April 14, 1953 H. E. ROSEBROOK 2,634,970

DOOR OPENER AND CLOSER

Filed March 30, 1951 4 Sheets-Sheet 1

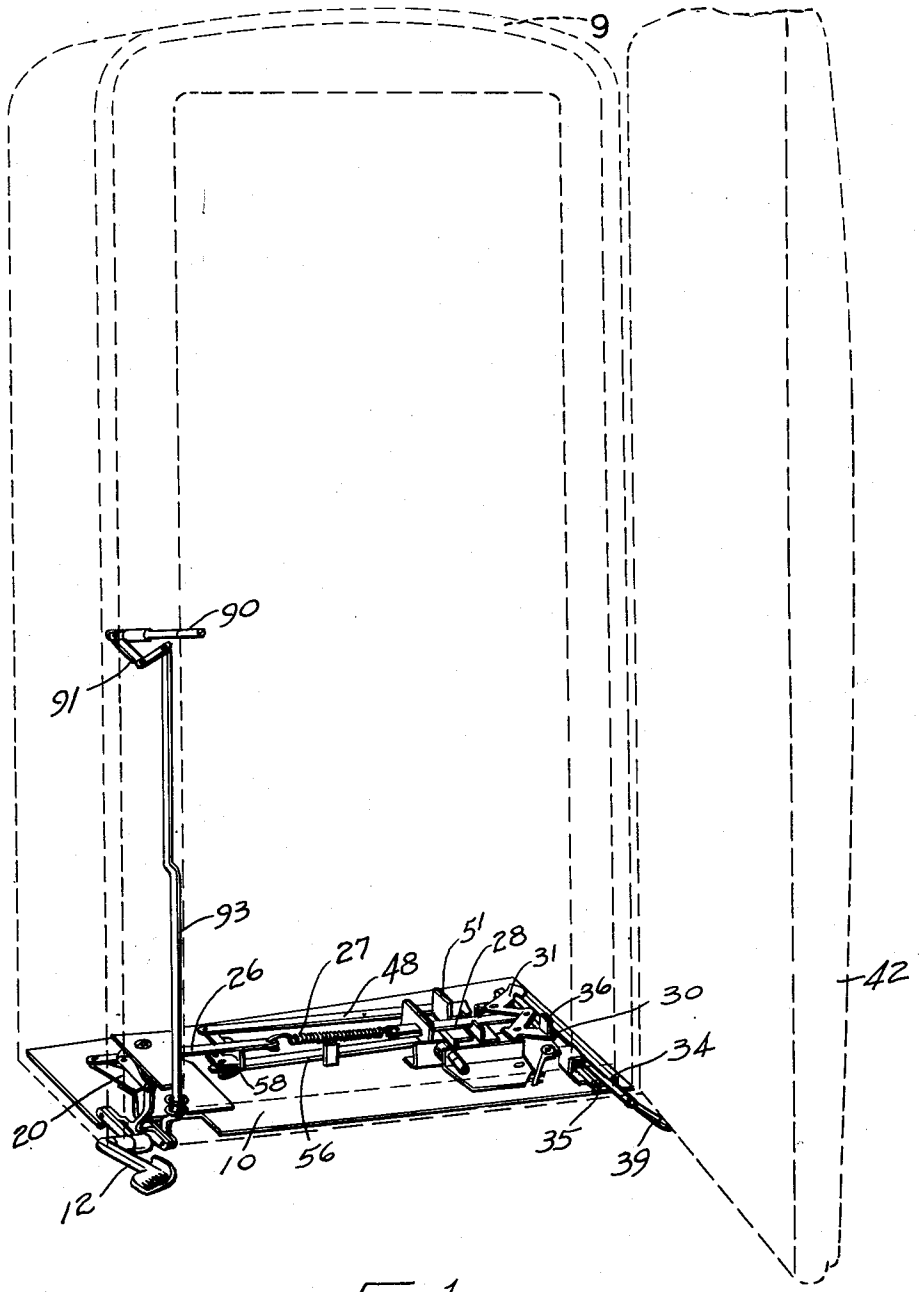


Fig. 1.

