 includes a protrusion which fits into the notch so that turning the handle (and thereby the disc) raises and lowers the hook member. The hook member includes a hook 58 adapted to engage a complementary hook 59 on the frame. The hook member includes an opening 60 which receives an end 61 of a push rod 62.

The push rod extends up through the inside of vertical member 11 and carries at its upper end a wedge member 63 which is mounted to the push rod by a screw 64. The wedge member includes tapering sides 65, 66 which are adapted to engage the heads 67, 68 of a pair of rivets 69, 70. Shanks 71, 72 of the rivets protrude through holes in the sides of the upper horizontal member and are adapted to be pressed against flanges 18 and 19, respectively, by upward movement of the wedge. The force exerted by the rivets locks the door against sliding movement in any position of the door, and thus provides a means for holding the door in an intermediate position, as well as for providing additional locking means along with the hook member for locking the door at its closed position.

The operation of the device should be evident from the foregoing. When the door is to be opened to the left in FIG. 1 it is first unlocked by turning the handle counter-clockwise. This lowers hook 58 to release it from the complementary hooks and at the same time pulls down the wedge member to release the rivets from contact with the upper track. The door may then be moved to the right in FIG. 1 which motion will pull the piston downwardly, drawing air in through check valve 31.

The door can be held open, either by disconnecting the cord from its keyhole slot, or by turning the handle member clockwise to force the wedge upward and the lateral members (rivets 69 and 70) against the track. Turning the handle member counterclockwise will release this locking action and if the cord is connected in the keyhole slot, the spring will tend to pull the piston upward in FIG. 1 thereby tending to return the door to the left by vitrue of the substantially constant force exerted by the spring together with the flow restriction imposed by the orifice 33.

It will be seen from the above that this device is readily adapted to be incorporated into screen doors having a passage suitable for a cylinder within its elements of construction. It is also adaptable to be made as a separate part, and screwed, bolted, or otherwise affixed to an already-existing screen door by attaching a cylinder thereto with the aforementioned devices incorporated therein.

It will further be understood that it is not necessary that the door closer have its cord attached to the lower track nor that the cylinder be vertically aligned. The cylinder could lie horizontally if desired and could be attached either to the door or to the frame so long as one end of the interconnecting means were attached to the piston and the other end to the frame or door, whichever does not carry the piston.

This invention thereby provides an inexpensive, convenient to use, lock and closer means suitable both for existing and for new doors. It finds its principal use in connection with lightweight screen doors, but it is also useful with heavier doors by appropriate modification of the spring.

This invention is not to be limited by the embodiments shown in the drawings and described in the description which are given by way of example and not of limitation, but only in accordance with the scope of the appended claims.

I claim:

1. In combination with a sliding door member which slides within a frame member: closer means comprising a cylinder attached to one of said members and having an axial length closed at one end, a piston making a fluid sealing, sliding fit in the cylinder, spring means connected to the piston which tends to force the piston toward the closed end of the cylinder, fluid flow restrictor means limiting the rate of fluid flow out of the cylinder when the piston moves toward the closed end, and interconnecting means connecting the other of said members to the piston, and so disposed and arranged that sliding movement of the door member changes the position of the piston in the cylinder, the piston's closest approach to the closed end occurring when the door member closes the frame; and lock means for said door member comprising an actuating means mounted to the door member, a hook member adapted to engage a complementary member mounted to the frame, the hook member being movable to and away from an engaged position by the actuating means, a push rod shiftable by actuating the actuating means, a wedge member mounted to the push rod, and a lateral member engageable by the wedge member to be moved against the frame to restrain the door member from movement when the actuating means is moved to a lock position, to thereby move the push rod to press the wedge against the lateral member, and force the lateral member against the frame.

2. A combination according to claim 1 in which the spring means comprises a plurality of coil-shaped convolutions whose axes are parallel to each other and which convolutions are disposed in staggered array, adjacent convolutions being connected by reaches which form a zigzag pattern with convolutions at their intersections.

