Nov. 18, 1930. R. HILL 1,782,040

DOOR CONTROL APPARATUS

Original Filed Aug. 23, 1927 4 Sheets-Sheet 1

Fig. 1

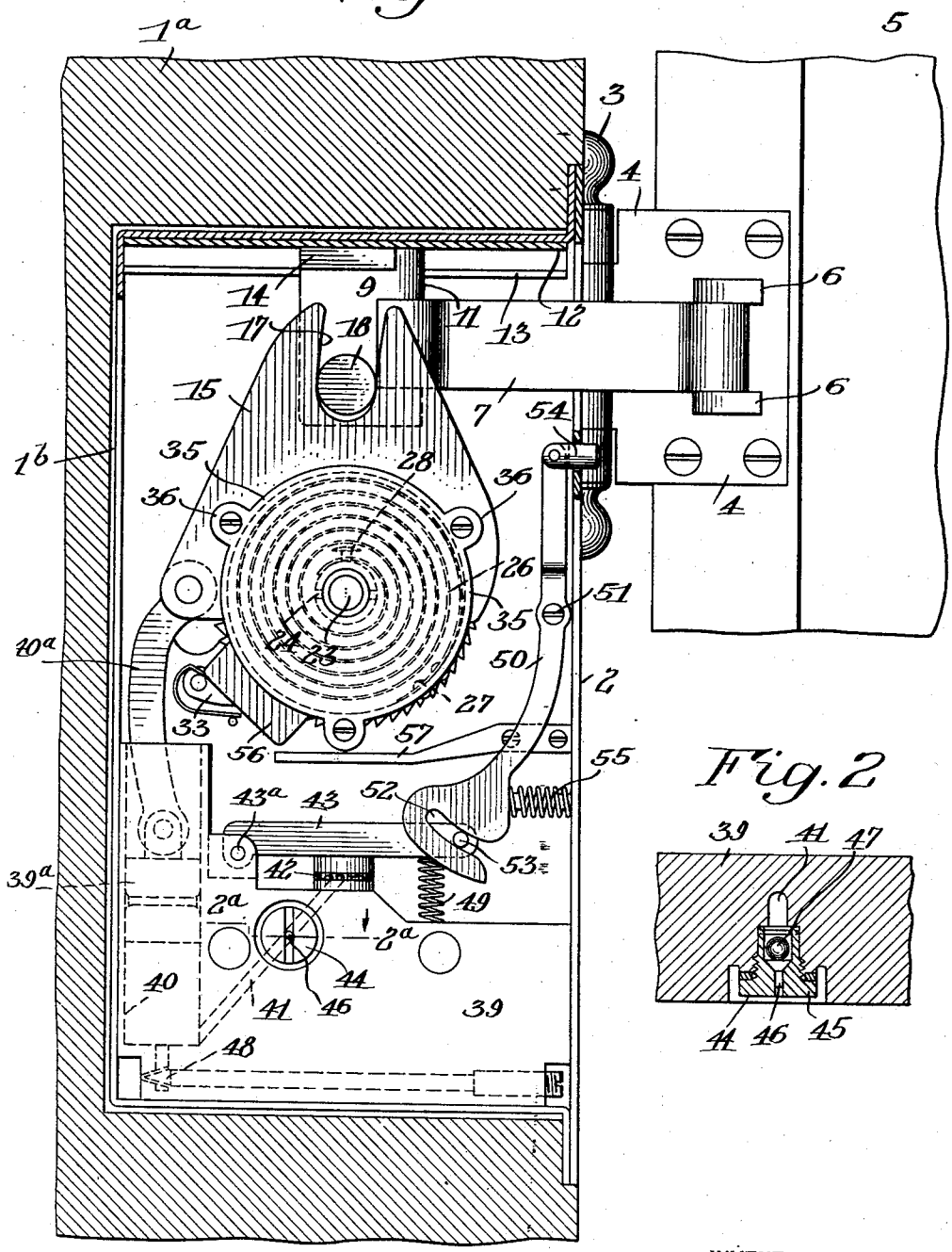


Fig. 2

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Fig. 3

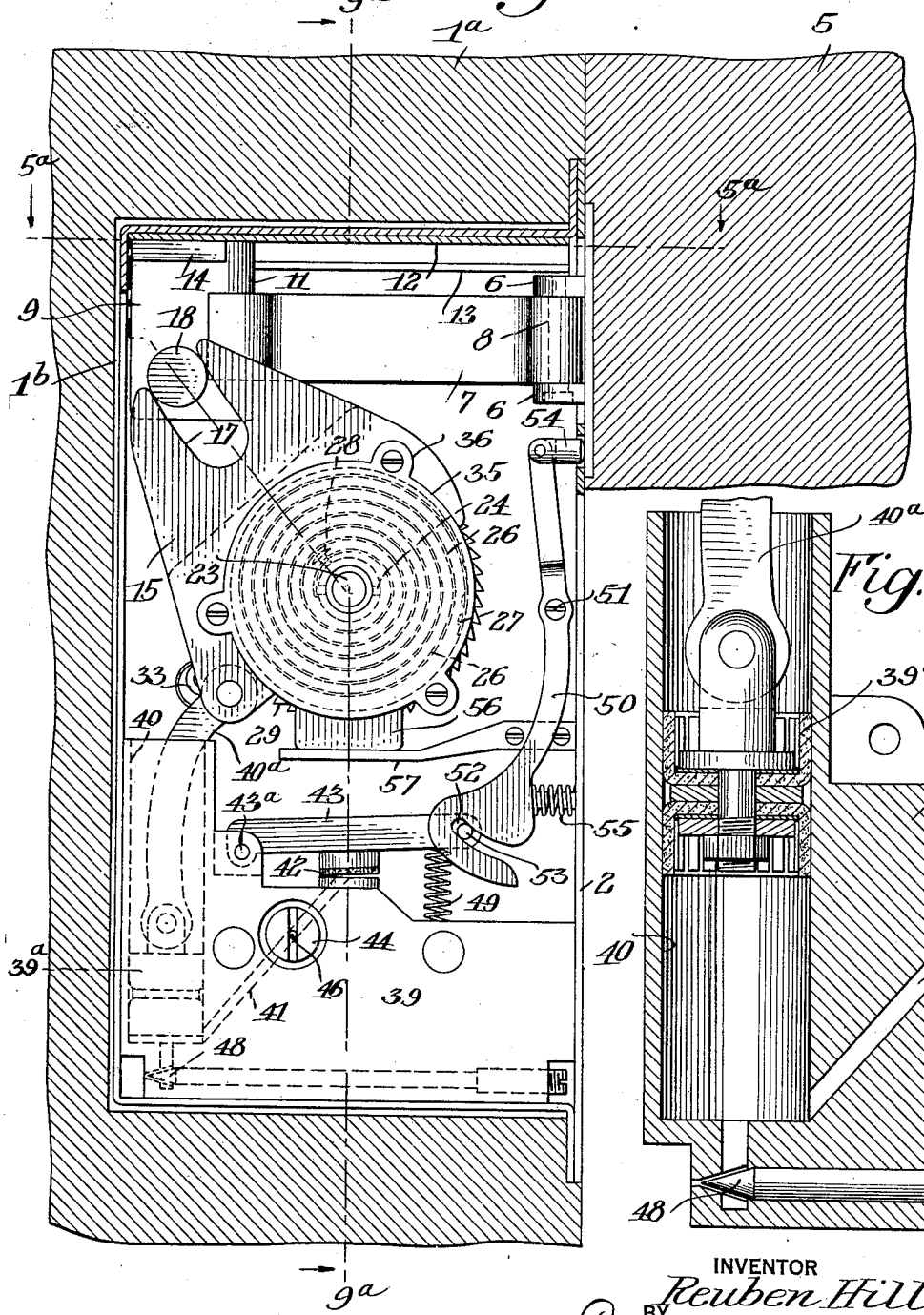


