Jan. 21, 1958 R. C. HOBBS 2,820,475

STORM DOOR RELEASE VALVE

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FIG. 1.

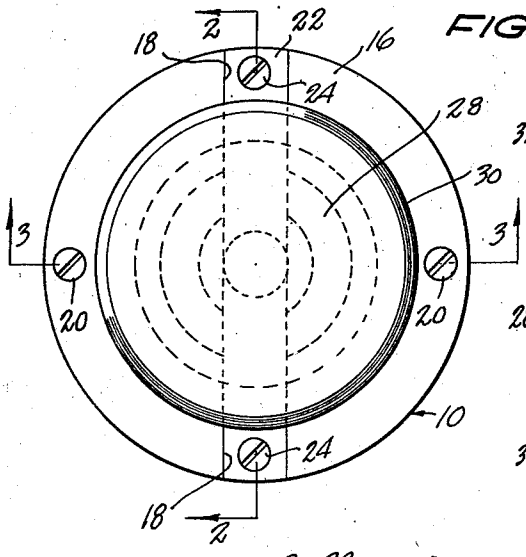
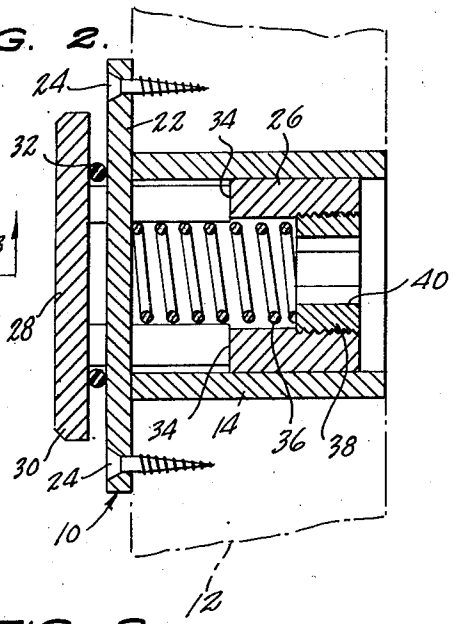


FIG. 2.



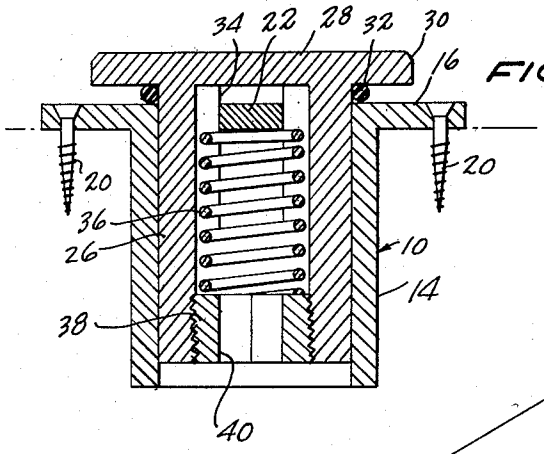
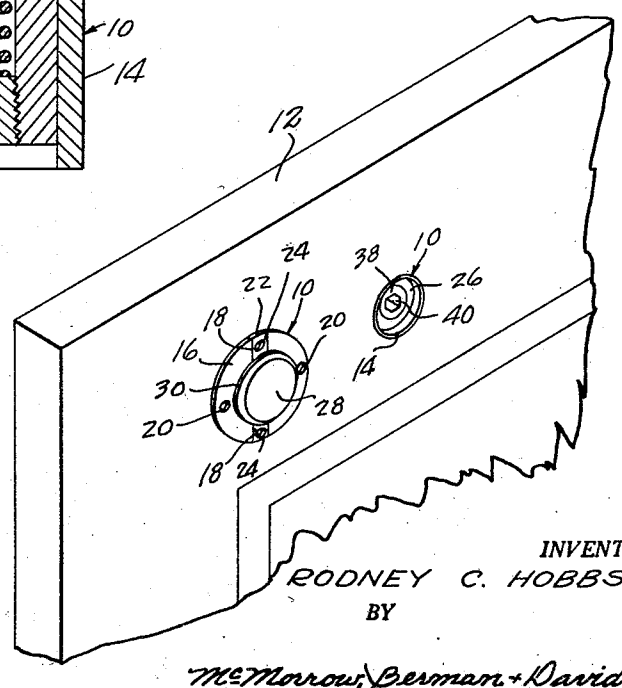


FIG. 3.

