Nov. 26, 1940. G. PARIOT 2,223,045

DOOR CLOSURE AND CHECK MECHANISM

Filed Sept. 15, 1938 2 Sheets-Sheet 1

Fig. 1.

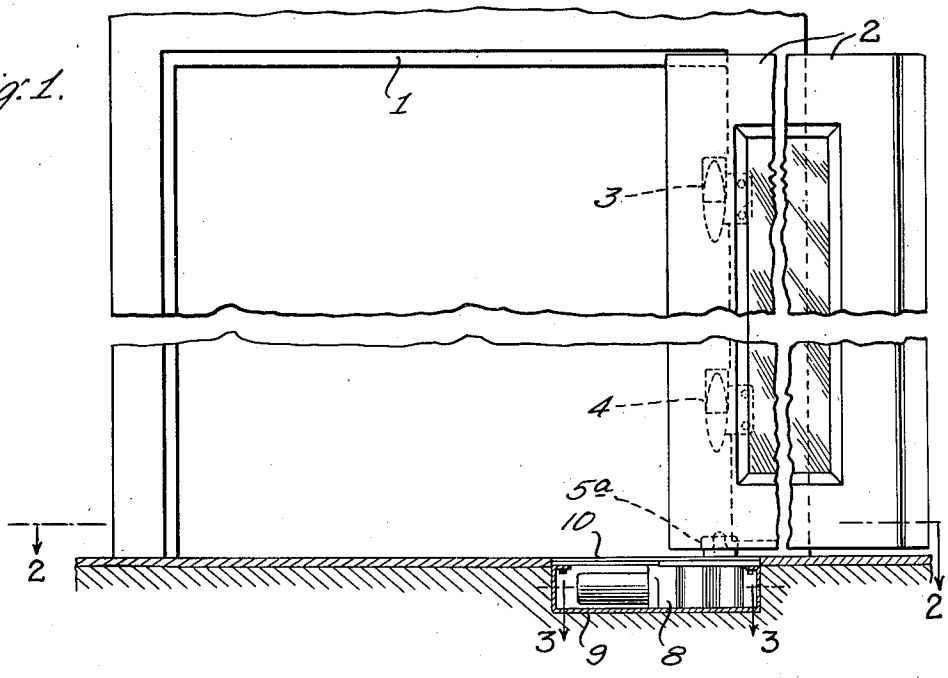
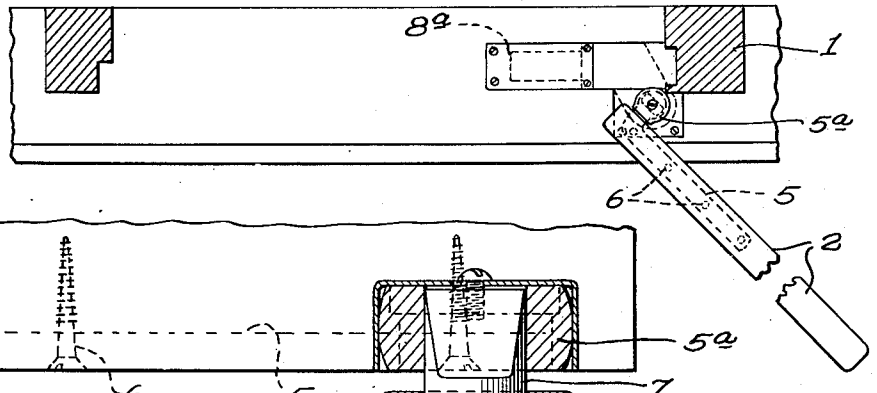


Fig. 2.