3. A combination according to claim 1 in which the cylinder is integral with the door member.

4. A combination according to claim 3 in which the spring means comprises a plurality of coil-shaped convolutions whose axes are parallel to each other and which convolutions are disposed in staggered array, adjacent convolutions being connected by reaches which form a zigzag pattern with convolutions at their intersections.

5. A combination according to claim 4 in which a fluid passage is provided from the inside of the cylinder to the outside thereof, a first check valve in the passage permitting flow only into the cylinder, a second check valve in parallel connection with the first check valve permitting fluid flow only out of the cylinder, the restrictor means being in series connection with the second check valve.

6. In combination: a sliding door member comprising a pair of vertical and pair of horizontal members interconnected to form a rectangular structure, one of the vertical members forming an internal cylinder; an end plug closing one end of said cylinder; a piston making a fluid sealing, sliding fit in the cylinder; spring means connected to the piston and the end plug which tends to force the piston

toward the end plug; a fluid flow passage from the inside of the cylinder to the outside thereof; fluid flow restrictor means in said passage limiting the rate of fluid flow out of the cylinder when the piston moves toward the closed end; a door frame including an upper track and a lower track for guiding the door member in its sliding movement; interconnecting means connecting the frame with the piston and so disposed and arranged that sliding movement of the door relative to the frame changes the position of the piston in the cylinder, the piston's closest approach to the end plug occurring when the door member closes the frame member; lock means for said door member comprising a complementary member mounted to the frame; a hook member including a hook engageable to the complementary member; actuating means mounted to the door member for moving the hook member; a push rod shiftable by actuating the actuating means; a wedge member mounted to the push rod; and a lateral member engageable by the wedge member to be moved against the frame to restrain the door member from movement when the actuating means is moved to a locked position thereby to move the push rod to press the wedge against the lateral member and force the lateral member against the frame.

7. In combination: a sliding door member comprising a pair of vertical and a pair of horizontal members interconnected to form a rectangular structure, one of the vertical members forming an internal cylinder; an end plug closing one end of said cylinder; a piston making a fluid sealing, sliding fit in the cylinder; spring means connected to the piston and the end plug which tends to force the piston toward the end plug; a fluid flow passage from the inside of the cylinder to the outside thereof; a first check valve in the passage permitting flow only into the cylinder; a second check valve in parallel connection with the first check valve permitting fluid flow only out of the cylinder; fluid flow restrictor means in series connection with the second check valve limiting the rate of fluid flow out of the cylinder when the piston moves toward the closed end; a door frame including an upper track and a

lower track for guiding the door member in its sliding movement; and interconnecting means connecting the frame with the piston and so disposed and arranged that sliding movement of the door relative to the frame changes the position of the piston in the cylinder, the piston's closest approach to the end plug occurring when the door member closes the frame member.

8. In combination with a sliding door member which slides within a frame member: closer means comprising a cylinder attached to one of said members and having an axial length closed at one end, a piston making a fluid sealing, sliding fit in the cylinder, the cylinder being attached to the door member, spring means connected to the piston which tends to force the piston toward the closed end of the cylinder, fluid-flow restrictor means limiting the rate of fluid flow out of the cylinder when the piston moves toward the closed end, and interconnecting means connecting the other said members to the piston, and so disposed and arranged that sliding movement of the door member changes the position of the piston in the cylinder, the piston's closest approach to the closed end occurring when the door member closes the frame, a fluid passage being formed from the inside of the cylinder to the outside thereof, a first check valve in the passage permitting flow only into the cylinder, a second check valve in parallel connection with the first check valve permitting fluid flow only out of the cylinder, the restrictor means being separate from and in series connection with the second check valve.

References Cited in the file of this patent

UNITED STATES PATENTS

1,283,745	Halapleus et al.	Nov. 5, 1918
2,195,875	Pixley	Apr. 2, 1940
2,925,860	Dunn	Feb. 23, 1960
2,973,984	Burke	Mar. 7, 1961
3,002,785	Larche	Oct. 3, 1961
3,018,507	Launer	Jan. 30, 1962