Fig. 4

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DOOR CONTROL APPARATUS

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Fig. 5

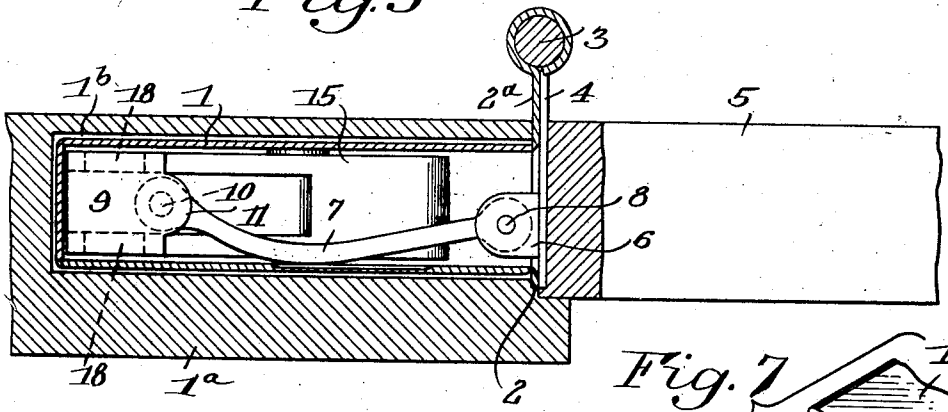
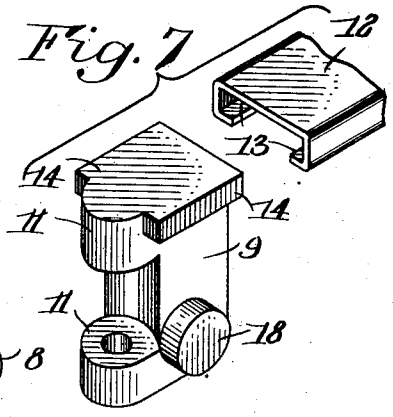


