

May 21, 1946.

V. H. NORRIS

2,400,568

CLOSURE OPERATING MECHANISM

Filed April 28, 1945

2 Sheets-Sheet 1

FIG 1

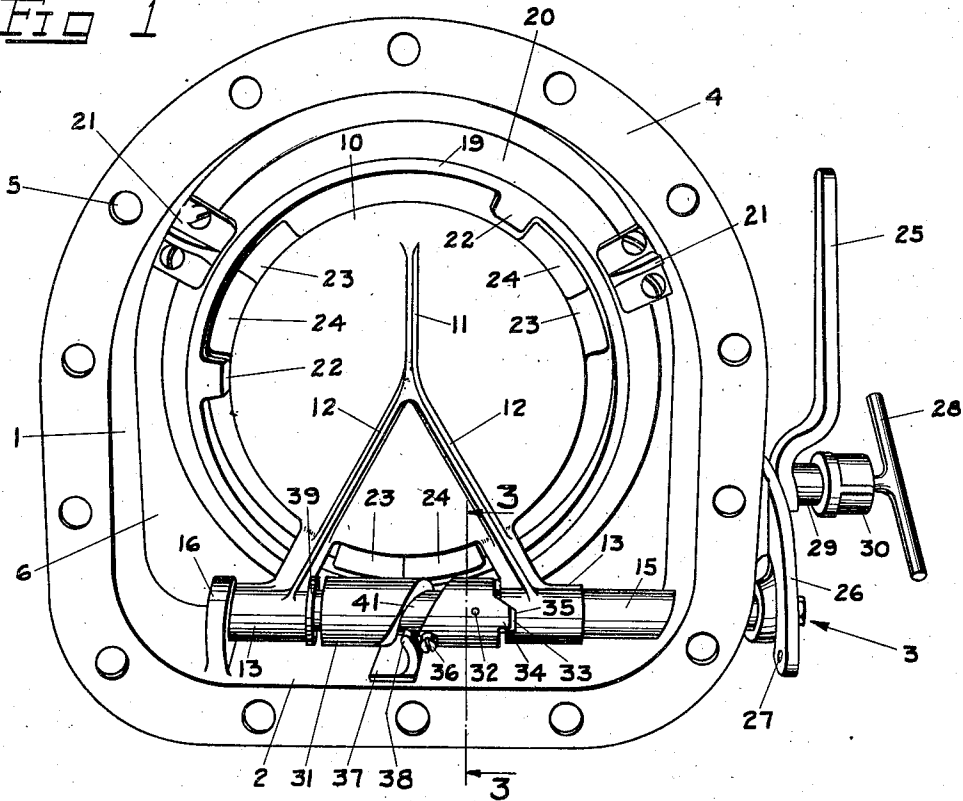


FIG 2

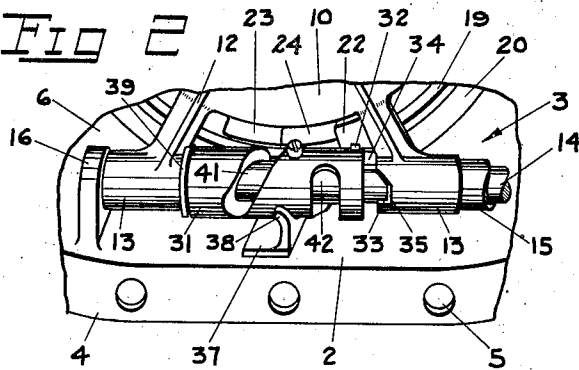
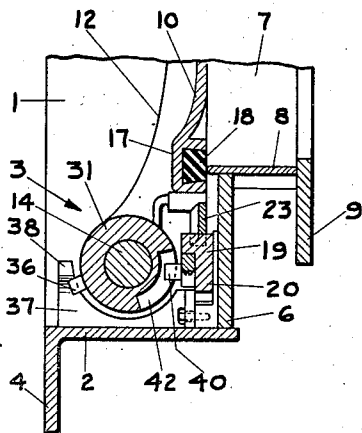