INVENTOR.

HOMER E. ROSEBROOK

BY

Richard A. Parsons

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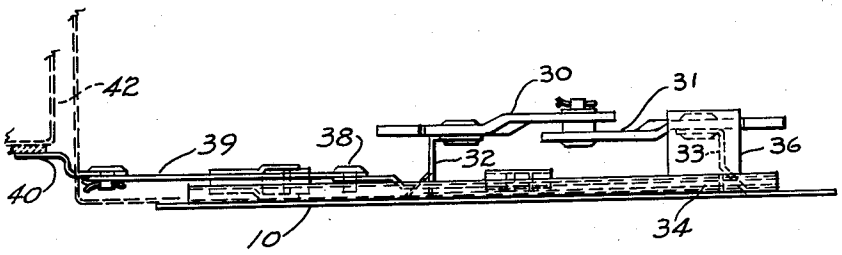


Fig. 5.

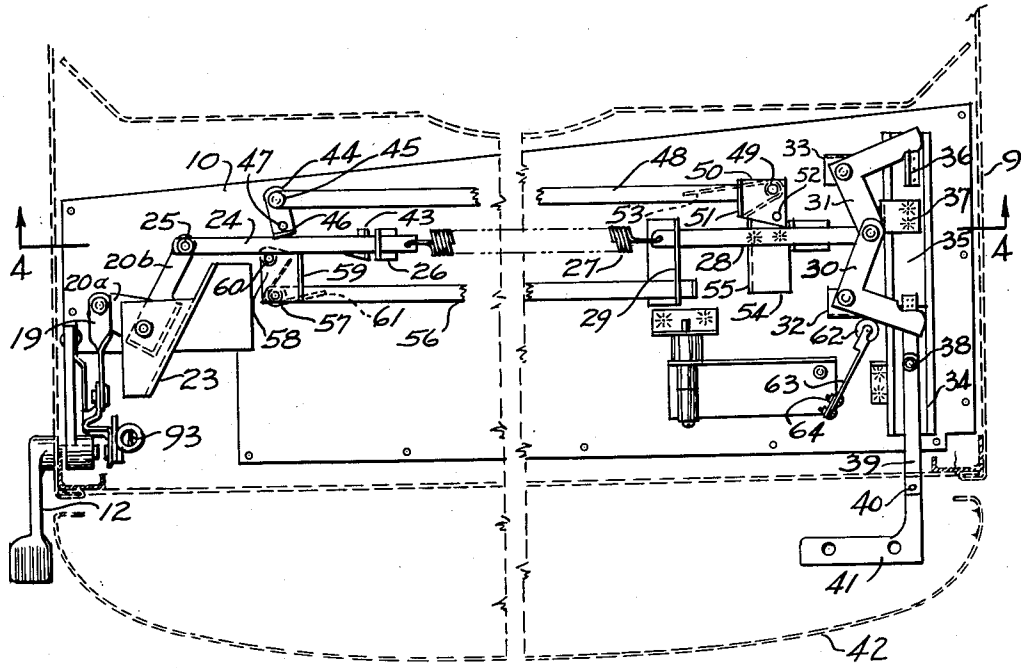


Fig. 2.