Fig. 7



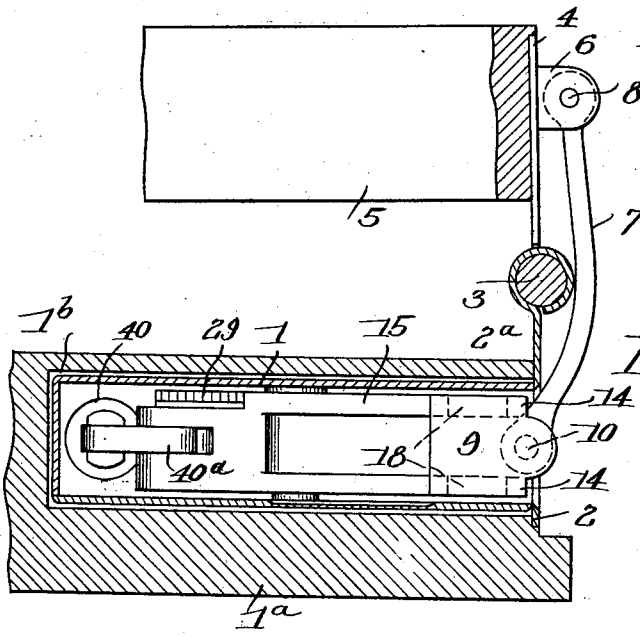


Fig. 6

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DOOR CONTROL APPARATUS

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Fig. 8

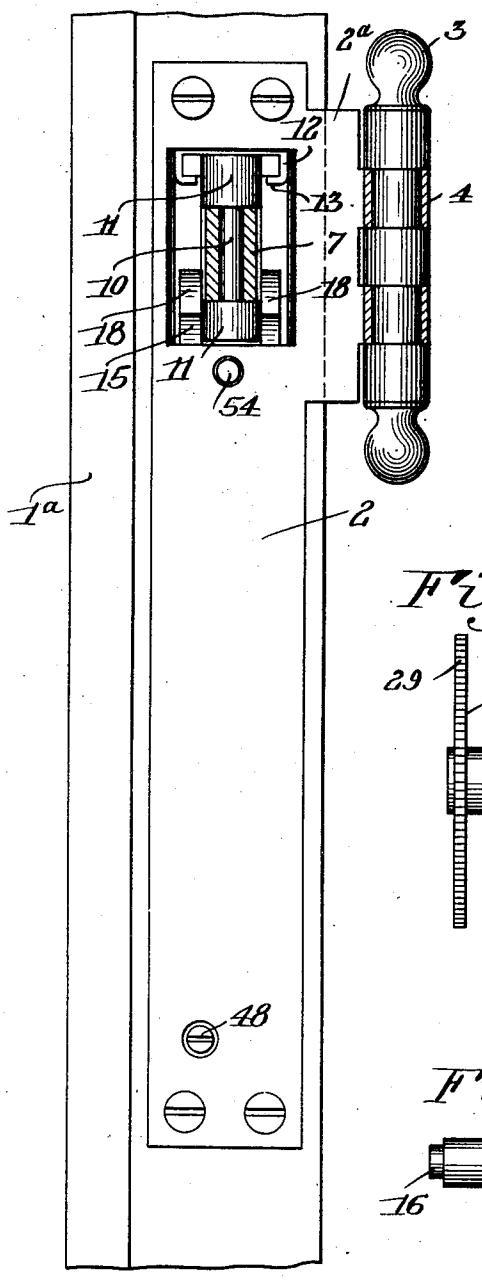


Fig. 9

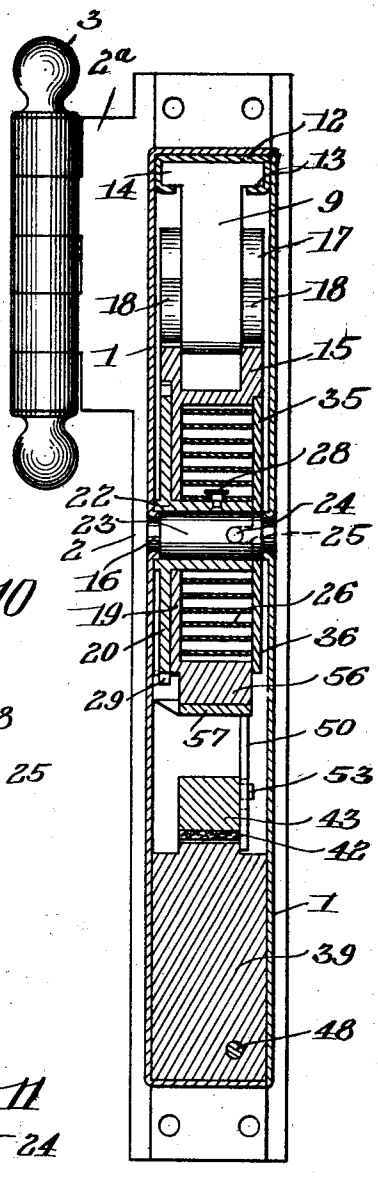


Fig. 10

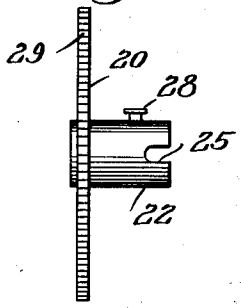
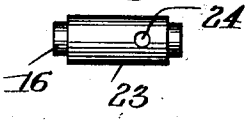


Fig. 11



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UNITED STATES PATENT OFFICE

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DOOR-CONTROL APPARATUS

Original application filed August 23, 1927, Serial No. 214,969. Divided and this application filed August 31, 1928. Serial No. 303,299.

The present invention relates to door control apparatus and more particularly to a door closing and checking device and has for an object to provide an improved unitary and compact device of this class.

A further object of the invention is to provide an improved door closing device designed to be installed and substantially concealed within the door or door jamb.

A further object of the invention is to provide a simple and effective pneumatic door check mechanism for checking or retarding the closing movement of the door in which the pressure is reduced or relieved when the door approaches closing position and in conjunction with which means is provided for effecting a relatively quick closing movement following a reduction in the pressure.

A further object of the invention is to provide an improved door closing mechanism combined with the door hinge for operation thereby in the opening and closing movements of the door.

To these and other ends the invention resides in certain improvements and combinations of parts, all as will be hereinafter more fully described, the novel features being pointed out in the claims at the end of the specification.

