

Nov. 5, 1940.

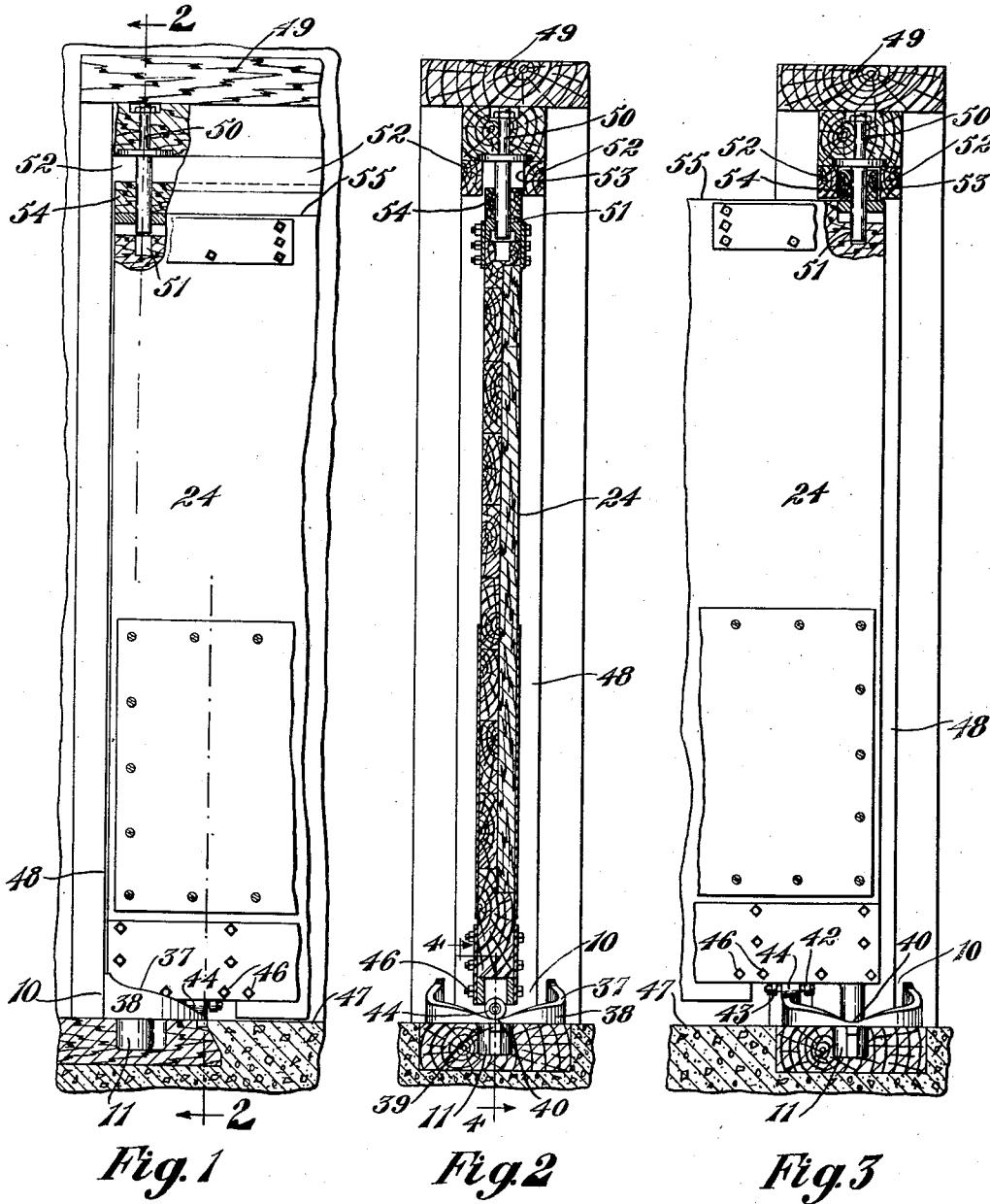
H. E. HUBBS

2,220,335

SELF-CLOSING HINGE APPARATUS

Filed Aug. 12, 1939

2 Sheets-Sheet 1



Inventor

Henry E. Hubbs

By *Freese and Bishop*
Attorneys

Nov. 5, 1940.