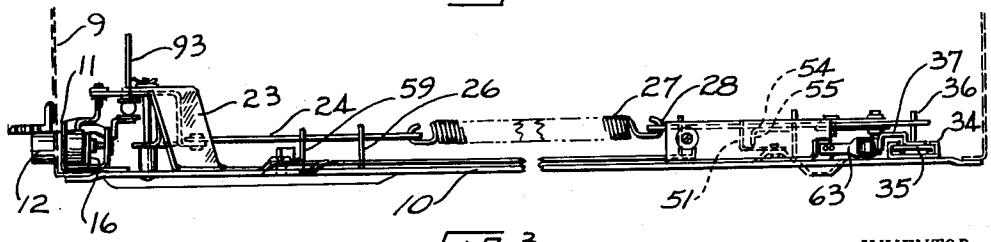


Fig. 3

INVENTOR.
HOMER E. ROSEBROOK
BY
Richard A. Parsons

April 14, 1953 H. E. ROSEBROOK 2,634,970

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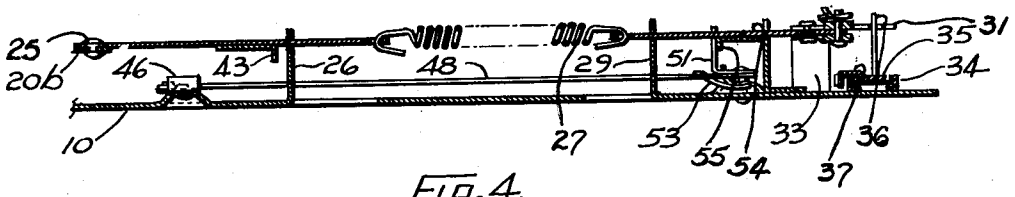


Fig. 4.

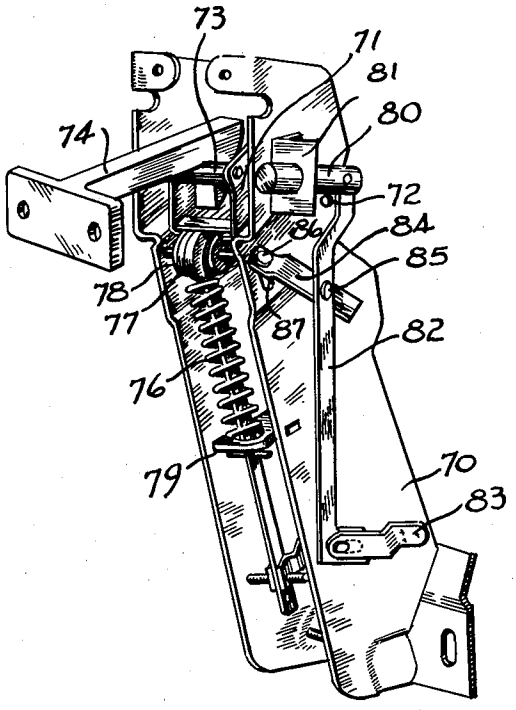


Fig. 7.

INVENTOR.

HOMER E. ROSEBROOK

BY

Richard A. Parsons

April 14, 1953 H. E. ROSEBROOK 2,634,970

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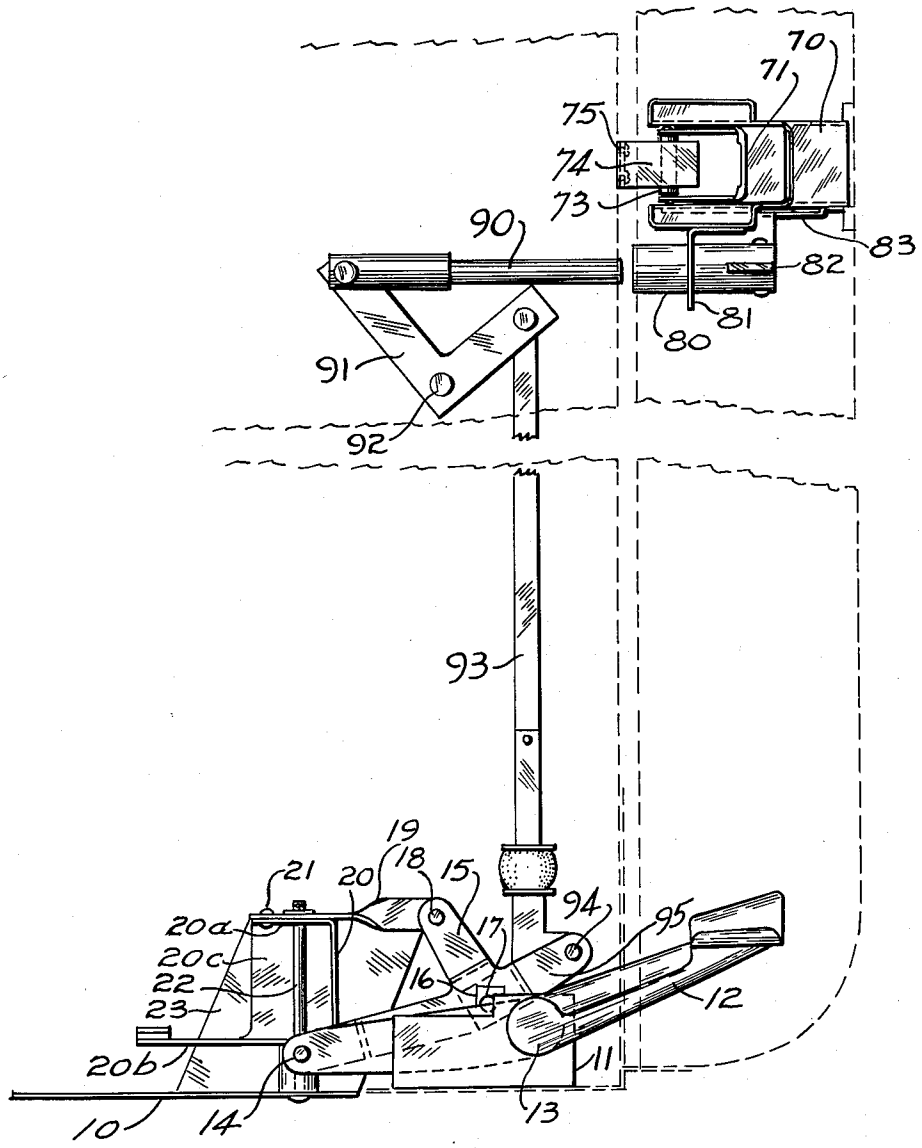