In the drawings:

Fig. 1 is a sectional elevation showing the relative position of the parts with the door approximately half way between open and closed positions;

Fig. 2 is a sectional view on line 2^a—2^a of Fig. 1 showing the construction of the check valve;

Fig. 3 is a figure similar to Fig. 1 showing the position of the mechanism when the door is closed;

Fig. 4 is a vertical section taken through the retarding cylinder;

Fig. 5 is a horizontal section taken on line 5^a—5^a of Fig. 3 with the door in closed position;

Fig. 6 is a horizontal section similar to Fig. 5 showing the parts with the door in extreme open position;

Fig. 7 is a fragmentary detail showing the cross-head and guide therefor, the cross-head being removed from the guide for the sake of clearness;

Fig. 8 is a vertical part sectional elevation looking toward the door jamb showing a portion of the cross-head and link therein;

Fig. 9 is a vertical section taken on line 9^a—9^a of Fig. 3 looking in the direction of the arrows;

Fig. 10 is a detailed view of a ratchet wheel having a sleeve attached thereto which cooperates with the master member; and

Fig. 11 is a detailed view of the pin which supports the ratchet wheel and master member in position within the casing.

Similar reference numerals throughout the several views indicate the same parts.

The present invention embodies on improved pneumatic door check and constitutes a division of my co-pending application, Serial No. 214,969, filed August 23, 1927.

The improvement in the present device has to do principally with means actuated by the door when practically closed to effect release of the pneumatic control valve for the retarding cylinder.

Referring to the drawings, 1 designates generally the casing enclosing most of the operating parts of my device. The door jamb is indicated at 1^a and is suitably cut away at 1^b to provide for the installation of the casing 1 therein, as clearly shown in Figs. 1 and 5. The front or outer edge of the casing 1 is provided with a cover plate 2 having an outstanding portion 2^a terminating in the usual knuckle for the insertion of the hinge pintle 3. The other hinge section 4 is of any desired shape and is provided with the usual screw holes so that it may be secured to the door 5 in the usual manner. Outstanding lugs 6 are formed on the face of the hinge section 4, as seen in Figs. 1, 5 and 6. A link element 7 is pivotally connected at one end to the lugs 6 by means of a pin 8 secured at its ends in said lugs. The link 7 extends through an opening in the front of the cover plate 2 and is pivotally connected at its inner end to a cross-head 9 by means of a vertically positioned pin 10 having its ends secured in lugs 11 formed on the cross-head, as shown in Figs. 1, 7 and 8. The cross-head 9

is guided for reciprocating movement at the top of the casing 1 by means of a channel shaped guide 12 riveted to the top of the casing and having inturned flange portions 13 which engage lugs 14 on the cross-head 9 to support the latter.

The means for moving the cross-head in a direction to close the door comprises preferably a master element 15 pivotally mounted upon a pin or bearing 16 having its ends secured in the side walls of casing 1. The upper portion of the master element is substantially triangular in shape and comprises spaced jaws slotted at 17 to receive the bearings or lugs 18 on each side of the cross-head 9 whereby to effect movement of the master member upon reciprocation of the cross-head. The particular shape of the element 15, as shown, is not material, it being understood that a different connection between pins 16 and lugs 18 will serve the same purpose.

Referring to Fig. 9, it will be seen that the element 15 includes a hollow cylindrical casing or drum portion 19 which is recessed at one side to receive a combined ratchet and gear wheel 20 concentric with the cylindrical casing portion 19. A sleeve 22 is constructed integrally with the wheel 20 and projects through one wall of said casing portion to the opposite wall thereof. The pin 16 is secured at its ends in the walls of the main casing 1 and has its enlarged bearing portion 23 seated against the casing walls for the purpose of centering the pin therein. A sleeve 22 fits around the bearing portion 23 and is held from turning by a stud 24 which passes through a hole in the bearing portion and engages in a notch 25 in the sleeve 22.

A coil spring 26 fits within the hollow cylindrical portion 19 of the element 15 and is secured at its outer end to the inner face of the wall thereof at 27. The inner end of the coil spring 26 is secured by a pin 28 to the sleeve portion 22 of the gear element 20. The element 20 is provided with teeth 29 by means of which it may be rotated so as to wind the inner end of said spring around the sleeve 22 to produce the desired tensioning effect. A winding key, not shown, having teeth thereon, is adapted to be inserted through an opening in the face of the casing 1, so located as to cause the teeth of the key to properly mesh with the teeth 29 on the element 20. It will be understood that by turning the winding key in the proper direction, the spring 26 can be properly tensioned.

I provide a spring pressed pawl 33 on the rear wall of casing 1 adapted to engage the teeth 29 to hold the element 20 from reverse movement. For the purpose of releasing the pawl, I provide a slot, not shown, in the face of the casing through which an implement may be inserted to depress the pawl in order to disengage it from the teeth 29, by which means the tension of spring 26 may be readily diminished.