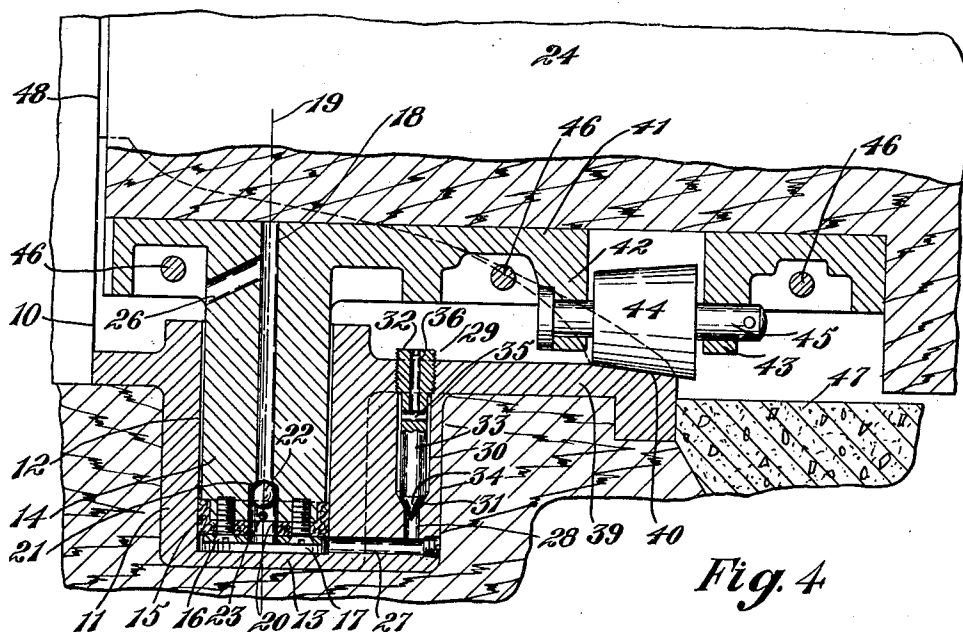
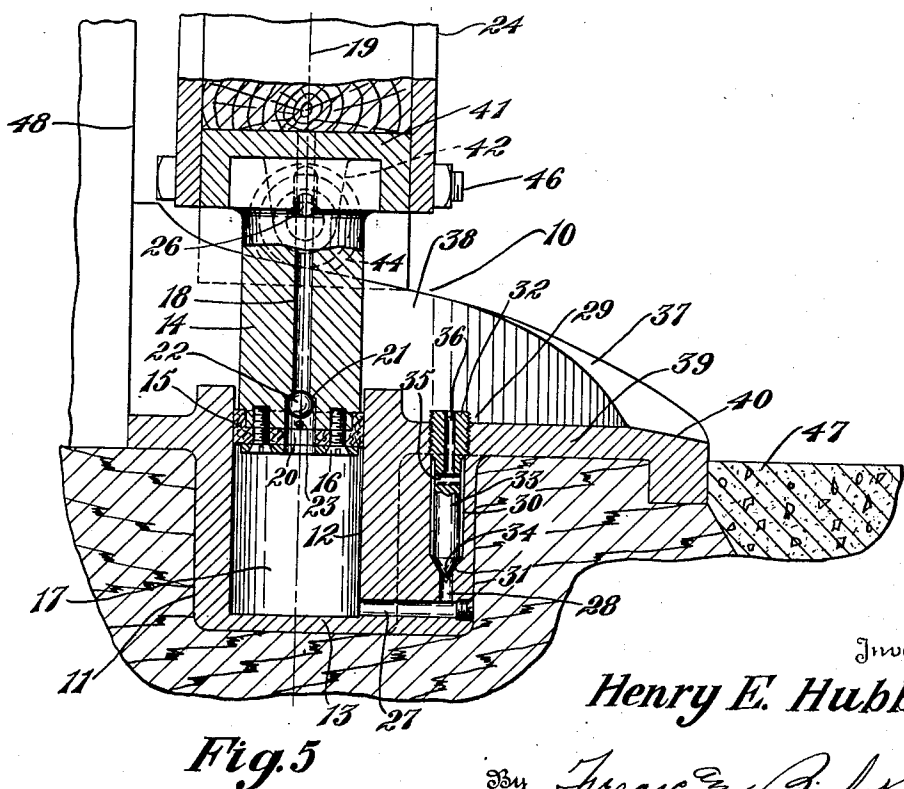
H. E. HUBBS

2,220,335

SELF-CLOSING HINGE APPARATUS

Filed Aug. 12, 1939

2 Sheets-Sheet 2



UNITED STATES PATENT OFFICE

2,220,335

SELF-CLOSING HINGE APPARATUS

Henry E. Hubbs, Shelby, Ohio, assignor to The
Shelby Spring Hinge Co., Shelby, Ohio, a cor-
poration of Ohio

Application August 12, 1939, Serial No. 289,813

1 Claim. (Cl. 16—154)

The invention relates to self-closing hinge apparatus generally, and more particularly to self-closing hinge apparatus for use on relatively heavy double acting doors in post-offices, warehouses, factories, or other places where merchandise or materials are moved in trucks through doorways preferably provided with pairs of such double acting doors.