Fig. 6.

INVENTOR.

HOMER E. ROSEBROOK

BY

Richard A. Parsons

Patented Apr. 14, 1953 2,634,970

UNITED STATES PATENT OFFICE

2,634,970

DOOR OPENER AND CLOSER

Homer E. Rosebrook, Greenville, Mich., assignor to Gibson Refrigerator Company, Greenville, Mich., a corporation of Michigan

Application March 30, 1951, Serial No. 218,443

6 Claims. (Cl. 268—36)

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This invention relates to door operators and more particularly to a door operator that will both open and close a door.

While such an operator is useful in many types of door installations, it is particularly useful in the case of doors for refrigerators that may be controlled by a foot pedal, thereby having both of the user's hands free to hold articles being taken from or put into the refrigerator.

The principal object of the invention is to provide a mechanism that will open the door upon operation of a lever, and close the same upon an identical operation of the same lever.

Another object of the invention is to provide a door opener and closer which will release the door latch and simultaneously open the door, and then close the door when desired.

A still further object is to provide a door opener and closer in which the actual opening and closing of the door is controlled by a spring which is stressed by operation of a suitable lever.

These objects will more fully appear in the following specification, when read in connection with the accompanying drawings, wherein:

Figure 1 is a phantom view of a refrigerator showing the door opener and closer in perspective, with the door open;

Figure 2 is a plan view of the door opener and closer;

Figure 3 is a front view of the same;

Figure 4 is a fragmentary cross-sectional view taken on substantially the line 4—4 of Figure 2;

Figure 5 is a right hand end elevational view of a part of the door opener and closer mechanism;

Figure 6 is a fragmentary phantom left hand elevational view of the refrigerator showing the latch operating mechanism; and

Figure 7 is a perspective view of the door latch mechanism.

Referring now in more detail to the drawings, the entire mechanism consists essentially of two sections, the door opener and closer, and the door latch operator. The former is shown in Figures 1 to 5, and the latter in Figures 1 and 6. Figure 7 shows the essential parts of a form of latch which can be operated by the latch operator.

The door opener and closer mechanism is mounted on a supporting plate 10 so that this entire sub-assembly can be mounted as a unit in the bottom of the refrigerator cabinet 9.

A bracket 11 carries a foot pedal in the form of a bell crank lever 12 pivotally mounted thereon at 13. The pedal is outside of the refrigerator

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cabinet while the opposite end of the pedal lever is inside of the cabinet. The rear end of lever 12 is pivotally connected at 14 to another bell crank 15 which in turn is pivotally connected at 17 to a bracket 16 mounted on plate 10. Bell crank 15 is pivotally connected at 18 to a link 19 which is a twisted strip of metal.