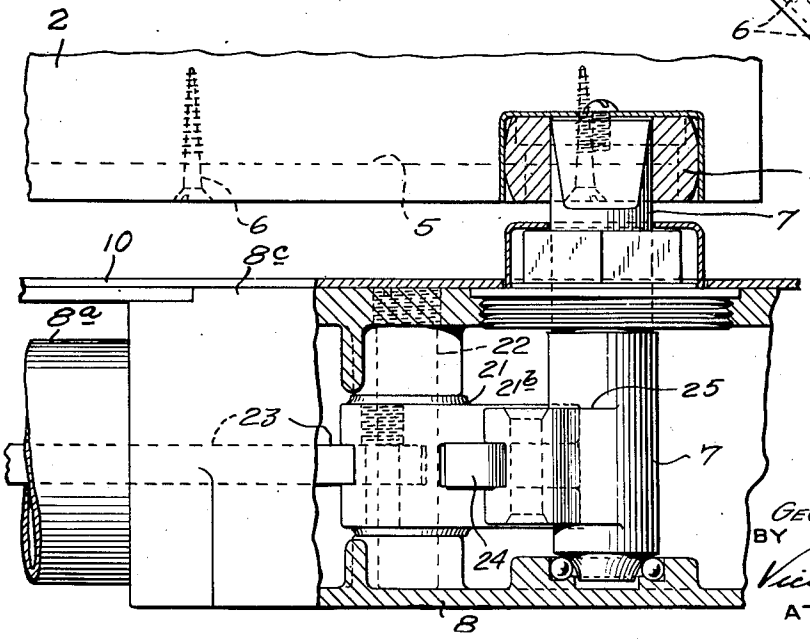


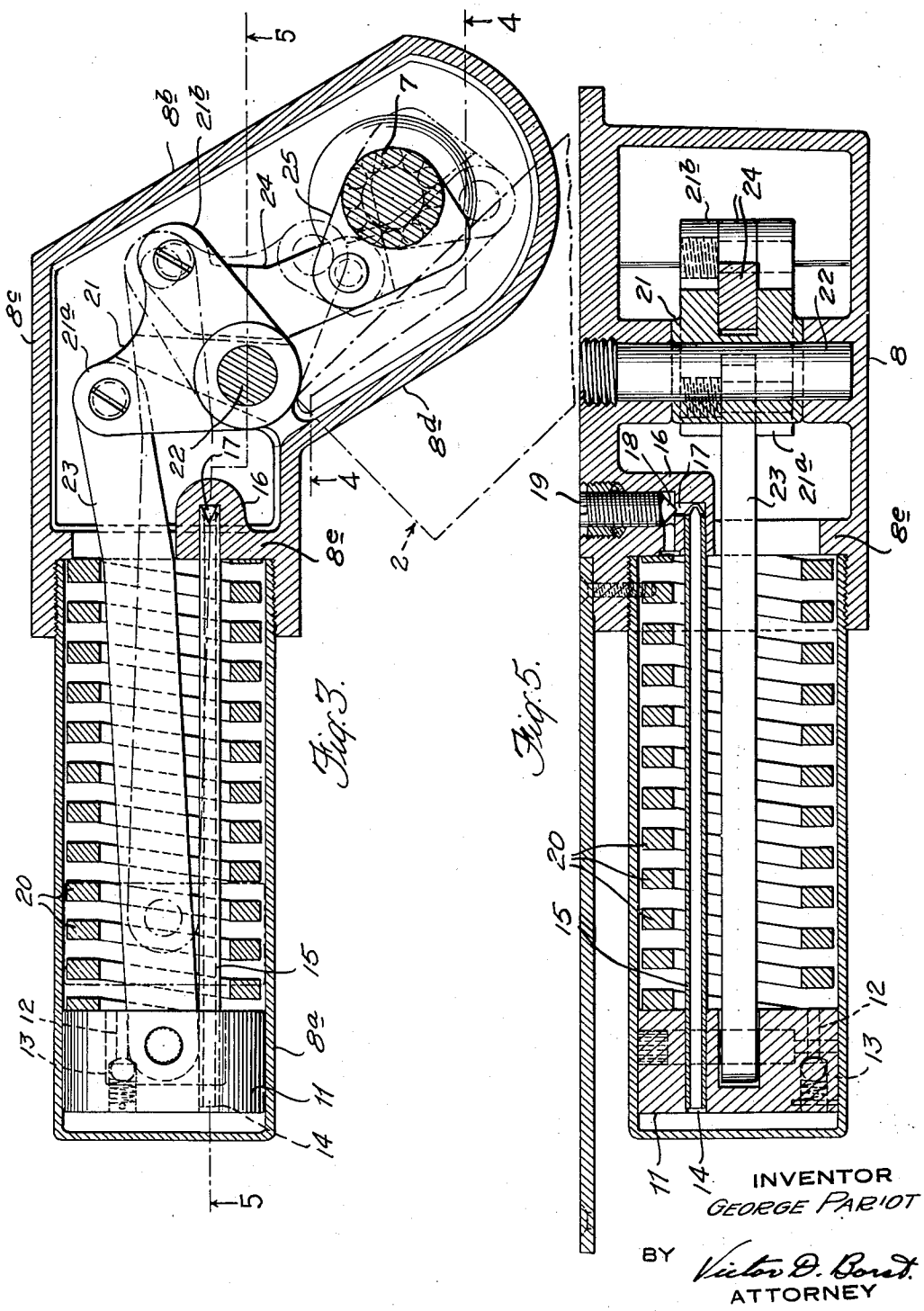
Fig. 4.