For such purposes, double acting gravity actuated hinges have been heretofore provided, but have been objectionable because after a door so hinged has been opened, the automatic closing of the same is very rapid, and causes noise by the quick oscillation of the door on a roller on a circular inclined cam in one form of gravity hinge in use.

A rapidly operating self-closing hinge on such a door is also objectionable because of the danger of catching and striking a person in the doorway on the rebound of the door.

Moreover, a self-closing gravity hinge utilizing a roller on a circular inclined cam tends to be self-destructive because of the sharp jar on the hinge parts when the door on which it is used swings by the closed position.

The objects of the present invention include the provision of an improved self-closing oscillating or double acting hinge particularly adapted for a heavy door, and in which the speed of the self-closing swings or oscillations of the door and the supporting hinge parts is controlled, thereby overcoming the foregoing disadvantages of a self-closing hinge apparatus in which the closing swings or oscillations of the hinge parts and the door or other member hinged thereby are uncontrolled.

Further objects of the present invention include the provision of an improved self-closing hinge apparatus of simplified and compact construction, and which is adapted for easy and economical production, use, and maintenance.

The foregoing and other objects are attained by the apparatus, parts, combinations and sub-combinations of the present invention, the nature of which is set forth in the following general statement, and by way of example preferred embodiments of which and their mode of operation are set forth in the following description, and which are particularly and distinctly pointed out and set forth in the appended claims forming part hereof.

The nature of the improved hinge apparatus of the present invention may be stated in general terms as including a member having walls forming a cylinder having a preferably upwardly

opening cylinder bore and a cylinder head extending across one end of the cylinder bore, which is the lower end thereof when the cylinder bore is upwardly opening for the preferred use of the hinge for a heavy door having a vertical axis of hinge swing or oscillation.

A hinge pin piston member is rotatable and reciprocable in the cylinder bore of the other member, and the hinge pin piston member extends downwardly into the cylinder bore when the same is upwardly opening.

The cylinder head and the piston and the cylinder bore form a compression chamber therebetween, and preferably gravity actuated means are operative upon rotation of the members with respect to each other from one position usually the closed position to reciprocate and reversely rotate or oscillate the members with respect to each other.

Fluid, preferably air, is admitted into the compression chamber through preferably check valved intake duct means on movements of the piston away from the cylinder head, and bleeder outlet duct means are provided for discharging the compressed fluid from the compression chamber when the piston is moving towards the cylinder head, thereby controlling the velocity of free swing or oscillation of the members with respect to each other and the door or other part supported on one of the members.

By way of example, preferred embodiments of the improved hinge apparatus and parts thereof, are illustrated in the accompanying drawings forming part hereof, in which

Figure 1 is a fragmentary elevation view of a door hinged by one preferred embodiment of the improved hinge apparatus hereof for swinging in a doorway about a vertical axis, the door being shown in its closed position;

Fig. 2, a fragmentary sectional view thereof as on line 2—2, Fig. 1;

Fig. 3, a view similar to Fig. 2 with the door shown in an open position;

Fig. 4, an enlarged fragmentary sectional view thereof as on line 4—4, Fig. 2 illustrating details of the improved hinge apparatus with the parts in their relative positions when the door is closed; and

Fig. 5, a view similar to Fig. 4, but with parts in their relative positions when the door has been opened and is ready for self-closing.

Similar numerals refer to similar parts throughout the several views.

The illustrated preferred embodiment of the improved hinge apparatus hereof is indicated

generally by 10 and includes preferably a one-piece cylinder member 11 which may be a steel casting, having walls forming an upwardly opening cylinder bore 12 and a cylinder head 13 extending across the lower end of the cylinder bore 12.

A hinge pin piston member 14 fits and extends downwardly into and is rotatable and reciprocable in the cylinder bore 12. The lower end of the hinge pin piston member 14 opposite the cylinder head 13 may preferably have secured thereon a leather washer 15 as by screw clamp means 16.