A plate element 35 closes the front of the holow cylindrical portion 19 of element 15 and is provided with ears 36 secured to the face of said element by means of a plurality of screws as shown in Fig. 1.

In the lower part of the casing is shown a casting 39 having a cylinder 40 carrrying a piston 39^a connected with the master element 15 by link 40^a, as shown in Figs. 1 and 3. A duct 41 leading from the lower end of the cylinder 40 has its upper end closed by a valve 42 provided on a pivot bar 43. A check valve generally indicated at 44 is provided in the cylinder casting 39. This valve serves to control communication between the duct 41 and the atmosphere and comprises a hollow plug member 45 having an inlet 46, Fig. 2, communicating with the duct 41. The plug is screwed into the casting 39 and connects with the duct 41. A valve seat is provided in the hollow portion of the plug and cooperating with said seat is a ball valve member 47. When the piston 39^a is traveling upward within cylinder 40, the check valve 47 is automatically opened to allow air to pass freely therethrough to the cylinder. The check valve closes, however, when the piston is traveling downward by reason of the pressure forcing the ball member against its seat. When the check valve is closed the air may pass slowly from the cylinder to the atmosphere through a suitable metering valve 48 which is adjustable to vary the amount of air discharging from the cylinder.

The operating means for the valve 42 comprises a spring 49 adapted to normally lift the valve to uncover the end of duct 41 and also a releasing element 50. The releasing element 50 comprises a lever pivoted at 51 to the casing 1. The lower end of the lever is widened and has formed therein a cam slot 52 adapted to engage a lug 53 on the rod 43 which is pivoted to the casting 39 at 43^a. The cam slot is eccentric to the axis of the pivot pin 51 so that the inner end of said slot, as seen in Fig. 1, lies somewhat closer to the pivot 51 than the lower end. This element provides means for lifting the bar 43 having the valve 42 thereon when the upper end of the lever 50 is swung inwardly by the door from the position shown in Fig. 1.

A plunger 54 is pivotally connected to the upper end of lever 50 above pivot 51. The plunger projects through an opening in the casing cover plate 2 and lies in such a position that its end will be struck by the hinge of the door as it closes, thus causing the lower end of the lever to swing forwardly, thus causing the cam or eccentric portion of the lever to raise the bar 43 through engagement with the lug 53 whereby to raise valve 42 to uncover the upper end of duct 41. A compression spring 55 bears at one end

against the lever 50 and at the other against the cover plate 2 of the casing and serves to hold the lower end of lever 50 at its extreme left hand position, as viewed in Fig. 1.

The master element 15 is provided with a lug 56 having a flat surface which lies at right angles to a radial line through the pin 16 on which the element 15 is mounted.

A leaf spring 57 is fixed at its front end to the casing and projects beneath the element 15 in a position to be depressed by the lug 56. It will be seen that this spring serves to aid in the retarding action of the door to some extent until a point is reached where the door is nearly closed and the corner of the lug 56 has reached the position at which it no longer depresses the spring 57. At this point in the closing operation the spring 57 will quicken its movement to effect a snapping action of the master member which will result in a relatively quick movement of the door to extreme closed position. At or just before the snapping action of the spring, valve 42 will be opened by the action of the lever 50 to permit a quick discharge of the air from the cylinder, whereby to decrease the load on the springs 26 and 57. When the flat face of lug 56 is in engagement with spring 57, it will be seen that there is a latching action, that is, the parts will be frictionally held in this position and it will take slightly more force in opening the door to move it the first few inches of its movement than it will after the lug 56 and spring 57 have separated.

When the door has been opened a short distance, it will be seen that the hinge passes out of contact with the end of plunger 54 allowing it to move outwardly under the force of spring 55 and the cam on the lower end of lever 50 will cooperate with the lug 53 on the bar 43 to move it downwardly whereby to close the valve 42. The cylinder 40 is opened to the atmosphere while the door is being opened by the unseating of the check valve 47. When the door has been opened and released, the spring 26 serves to close the same under the retarding force of the air acting against the downward movement of the piston.