INVENTOR
GEORGE PARIOT
BY
Victor D. Brust
ATTORNEY

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DOOR CLOSURE AND CHECK MECHANISM

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INVENTOR
GEORGE PARIOT

BY Victor D. Borst
ATTORNEY

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DOOR CLOSURE AND CHECK MECHANISM

George Pariot, New York, N. Y., assignor to The Oscar C. Rixson Company, a corporation of Illinois

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5 Claims. (Cl. 16—68)

The invention herein disclosed relates to a door closure and check mechanism of the type that is embedded in the floor and from which a pivot extends and is connected to the door.

An object of the invention is to provide a door closure and check mechanism in which the closing force acting to close the door is greatest at or near the closed position of the door and in which the force acting to close the door decreases as the door is opened. Another object of the invention is to provide a structure having these features and that is compact so that substantially all of the mechanism lies beneath the door in the closed position of the door.

These and other objects and certain advantages that will hereinafter appear are realized in the embodiment of the invention disclosed in the accompanying drawings in which:

Fig. 1 is an elevation of a door showing the door in the open position;

Fig. 2 is a transverse section of the same taken on the line 2—2 of Fig. 1;

Fig. 3 is a section of the door closure and check mechanism taken on the line 3—3 of Fig. 1;

Fig. 4 is a fragmentary section taken on the irregular line 4—4 of Fig. 3;

Fig. 5 is another section of the same taken on the line 5—5 of Fig. 3.

In the drawings, 1 represents a door frame to which a door 2 is secured by means of hinges 3 and 4. A bracket 5, having a lateral, cup-shaped extension 5*a* is secured to the bottom of the door by screws 6. The extension 5*a* of the bracket is coaxial with the hinges 3 and 4 and fits over and is secured to a pivot 7 that extends through one wall of the case 8 of the door closure and check mechanism.

The door closure and check mechanism is mounted in a recess in the floor and directly beneath the door in the closed position of the door. A box 9 is provided in the recess in the floor and the door closure is mounted in this box and enclosed by a plate 10. The case of the door closure and check mechanism includes a cylinder 8*a* and a housing 8*b*, the cylinder having one end closed and the other end threaded into the end of the housing which includes a short section 8*c* coaxial with the cylinder 8*a* and a section 8*d* angularly disposed with respect to the axis of the cylinder 8*a*. It is through the wall of the section 8*d*, adjacent the end thereof, that the pivot 7 extends.