FIG. 4.



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STORM DOOR RELEASE VALVE

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3 Claims. (Cl. 137—541)

In situations in which a storm door is installed in its usual spaced relation to the conventional exterior door of a house or other building, the opening or closing of one or the other of the doors creates, at times, excessive air pressure in the space between the doors, and at other times, a partial vacuum condition or suction in said space.

For example, if the inner door is closed with the storm door closed, the air in the space between the doors often cannot escape into the building interior with suffcient rapidity during the closing of the inner door, and tends to exert pressure against the storm door. This is particularly true when the inner door is equipped with a closing device including a hydraulic cylinder. If the cylinder is of considerable strength, the storm door can be damaged under such conditions. Under other circumstances, the inner door closes slowly or not at all, due to the fact that the excess air pressure in the space between the doors offers a resistance too great for the closing device to overcome.

The creation of vacuum or suction conditions in the space, on the other hand, tends to occur when either door is opened while the other is closed. Under these circumstances, air cannot rush into the space to relieve the vacuum conditions with sufficient rapidity, and as a result difficulty is experienced in opening the door.

In view of the clear need for means to eliminate either of these undesirable conditions, it is proposed, in carrying out the present invention, to provide a release valve to be mounted in the storm door, and which will have a check valve function, to relieve the abnormally high or low air pressure conditions within the building entry.

Summarized briefly, the device includes an outer cylinder mounted stationarily in the storm door and opening at opposite ends upon the opposite faces of the door, an inner cylinder telescoped within the outer cylinder and movable axially of the cylinders, the inner cylinder being spring loaded and being normally biased to a position in which it prevents the passage of air through the device, air vent openings in the inner cylinder adapted for the passage of air through the device when the inner cylinder is shifted out of said normal position against the restraint of its spring and a cross bar to provide a means holding the cylinders assembled and to provide, also, an abutment for one end of the spring.

A further object of importance is to provide a valve assembly as stated which can be installed with a minimum of difficulty in the door.

Yet another object is to so design the valve assembly as to permit it to be used as one of a pair of like assembles, positioned reversely in respect of one another so as to permit the relief either of excess air pressure or vacuum conditions within the building entry.

Other objects will appear from the following description, the claims appended thereto, and from the annexed drawing, in which like reference characters designate like parts throughout the several views, and wherein:

Figure 1 is an end elevational view of the release valve formed in accordance with the present invention;

Figure 2 is a longitudinal sectional view on line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view at right angles to the cutting plane of Figure 2, substantially on line 3—3 of Figure 1; and

Figure 4 is a fragmentary perspective view of a door in which a pair of the valves has been installed.

The valve device **10** constituting the present invention is illustrated in the several figures of the drawing as being mounted in a storm door **12**. The device includes an outer cylinder **14** of a length substantially equal to the thickness of the portion of the door in which it is to be installed, said door portion being drilled or otherwise apertured to receive the cylinder. The cylinder **14**, at one end, is formed with a flat, outwardly directed attaching flange **16** formed at diametrically opposite locations with recesses **18**. Spaced equidistantly from the recesses circumferentially of the flange are openings receiving screws **20** by means of which the cylinder is secured fixedly to the door with its opposite ends opening upon the opposite faces of the door.

Extending diametrically of the cylinder in the plane of the flange **16** is a straight cross bar **22**, the ends of which fit snugly in the respective recesses **18**. The cross bar ends are apertured to receive screws **24**, so that when the several screws **20**, **24** are threaded into the door, the cross bar and outer cylinder together constitute a stationary assembly.