The cylinder head 13 and the piston 14 and the cylinder bore 12 form a compression chamber 17 therebetween. For admitting fluid to the compression chamber, preferably check valved intake duct means are provided which as shown are in the piston 14.

The check valved intake means in the piston 14, as shown, include a central duct bore 18 coaxial with the vertical axis 19 of the piston 14 and extending throughout the entire length of the piston. The lower end of the duct 18 is provided with a counterbore 20, and the washer 15 and screw clamp means 16 are apertured for registering with the lower end of the counterbore 20. The upper shoulder 21 between the counterbore 20 and the duct 18 provides a seat for the check valve ball 22, and a transverse pin 23 as shown extends in the lower end of the piston 14 laterally across the counterbore 20 below the check valve ball 22 for preventing the ball from dropping out of the counterbore 20 and maintaining the ball closely adjacent to the shoulder valve seat 21, so as to provide a check valve for the fluid intake duct means for the compression chamber 17.

The extreme upper end of the duct 18 is closed by a lower portion of the door 24 mounted on the improved hinge apparatus 10. Intermediate the ends of the piston 14 and above the upper end of the cylinder member 11, the piston 14 is provided with a transverse duct bore 26 the inner end of which communicates with the vertical duct bore 18 and the outer end of which in the hinge apparatus 10 communicates with the outside air, air being preferably utilized in the improved hinge apparatus 10 as the working fluid.

Bleeder or restricted outlet duct means are also provided for discharging fluid from the compression chamber 17, and as shown include a transverse outlet duct bore 27 the inner end of which communicates with the compression chamber 17 through the wall of the cylinder bore 12 and the outer end of which communicates with the lower end of a vertical outlet duct bore 28. The upper end of the bore 28 is provided with preferably adjustable bleeder needle valve means indicated generally by 29.

The bleeder needle valve means 29 as shown includes an upper counterbore 30, the lower end of which connects with the upper end of the bore 28 by a conical shoulder 31.

The upper end of the counterbore 30 as shown is internally threaded and has screwed therein the upper enlarged externally threaded end 32 of an adjusting needle 33 which is of less diameter than the counterbore 30 and extends downwardly from the upper threaded end 32 and terminates in a conical end 34 having substantially the same taper as the conical shoulder 31.

The needle 33 is furthermore provided with a transverse duct 35 intermediate the upper

threaded end 32 and the lower conical end 34, the opposite ends of the transverse duct 35 communicating with the counterbore 30. A vertical duct bore 36 is provided in the needle 33, the lower end of the vertical duct bore 36 communicating with the transverse duct bore 35 and the upper end of the vertical duct bore 36 communicating with the atmosphere.

Accordingly by screwing the threaded upper end 32 of the adjusting needle 33 upwards or 10 downwards, the conical end 34 of the needle 33 may be adjusted as desired closely adjacent the conical shoulder 31, whereby the discharge of fluid from the compression chamber 17 through the transverse duct 27 and the vertical duct 28 15 may be restricted to any desired rate, depending upon the width of the restricted annular opening between the conical end 34 of the needle 33 and the conical seat 31.

After passing through the restricted annular opening the fluid flows around the needle 33 in the counterbore 30, through the transverse duct 35 in the needle 33, and out of the vertical duct 36.

The improved hinge apparatus 10 furthermore 25 includes means operative upon rotation of the piston member 12 with respect to the cylinder member 11 from one position, usually the closed position as shown in Figs. 1, 2 and 4, to reciprocate and reversely rotate or oscillate the piston 30 in the cylinder bore.

The reciprocating and reversely rotating means, as shown and preferably, are gravity actuating means which include a cylindrically curved and inclined cam face 37 formed on the 35 upper end of a U-shaped wall 38, the lower end of which is connected with a horizontal flange and mounting plate 39 extending outwardly from the upper end of the cylinder member 11.

The curved and inclined cam face 37 has a 40 low point 40 which is located in a radial plane of the vertical axis 19 of swing or oscillation of the hinge pin piston 14, and the inclined cam face 37 curves preferably symmetrically upwardly about opposite sides of the radial plane contain- 45 ing the low point 40.

The upper end of the hinge pin piston 14 is connected with a laterally extending arm 41 from which depends downwardly at opposite sides of the U cam wall 38 laterally spaced bearing brackets 42 and 43 having aligned bearing bores therein.