Within the cylinder 8*a*, a piston 11 is slidably mounted. The piston has two ports in the face thereof one of which communicates with a passage 12 through the piston and in which there is a ball check valve 13. This check valve is arranged to permit free passage of air to the chamber formed between the face of the piston and the end of the cylinder upon movement of the piston away from the end of the cylinder. The other port forms the end of a passage 14 through the piston in which passage a tube 15 is slidable. This tube extends axially of the cylinder and is secured in a bracket 16 in the housing. The tube communicates with a lateral passage 17 from which the flow of air is controlled by a conical valve 18 on the end of a set screw 19 that is accessible from the outside of the casing. As the piston moves toward the closed end of the cylinder, the air between the piston and the end of the cylinder can only escape through the tube 15. Adjustment of the valve 18, therefore, determines the rate the piston 11 may move towards the closed end of the cylinder.

The piston is urged towards the closed end of the cylinder, i. e. in a direction to effect the closing of the door 2, by a heavy spring 20. The spring acts between the rear face of the piston 11 and a shoulder formed by an internal flange 8*e* formed in the section 8*c* of the housing 8*b*. In the closed position of the door 2, i. e. with the piston adjacent the closed end of the cylinder as shown in Fig. 3, the spring 20 is compressed so that there is a resilient force acting on the door to maintain it in the closed position. As the door is opened, the piston 11 moves away from the closed end of the cylinder and the spring 20 is further compressed. When the open door is released, the piston moves toward the closed end of the cylinder under the action of the spring 20, the speed of the piston being determined by the setting of the valve 18.

The piston 11 is connected to the pivot 7 to effect the foregoing action by a system of links and levers. The links and levers constituting this system are mounted in the case 8 and arranged and interconnected so that the force of the spring is resolved into components in such a manner that the effective force acting to rotate the pivot 7 in a direction to close the door varies upon movement of the door in such a way as to decrease as the door is opened. This system of links and levers includes a bell crank lever 21 having two arms 21*a* and 21*b* angularly displaced through an angle of approximately forty-five degrees. This link is mounted on a pivot 22 at the intersection of the sections 8*c* and 8*d* of the housing. A connecting rod or link 23 is

pivotally secured at one end to the piston 11 and at the other end to the arm 21a of the bell crank 21. A link 24, shaped as illustrated, is pivotally connected at one end to the arm 21b of the bell crank lever and at the other end to a crank 25 formed on the pivot 7. In Fig. 3 the position of the links and levers in the closed position of the door are shown in full lines and the position of the same levers in the open position of the door is shown in broken lines.

It will be seen from Fig. 3 that in the closed position of the door, the crank arm 21a of the bell crank lever 21 is substantially perpendicular to the effective line of the connecting rod 23. The full force of the spring 20, therefore, is acting to effect rotation of the bell crank counterclockwise as seen in Fig. 3. As the door is opened and the bell crank is rotated clockwise from the full line position shown in Fig. 3, the crank 21b after partial movement assumes successive positions in which the force of the spring is resolved into components, one component along the crank and which has no effect upon rotating the crank, and the other at right angles thereto. As the crank 21b is rotated more in the direction in which it rotates when the door is open, the ineffective force component becomes greater and the effective force component becomes less. The crank on the pivot 7 is also arranged to resolve the effective force transmitted from the bell crank. This arrangement is such that the effective component acting on the crank at first becomes greater and then decreases. This sacrifice in the direction towards effectuating one of the objects of the invention is for the purpose of making a compact structure. By the arrangement disclosed, however, the desideratum of having the maximum effective closing force acting on the door in the closed position of the door and a continuous decrease of the effective closing force as the door is opened is realized for all practical purposes.

It will be obvious that various changes may be made by those skilled in the art in the details of the embodiment of the invention illustrated in the drawings and described above within the principle and scope of the invention as expressed in the appended claims.