Link 19 is pivoted to bell crank 20 at 21. This bell crank 20 is seen as approximately a right angle in Figure 1, but the two arms 20*a* and 20*b* are spaced vertically by a web 20*c* as seen in Figure 6. Bell crank 20 is pivoted above plate 10 by a vertical pin 22 to a bracket 23.

The arm 20*b* is pivotally connected to a bar 24 at 25 which slides through a slot in a guide bracket 26 fixedly attached to plate 10. A coil tension spring 27 is connected at one end to bar 24 and at its other end to one end of a bar 28. The latter slides through a slot in an upstanding guide bracket 29 on plate 10.

Bar 28 is pivotally connected at its opposite end to corresponding arms of a pair of bell cranks 30 and 31 which are pivotally mounted on brackets 32 and 33 respectively, fastened to plate 10.

In a channel shaped guide 34 fastened to plate 10 is a slide 35. This slide may be of an elongated channel member, as shown in Figure 3. The slide carries an upstanding abutment 36 and a latch keeper 37, the purposes of which will appear presently.

Pivotally attached to the slide 35 at 38 is a rod 39 which in turn is pivotally connected at 40 to a bracket 41 fastened to the refrigerator door 42 interiorly thereof.

Fixedly connected to bar 24 underneath the same and to the left of bracket 26 is a striker 43 of angular cross-section. See Figure 4. A rocker 44 having an upstanding flange 46 is pivotally connected at 47 to plate 10. Flange 46 is high enough to lie in the path of the flange on striker 43. Rocker 44 is pivoted at 45 to a link 48 which is pivotally connected at 49 to a rocker 50 having an upstanding flange 51. The rocker 50 is pivoted on plate 10 at 52. A spring 53 coiled around pivot 49 and connected at its ends to link 48 and rocker 50 tends to keep these parts in the position shown in Figure 2.

Underneath bar 28 and fixed thereto is a striker 54 having a downturned flange 55. This flange 55 and flange 51 on rocker 50 are of great enough dimensions to insure that they will contact each other during their relative movement, as will more fully appear later.

A push rod 56 extends through a slot in bracket

29 into the path of movement of flange 55 on striker 54. The other end of push rod 56 is pivoted at 57 to a rocker 58 having an upstanding flange 59. The rocker 58 is pivoted on plate 10 at 60. A spring 61 coiled around pivot 57 is connected to rocker 58 and push rod 56 to maintain them normally in the position shown in Figure 2.

A latch for holding the door 42 in open position comprises a roller 62 mounted on a leaf spring 63 which in turn is fixed to a bracket 64 on plate 10. The roller is in the path of movement of latch keeper 37 on slide 35 and is deflected when the latter strikes the roller.

The exact latch structure illustrated does not form a part of the present invention. It is, however, a form of latch that operates very satisfactorily with the present invention. The latch is shown in Figures 6 and 7.

It comprises a generally U-shaped housing 70 mounted in the door in a horizontal position, as shown in Figure 6. Figure 7 shows the latch turned around to illustrate its interior construction. A U-shaped yoke 71 is pivoted in the housing 70 at 72 and carries a cylindrical keeper 73. The keeper normally engages a hook member 74 fastened to the cabinet wall by screws 75. A coil compression spring 76 has one end fastened to a cylinder 77 mounted between a pair of ears 78 on yoke 71. The other end of the spring is fastened to a lug 79 in housing 70.

A latch push button 80 slides through a guide 81 on the housing 70 and is pivotally connected to a bar 82. This bar is pivoted at the lower end to bracket 83 on the housing. A link 84 is pivoted at 85 to the bar 82. The other end of link 84 receives a pin 86 extending through a slot 87 in the housing 70.

A push on the free end of push button 80 will cause bar 82 to rotate clockwise (in Figure 7) pulling on link 84 which will pull pin 86 downward in slot 87 compressing spring 76 and swinging yoke 71 and keeper 73 downwardly to release the keeper from hook 74 so that the door may open. Upon release of pressure on button 80 the spring will restore the keeper to normal position ready to receive hook 74 when the door is closed.