A preferably tapered roller 44 is located between the bearing brackets 42 and 43, and has an axial bore therein aligned with the bores 55 of the bearing brackets 42 and 43, and a bearing pin 45 extends through the bores of the bracket 42, the roller 44, and the bracket 43; the external tapered surface of the roller 44 resting upon and rolling on the curved and inclined cam face 37. 60

The lower end of the door 24 is connected with the arm 41 as by transverse bolts 46. The hinge apparatus 10 is mounted on the floor 47 of the doorway opening adjacent one vertically extending side door jamb 48 thereof. The doorway opening furthermore includes an upper horizontally extending head jamb piece 49 from which downwardly extends a top pivot pin 50 having a vertical axis in alignment with the vertical swinging or oscillating axis 19 of the 70 lower hinge pin piston 14. The lower end of the top pivot pin 50 extends into an aligned vertical bore 51 formed in the upper end of the door 24.

As shown horizontally extending spaced head 75

guide pieces 52 depend downwardly at opposite sides of the head jamb piece 49 and form a horizontally extending downwardly opening channel 53 in which a horizontally extending follow piece 54 is arranged to slide up and down, the follow piece 54 having a vertical bore therein through which the top pivot pin 50 extends. The upper horizontal end face 55 of the door 24 is located below the lower horizontal faces of the guide pieces 52 a sufficient distance so that the upper end face 55 of the door 24 does not strike the guide pieces 52 at the position of extreme upper displacement of the door 24. The follow piece 54, when the door is in the closed position, as shown in Figs. 1 and 2, rests upon the upper end face 55 of the door 24.

The door 24 as shown is of double plank heavy construction, and in use when associated as above described with the improved hinge apparatus 10, when the door 24 is rotated or swung from the closed position as shown in Figs. 1, 2 and 4, in either direction about the vertical axis 19 of swing, the roller 44 rolls upwardly on one of the symmetrical curved and inclined halves of the cam face 37, thereby rotating the piston member 14 in the cylinder member 11 and raising the piston member 14 upwardly away from the cylinder head 13 causing an increase in volume of the compression chamber 17 and creating a reduced pressure therein causing air to flow through the check valved inlet duct means into the compression chamber 17, so that when the door and hinge pin piston 14 reach their position of extreme upward displacement from the cylinder head 13 as shown in Fig. 5, a mass of air is contained in the compression chamber 17. This mass of air is compressed in the chamber 17 when gravity, upon release of the door 24 after opening the same causes the roller 44 to roll downwardly on one side of the curved and inclined cam face 37 at the same time reversely rotating the hinge pin piston member 14 and downwardly moving the same towards the cylinder head 13.

The air in the compression chamber 17 beneath the hinge pin piston 14 thus compressed on the downward stroke or movement of the piston 14, cushions the downward movement of the hinge pin member 14 and the door 24 supported thereon and consequently controls and maintains at any desired velocity the closing swinging of

the door 24, depending upon the rate of discharge of the air fluid from the compression chamber 17 as determined by the adjustment of the needle valve 29, and the minimum area of opening of the restricted outlet duct means.

At least one reciprocation of the piston member 14 in the cylinder member 11 and at least one reverse rotation of these members with respect to each other is effected at every opening of the door 24, and usually a number of damped reciprocations and oscillations of the piston member 14 and the cylinder member 11 are effected, each time the door 24 is opened, as by being struck against the corner of a push truck.

The improved hinge apparatus 10 thus attains the objects of the invention by controlling and damping to any desired degree the closing swings or oscillations of the swinging hinge member and the door carried thereby.

The embodiments of the present invention and the parts thereof illustrated and described herein are by way of example, and the scope of the invention is not limited to the same or the particular details thereof, but is commensurate with any and all subject matter contained herein which are or may at any time properly under the patent laws be set forth in the claim hereof or originating herein, and the elements of such claim are intended to include their functional or structural equivalents.

I claim:

Hinge apparatus including walls forming an upwardly opening cylinder bore and a cylinder head extending across the lower end of the cylinder bore, a downwardly extending hinge pin piston rotatable and reciprocable in the cylinder bore and projecting above said bore into the atmosphere when the piston is seated on the lower end thereof, the cylinder head and piston forming a compression chamber therebetween in the cylinder bore, gravity actuated means operated upon rotation of the hinge pin piston from one position to reciprocate and rotate the piston in the cylinder bore, check valved intake duct means in the piston including a vertical duct and a transverse duct in said projecting portion of said piston for admitting air from the atmosphere to the compression chamber, and restricted outlet duct means for discharging air from the compression chamber into the atmosphere.

HENRY E. HUBBS.