I claim:

1. In a door closure and check mechanism of the type described, the combination comprising a case including a cylinder and a housing, a pivot extending through a wall of the case and adapted to be connected to a door, a piston slidably mounted in the cylinder, a spring acting on the piston to move the piston towards one end of the cylinder, a series of links and levers connecting the pivot and the piston arranged to effect movement of the pivot in a direction to close a door connected thereto upon movement of the piston under the action of the spring and including a bell crank lever, arranged and interconnected to effect a resolution of the spring force acting on the piston, whereby the effective force of the spring acting to rotate the pivot decreases as the pivot is rotated in a direction to effect compression of the spring.

2. In a door closure and check mechanism of the type described, the combination comprising a case including a cylinder and a housing, a pivot extending through a wall of the case and adapted to be connected to a door, a piston slidably mounted in the cylinder, a spring acting on the piston to move the piston towards one end of the cylinder, a series of links and levers connecting the pivot and the piston arranged to effect movement of the pivot in a direction to close a door connected thereto upon movement of the piston under the action of the spring and including a bell crank lever having two arms displaced through an angle of forty-five degrees, arranged and interconnected to effect a resolution of the spring force acting on the piston, whereby the effective force of the spring acting to rotate the pivot decreases as the pivot is rotated in a direction to effect compression of the spring.

3. In a door closure and check mechanism of the type described, the combination comprising a case including a cylinder and a housing, a pivot offset from the axis of the cylinder extending through the wall of the case and adapted to be connected to a door, a crank on the pivot, a piston slidably mounted in the cylinder, a spring acting on the piston to move the piston towards one end of the cylinder, a system of links and levers connecting the piston and the crank of the pivot arranged to effect movement of the pivot in a direction to close a door connected thereto upon movement of the piston under the action of the spring and to compress the spring on opening the door, the links and levers including a bell crank lever arranged and connected to the piston and the crank on the pivot to effect a resolution of the force of the spring acting on the piston, whereby the effective force acting to rotate the pivot decreases as the pivot is rotated in a direction to effect compression of the spring.

4. In a door closure and check mechanism of the type described, the combination comprising a case having a cylinder and a housing, a pivot offset from the axis of the cylinder, extending through a wall of the case and adapted to be connected to a door, a crank on the pivot, a piston slidably mounted in the cylinder, a spring acting on the piston to move the piston towards one end of the cylinder, a system of links and levers connecting the piston and the crank of the pivot arranged to effect movement of the pivot in a direction to close a door connected thereto upon movement of the piston under the action of the spring and to compress the spring on opening the door, the system of links and levers including a bell crank lever having arms angularly displaced through an angle of approximately forty-five degrees intermediate the piston and the pivot, a connecting rod connecting the piston and one arm of the bell crank lever, and a link connecting the other arm of the bell crank lever and the crank of the pivot, the bell crank lever being arranged to effect a resolution of the force of the spring acting on the piston, whereby the effective force acting to rotate the pivot decreases as the pivot is rotated in a direction to compress the spring.

5. A door closure of the floor type comprising a case including a cylindrical portion and an angular portion, a coil spring axially disposed in the cylindrical portion engaging the case at its inner end, a rotative pivot extending through the wall of the angular portion at right angles to the axis of the spring and substantially offset therefrom, a crank on said pivot located within the case, a connecting member, one end of which engages the outer end of the spring and which is operative to store energy in the spring, a second pivot in the case parallel to the first pivot and whose axis is located between that of the spring and that of the first pivot and nearer to the for-

mer axis than to the latter axis, a crank pivoted on the second pivot and pivotally connected at its free end to the connecting member, said crank being disposed at substantially right angles to the effective line of the connecting member when the spring is under least tension and rotative toward the door actuated pivot to store energy in the spring, and a link connecting the two cranks, whereby the longitudinal component of force on the second crank increases and the rotative component decreases as the door opens.

GEORGE PARIOT.