I claim as my invention:

1. A door control device, comprising a casing, an element pivotally mounted in said casing and having a spring connected therewith through which force is transmitted to close the door, an operating member for said element arranged to slide thereon during operation thereof, a supporting guide for the operating member on which the latter is free to slide, a second spring in said casing having a contact surface, and a lug on said element adapted upon rotation of said element to engage said surface whereby said second mentioned spring will operate to oppose or retard the rotation of said element during a portion of its movement through engagement of the lug and will quicken the action for the rest of its movement to effect a quickened movement of the door when approaching extreme closed position.

2. In a door closing device, a flat elongated casing arranged to be positioned longitudinally within a door jamb and having an aperture in the edge thereof, a link movable endwise through said aperture and having its outer end arranged for connection to a door, a pin secured within said casing positioned transversely to the length thereof, an element pivotally mounted on said pin, said element being connected above its pivotal axis to the inner end of said link, spring means associated with said element tending to move the same about its pivotal axis in a direction to close the door, retarding means positioned within said casing below said element and operatively connected thereto so as to oppose the action of said spring means, and means associated with said retarding means for decreasing its retarding effect at a predetermined point in the movement of said element in the door closing direction, said means comprising an element projecting through said casing in a position to be engaged and moved by the door in its closing movement.

3. In a door closing device, a flat elongated casing arranged to be positioned longitudinally within a door jamb, an aperture in the edge of said casing, a link movable endwise through said aperture and having its outer end arranged for engagement with a door, an element pivotally mounted in said casing to oscillate substantially in the plane of the door when in closed position, said element being connected above its pivotal axis to the inner end of said link, spring means associated with said element tending to move the same about its pivotal axis in a direction to close the door, retarding means positioned within said casing below said element, said retarding means comprising a cylinder, a piston in said cylinder, a piston rod connected at one end to said piston and at the other end to said element, a check valve for allowing free passage of fluid within said cylinder only when the rotary element is moving in the door opening direction, an additional valve associated with said cylinder, a movable cam arranged to open said valve when said cam is moved, and means for moving said cam comprising a member projecting through said casing in a position to be engaged by the door in its closing movement.

4. In a door control device, a support arranged for insertion within a recessed door member or door jam member, an oscillatory device upon the support, a link carried by said oscillatory device for connection with one of said members, means serving to move the oscillatory device in a direction to exert

a pull on the link to move the latter from an outer to an inner position, and a yieldable element having one end fixed to the support and the other in a position to be flexed by a portion of said oscillatory device when the link approaches said inner position.

5. In a door control device, a support arranged for insertion within a recessed door member or door jam member, an oscillatory device upon the support, a link carried by said oscillatory device for connection with one of said members, means serving to move the oscillatory device in a direction to exert a pull on the link to move the latter from an outer to an inner position, and a yieldable element fixed to the support and arranged to cooperate with a portion of the oscillatory device to quicken the movement thereof when the link approaches its inner position.

6. In a door closing device, a support adapted for insertion in a recessed door member or door jam member, an oscillatory device on said support arranged for movement between inner and outer positions thereon, a link pivoted on the oscillatory member and adapted for connection with one of said members, means for moving the oscillatory member from the outer to the inner position, means for retarding the inner movement of the oscillatory member, and a control device independent of the oscillatory device for effecting a decrease in the retarding action of said retarding means when the oscillatory device approaches its inner position, said control device including an actuating part in position to be operated by one of said members when the door member approaches closing position.

7. A door closing device for operation between a door member and a jamb member comprising an element arranged to be pivotally mounted upon one of said members for a swinging movement thereon, a link connected to one end of said element and arranged to be connected at its opposite end to the one of said members, means acting on said element tending to swing it in one direction about its pivotal axis whereby said door member is urged to a closed position, retarding means associated with said element for opposing its movement in the door closing direction, control means for said retarding means adapted for decreasing its retarding effect, and means projecting in position to be engaged by one of said members at a predetermined point in the closing movement of the door for actuating said control means.