An inner cylinder **26** slidably telescopes within the outer cylinder, and is formed open at one end. At its other end, the inner cylinder has a flat end wall **28** integral with an outwardly directed circumferential flange **30** overlying the flange **16**. An annular, leak preventing gasket or O ring, of soft rubber or other compressible sealing material, is interposed between the flanges **16**, **30** and fits snugly about the outer surface of the inner cylinder.

Formed in the inner cylinder are diametrically opposed, longitudinally extending air vent openings **34**. The openings **34** terminate at one end in the plane of the inner face of the end wall **28**, and at their other ends terminate a substantial distance inwardly from the open end of the inner cylinder. The openings **34** are of a width equal to the width of the cross bar, and the cross bar extends through said openings, thus holding the outer and inner cylinders assembled with one another.

Disposed within the inner cylinder, and abutting at one end against the cross bar **22**, is a compression spring **36**, engaged at its other end by a plug **38** having external threads engaging complementary threads formed in the wall of the bore of the inner cylinder. The plug **38** has a central aperture **40** of non-circular cross section, adapted to receive a tool, not shown, of complementary cross section, which tool is adapted to rotate the plug for the purpose of adjusting it axially of the inner cylinder, thereby to correspondingly adjust the tension of the coil spring.

In mounting the device in a door, the outer cylinder is first installed, after which the inner cylinder is inserted therein, with the O ring **32** disposed between the flanges **16**, **30**. Then, the cross bar is positioned through the air vent openings **34**, and secured in place by the screws **24**. The spring **36** is next inserted in the inner cylinder, after which the plug **38** is threaded into the illustrated position thereof to complete the installation.

In a complete installation such as that shown in Figure 4, two of the valves would be used, one valve being arranged reversely to the other, so that one valve permits air to pass therethrough into the space between the storm and inner doors, while the other valve permits air to pass through it from said space to the building exterior. Under these circumstances, the pair of valves will function one to relieve abnormally high pressure conditions

in the entry space between the doors, and the other to relieve suction conditions created within said space. The abnormally high pressure conditions would be occasioned by closing of either door while the other door is closed, and the suction conditions would be created by the opening of either door with the other door closed. Either condition places undue strain on the storm door, and further, represents an inconvenience to the person opening or closing the door.

Assuming, for example, that both doors are closed, the inner cylinder would be biased by the spring 36 to the position thereof shown in both Figures 2 and 3, that is, the closed position. Under these circumstances, the O ring 32 will be held under compression between the flanges 16, 30, and will of course close the air vent openings 34 so far as the portions of said openings appearing above the cross bar 22 in Figure 3 are concerned. The portions of the openings below the cross bar in Figure 3 would be closed at this time by the wall of the outer cylinder 14.

Considering now that one of the doors is being closed with the other door already closed, air would ordinarily be penned up in the building entry between the doors, creating excessive air pressure in said entry exerted against both doors. However, if a pressure relief valve is installed in the storm door, the pressure in the building entry will shift the inner cylinder outwardly from the outer cylinder against the restraint of the spring, thus opening the valve and permitting the pressure to be relieved. If, on the other hand, the inner door is being opened with the storm door closed, a vacuum condition tends to arise in the building entry. Under these circumstances, the other valve, that opens into the building entry, moves to open position to relieve the vacuum condition. It is thus apparent that damage to the storm door in both events is effectively precluded by the installation of a pair of the valves.

Of course, if desired, one can install only a single valve, to relieve one or the other of the two conditions discussed herein, and it is important to note that one form of valve can be used for either type of installation.

It is believed apparent that the invention is not necessarily confined to the specific use or uses thereof described above, since it may be utilized for any purpose to which it may be suited. Nor is the invention to be necessarily limited to the specific construction illustrated and described, since such construction is only intended to be illustrative of the principles, it being considered that the invention comprehends any minor change in construction that may be permitted within the scope of the appended claims.