The latch operating mechanism (Figures 1 and 6) comprises a plunger 90 mounted in suitable guides in the refrigerator cabinet wall. A bell crank 91 is pivoted at 92 on the cabinet wall and is also pivoted to plunger 90 and to a rod 93. This rod 93 is pivoted at 94 to an extension 95 of bell crank 15.

The operation of the entire mechanism is as follows:

A downward pressure on foot pedal 12 rocks bell crank 15 and extension 95 clockwise, as viewed in Figure 6. Bell crank extension 95 pulls down on rod 93 thereby projecting plunger 90 outwardly into engagement with push button 80 to release the latch as explained above.

Simultaneously bell crank 15 pulls on link 19 rotating bell crank 20 counter-clockwise (as viewed in Figure 2) pulling on bar 24 and spring 27. Bar 28 and the right hand end of spring 27 cannot move appreciably as flange 55 of striker 54 will strike against flange 51 of rocker 50. (See Figure 2.) Thus, spring 27 is placed in tension.

Continued movement of bell crank 20 and bar 24 tensions spring 27 still more until the flange on striker 43 strikes the flange 46 on rocker 44 and rotates the latter clockwise. That movement pushes link 48 to the right. Just prior to the time that striker 43 engages flange 46 it also engages flange 59 on rocker 58 rotating the latter

clockwise sufficiently to permit the flange on striker 43 to move by flange 59. Thereupon spring 61 snaps rocker 58 back to its original position. At that time the flange on striker 43 is behind flange 59 and cannot return to its original position.

When link 48 is pushed to the right it rotates rocker 50 clockwise so that flange 51 thereon releases flange 55 on striker 54. The tensioned spring then pulls on bar 28 and rotates bell cranks 30 and 31. The latter pushes on abutment 36 which starts to open the door 42 through the medium of slide 35, rod 39 and bracket 40. By the time the abutment 36 has been pushed to a point about opposite bar 28 the door has gained sufficient momentum to continue to open position.

About that time abutment 36 leaves bell crank 31 and contacts bell crank 30 returning both to their initial positions. This movement is not opposed by spring 27 because its tension has been released, as will more fully appear presently.

When the door has fully opened latch keeper 37 will have slipped past roller 62. The spring 63, while not very strong, is of sufficient strength to prevent the door from swinging closed by itself.

About the time abutment 36 reaches its midway position, striker 54 has moved over against the end of push rod 56. A slight push on the free end of push rod 56 by striker 54 swings rocker 58 clockwise so that flange 59 releases the flange on striker 43 permitting spring 27 to lose its tension and pull the parts at the left of Figure 2 to their initial positions.

With the door latched open articles may be placed in, or removed from the refrigerator. When it is desired to close the door the pedal 12 is depressed again and the same cycle is repeated except that this time bell crank 30 initiates the door movement, pulling on rod 39 instead of pushing it.

From the foregoing it will be seen that this invention provides a door opener and door closer of novel form actuated by a single lever, with its operation the same for both movements of the door.

The scope of the invention is indicated in the appended claims.

I claim:

1. A cabinet having a swinging door thereon, a door opener and closer comprising a rod connected to the door and movable between door opened and door closed positions, a door operating lever and mechanism connected to said door operating lever for opening and closing the door, said mechanism including a pair of members one engageable with said push rod in door closed position to open the door and the other engageable with the rod in door opened position to move it toward door closed position, a spring connected to said members and to said door operating lever, and means for holding the end of the spring connected to said members in a predetermined position until said spring is subjected to a definite tension, and means for releasing the last mentioned end of the spring when said definite tension is reached.

2. A cabinet having a swinging door therein, a door opener and closer comprising a rod connected to the door and movable between door opened and door closed positions, a door operating lever and mechanism connected to said door operating lever for opening and closing the door, said mechanism including a pair of bell cranks pivotally connected intermediate their ends to a common support and positioned ad-

jacent said rod whereby one arm of one bell crank acts on the rod in one of its positions and one arm of the other bell crank acts upon said rod in the other of its positions, a first bar pivotally connected to the other arms of the bell cranks, a spring having one end connected to the other end of said first bar, a second bar connected at one end to the other end of said spring, latch means associated with said first bar and said support for latching said first bar in inoperative position, means connecting the second bar to said door operating lever, and trip means associated with said second bar and said latch means for releasing said latch means upon a predetermined movement of said second bar.