8. In a door closing device, a support arranged to be mounted in a chamber formed in a door jamb substantially in the plane of the door when it is in closed position, door closing means connected with the support for operation within the chamber and including a part adapted for connection with the door, said means during the opening of the door being conditioned to effect movement of the door to substantially closed position when released, a retarding device arranged to occupy a position within said chamber and cooperating with the closing means to retard its action when operating to close the door, and control means arranged for operation within the chamber and associated with said retarding means for effecting a decrease in its retarding action when the door approaches closed position, said control means including a spring pressed lever having a part projecting in the path of and arranged to be actuated by the door whereby to render the control means effective.

9. A door control device comprising means adapted for operation between a door jamb and a door arranged during the opening movement of the latter to be conditioned thereby to effect movement of the door to substantially closed position when released, means for retarding the door when moving to said position, and control means independent of the door closing means arranged to effect a decrease in the retarding action of said retarding means when the door approaches said position, said control means comprising relatively movable parts one of which is arranged to be engaged and actuated by the door when nearing closing position.

10. A door control device for operation between a door and a door jamb having a chamber formed therein comprising closing means within the chamber for the door adapted to be connected with the latter and arranged to be conditioned thereby during the opening of the door to effect closing of the same when released, pneumatic retarding means for the closing means including a pressure control valve, and actuating means for the valve including a part arranged to be operated by the door independently of the closing means for retarding the action of said retarding means when the door approaches a predetermined position.

11. A door control device comprising means adapted for operation between a door jamb and a door, comprising closing means arranged to be conditioned during the opening of the door to effect closing of the same when released, pneumatic retarding means for the closing means, means arranged to be operated by the door independently of the closing means for retarding the action of said retarding means when the door approaches a predetermined position, and yieldable means serving to positively effect a relatively quick closing movement of the door when moved to said predetermined position.

12. In apparatus of the class described, door control means for operation between a fixed and a movable door member, comprising a support adapted for connection with one of said members, an oscillatory device on

the support, a link arranged for connection with the other of said members slidably carried by the support and in sliding engagement with said oscillatory device, means tending to urge the oscillatory device in a direction to close the movable door member when the latter is opened, and means arranged to cooperate with said device when the movable door member approaches closing position whereby to effect a relatively quick closing movement of the latter, said means being designed to resist the initial opening movement of the movable door member.

13. In apparatus of the class described, door control means comprising an oscillatory device and a connection arranged for operation between the door jamb and the door, means tending to urge the oscillatory device in a direction to close the door when the latter is opened, a leaf spring fixed at one end and having its opposite end projecting in the path of a portion of said oscillatory device, said portion being designed to move the spring when the door approaches closing position and to subsequently permit a snap action thereof whereby the spring will positively effect a quick closing movement of the door.

14. In apparatus of the class described, door control means arranged for operation between a door member and a jamb member, comprising an oscillatory device arranged for connection with one of said members, a guide on said last mentioned member, a link slidable upon said device and said guide and arranged for connection with the other of said members, means tending to urge the oscillatory device in a direction to close the door member when the latter is opened, and normally inactive means adapted to cooperate with the oscillatory device when the door member approaches closing position to positively effect a relatively quick closing movement of said door member, said means including a part on the oscillatory device and a yieldable element arranged to be tensioned thereby when said part is moved to a predetermined position whereby said part will be actuated by said element.

15. In apparatus of the class described, a door control device arranged for operation between a door member and a jamb member, comprising an oscillatory device and an operating connection thereon, means tending to urge the oscillatory device in a direction to close the door member when the latter is opened, normally inactive means adapted to cooperate with the oscillatory device when the door member approaches closing position to effect a relatively quick closing movement of said door member, retarding means for said oscillatory device, and means independent of the oscillatory device arranged to be actuated by the door member to decrease the retarding action of said retarding means when the door member approaches closing position.

16. In apparatus of the class described, a door control device for operation between a door jamb member and a door member hinged thereto, comprising an oscillatory device adapted to be secured to one of said members, an operating connection for said device arranged to slide thereon during operation thereof and adapted to be secured to the other of said members, guide means forming a support for said connection on which the connection is free to slide, means tending to urge the oscillatory device in a direction to close the door member when the latter is moved to open position, and yieldable means arranged to be engaged and operated by a portion of the oscillatory device to build up an increased resistance in the yieldable means when the door member approaches closing position, said portion being designed to permit the yieldable means when the door is in said position to have a snap action subsequent to movement of the same to a predetermined position whereby to effect a relatively quick movement of the door member to closed position.

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