What is claimed is:

1. A release valve adapted for extension through a storm door with its ends opening upon the opposite surfaces of the door; comprising an open ended tubular cylinder; a mounting flange extending outwardly from one of said ends, said flange being formed with diametrically opposite recesses, a cross bar extending diametrically of the outer cylinder and having its ends seating in said recesses, said cross bar being disposed in the plane of said flange and being provided with means for mounting the same; an inner cylinder slidably telescoped within the outer cylinder, said inner cylinder including an end wall closing one end thereof and being formed open at its other end; a flange extending outwardly from said end wall and overlying the outer cylinder flange; gasket means extending about the inner cylinder and interposed between the flanges to provide a seal between the cylinders on shifting of the inner cylinder in an axial direction inwardly in respect to the outer cylinder, the inner cylinder having a pair of diametrically opposite air vent openings formed in its side wall, said cross bar extending through the air vent openings, said air vent openings being covered in part by the gasket means and in part by the side wall of the outer cylinder when the inner cylinder is shifted in said direction, and being uncovered when the inner cylinder is shifted in an opposite direction, thus to permit air to pass through the cylinders from one to the other; and spring means resiliently and yieldably biasing the inner cylinder in said first named direction.

2. A release valve adapted for extension through a storm door with its ends opening upon the opposite surfaces of the door; comprising an open ended tubular cylinder; a mounting flange extending outwardly from one of said ends, said flange being formed with diametrically opposite recesses; a cross bar extending diametrically of the outer cylinder and having its ends seating in said recesses, said cross bar being disposed in the plane of said flange and being provided with means for mounting the same; an inner cylinder slidably telescoped within the outer cylinder, said inner cylinder including an end wall closing one end thereof and being formed open at its other end; a flange extending outwardly from said end wall and overlying the outer cylinder flange; gasket means extending about the inner cylinder and interposed between the flanges to provide a seal between the cylinders on shifting of the inner cylinder in an axial direction inwardly in respect to the outer cylinder, the inner cylinder having a pair of diametrically opposite air vent openings formed in its side wall, said cross bar extending through the air vent openings, said air vent openings being covered in part by the gasket means and in part by the side wall of the outer cylinder when the inner cylinder is shifted in said direction, and being uncovered when the inner cylinder is shifted in an opposite direction, thus to permit air to pass through the cylinders from one to the other; a spring extending within the inner cylinder and abutting at one end against said cross bar; and a plug mounted in the open end of the inner cylinder and providing an abutment for the other end of the spring, the spring being held under compression between the cross bar and plug and being arranged to normally bias the inner cylinder in said first named direction, said plug having an aperture formed therein to permit the passage of air through the inner cylinder.

3. A release valve adapted for extension through a storm door with its ends opening upon the opposite surfaces of the door; comprising an open ended tubular cylinder; a mounting flange extending outwardly from one of said ends, said flange being formed with diametrically opposite recesses; a cross bar extending diametrically of the outer cylinder and having its ends seating in said recesses, said cross bar being disposed in the plane of said flange and being provided with means for mounting the same; an inner cylinder slidably telescoped within the outer cylinder, said inner cylinder including an end wall closing one end thereof and being formed open at its other end; a flange extending outwardly from said end wall and overlying the outer cylinder flange; gasket means extending about the inner cylinder and interposed between the flanges to provide a seal between the cylinders on shifting of the inner cylinder in an axial direction inwardly in respect to the outer cylinder, the inner cylinder having a pair of diametrically opposite air vent openings formed in its side wall, said cross bar extending through the air vent openings, said air vent openings being covered in part by the gasket means and in part by the side wall of the outer cylinder when the inner cylinder is shifted in said direction, and being uncovered when the inner cylinder is shifted in an opposite direction, thus to permit air to pass through the cylinders from one to the other; a spring extending within the inner cylinder and abutting at one end against said cross bar; and a plug mounted in the open end of the inner cylinder and providing an abutment for the other end of the spring, the spring being held under compression between the cross bar and plug and being arranged to normally bias the inner cylinder in said first named direction, said plug having an aperture formed therein to permit the passage of air through the inner cylinder, said plug being mounted in the inner cylinder for adjustment in a direction axially of the inner

cylinder, toward and away from the crass bar, whereby to adjustably tension the spring.

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