3. A cabinet having a swinging door thereon, a door opener and closer comprising a rod connected to the door and movable between door opened and door closed positions, a door operating lever and mechanism connected to said door operating lever for opening and closing the door, said mechanism including a pair of bell cranks pivotally connected intermediate their ends to a common support and positioned adjacent said rod whereby one arm of one bell crank acts on the rod in one of its positions and one arm of the other bell crank acts upon said rod in the other of its positions, a first bar pivotally connected to the other arms of the bell cranks, a spring having one end connected to the other end of said first bar, a second bar connected at one end to the other end of said spring, latch means associated with said first bar and said support for latching said first bar in inoperative position, means connecting the second bar to said door operating lever, trip means associated with said second bar and said latch means for releasing said latch means upon a predetermined movement of said second bar, latch means on said second bar for latching the latter in a position at the end of its predetermined movement, and trip means associated with said first bar and said latch means for tripping the latter upon a predetermined movement of the first bar.

4. A cabinet having a swinging door thereon, a door opener and closer comprising a rod connected to the door and movable between door opened and door closed positions, a door operating lever and mechanism connected to said door operating lever for opening and closing the door, said mechanism including a pair of bell cranks each pivotally connected to a common support, one end of each bell crank being pivotally connected together, a coiled spring, means connecting one end of the spring to the pivotally connected ends of the bell cranks, means connecting the other end of said spring to said door operating lever for tensioning the spring when the door operating lever is depressed, and trip means for releasing the tension in the spring whereby the spring in returning to its normal position rotates the bell cranks through a predetermined arc.

5. A cabinet comprising a cabinet member having a door opening and a door member for closing said opening, a latch on one of said members and a cooperating keeper on the other member, a door operating lever mounted on said cabinet member for limited rocking movement relative thereto, mechanism connecting said door operating lever to said latch for releasing the latter upon a predetermined movement of said door operating lever, a rod connected to the door and movable between opened and closed door positions, a pair of rod engaging members movably mounted on said cabinet, one of said rod engaging members being engageable with said rod in door closed position to open the door and the other engageable with said rod in door opened position to close the door, a coiled spring, means connecting one end of said coiled spring to said members, means for connecting the other end of said coiled spring to said door operating lever whereby to move said end when said door operating lever is rocked, means including a trip mechanism for holding the first named end of said coiled spring while said door operating lever is rocked a predetermined distance to tension said coiled spring, said trip mechanism being actuated to release said first named end of the coiled spring when said door operating lever is rocked a predetermined distance whereby the tension in said spring actuates said rod engaging members to open or close said door.

6. A cabinet comprising a cabinet member having a door opening and a door member for closing said opening, a latch on one of said members and a cooperating keeper on the other member, a door operating lever mounted on said cabinet member for limited rocking movement relative thereto, mechanism connecting said door operating lever to said latch for releasing the latter upon a predetermined movement of said door operating lever, a rod connected to the door and movable between opened and closed door positions, a pair of bell cranks each pivotally connected to a common support, one end of each bell crank being pivotally conneced to the other, the other end of one bell crank being engageable with said rod in door closed position to open the door and the other end of the other bell crank being engageable with said rod in door opened position to close the door, a coiled spring, means connecting one end of said coiled spring to the pivotally connected ends of said bell crank, means for connecting the other end of said coiled spring to said door operating lever whereby to move said end when said door operating lever is rocked, means including trip mechanism for holding the first named end of said coiled spring while said door operating lever is rocked a predetermined distance to tension said coiled spring, said trip mechanism being actuated to release said first named end of the coiled spring when said door operating lever is rocked a predetermined distance whereby the tension in said spring actuates bell cranks to open or close said door.

HOMER E. ROSEBROOK.

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