FIG 3



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2 Sheets-Sheet 2

FIG 4

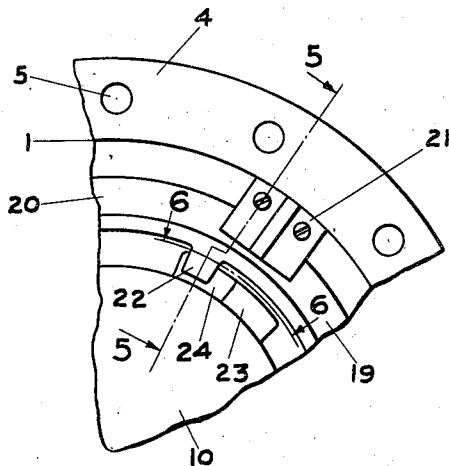


FIG 5

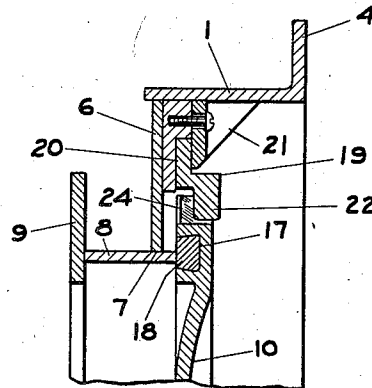


FIG 6

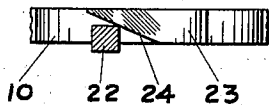


FIG 6

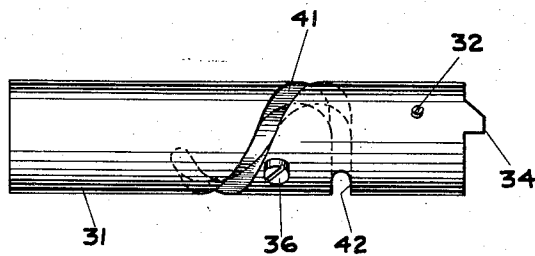
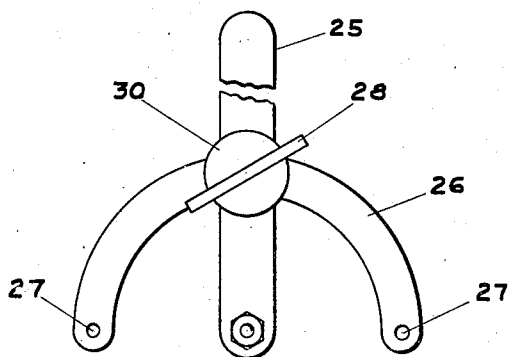


FIG 7



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2,400,568

CLOSURE OPERATING MECHANISM

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Application April 28, 1945, Serial No. 590,858

10 Claims. (Cl. 114—178)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to operating mechanisms for closure devices and more particularly to those of quick-action type for actuating covers for portholes and the like.

Portholes and other openings or conduits, such as ventilation pipes, are provided ordinarily with pivoted closures adapted to be swung into and out of overlying closing relation to their openings. The closures are then ordinarily frictionally secured or latched in closed position by suitable latching means. For portholes, the latching means sometimes includes a lock ring rotatably surrounding each opening and having lugs adapted to coast with wedge or cam elements carried by the closure upon movement of said closure into closing position and rotation of the ring. In the past, the closure has been swung into and out of closing position by suitable operating means and other additional means separate and distinct from the operating means has been provided for actuating the lock ring so as to require the use of two hands or a pair of separate and distinct manipulations in closing and securing the closure as well as in unlatching and opening said closure.

The principal object of the present invention is, therefore, to provide for operating a closure device quickly and by a single continuous manipulation thereof.

Other objects of the invention are to provide common actuating means connected both with a closure member for moving the same into and out of overlying closing relation to an opening and with latching means for securing the member in closing relation, whereby said member is swung and the latching means is actuated by manual movement of the actuating means; to provide an improved operating mechanism for a closure device having a closure member adapted to be swung into and out of overlying closing relation to an opening and a lock ring rotatably surrounding the opening so as to coast with the member and maintain the same in its closing relation, the mechanism having independent releasable connections with said member and ring for swinging the member and rotating the ring in sequence independently of and relative to each other whereby either said member or said ring is operatively disengaged from said mechanism and remains stationary upon operation of the other; to provide an improved operating mechanism, of the character described, having an actuating shaft releasably connected to the closure member so as to be released therefrom upon rotation of the shaft and swinging of said member into clos-

ing relation to the opening, said shaft having a pin and slot connection with the lock ring for rotating said ring into latching position when the member is in its closed position, whereby said member is closed and latched by a single, continuous actuation of the shaft; and to provide improved elements and arrangements thereof in an operating mechanism for a closure device, of the character described and for the purposes set forth.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred form of which is illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of a closure device, having an operating mechanism embodying the features of the present invention, in its closed, unlatched position.

Fig. 2 is a perspective view of a portion of the closure device and its operating mechanism in the latched position of said device.

Fig. 3 is a transverse, vertical, sectional view, taken on the line 3—3, Fig. 1.

Fig. 4 is an elevational view of a portion of the closure device in its latched position.

Fig. 5 is a transverse, sectional view, taken on the line 5—5 of Fig. 4.

Fig. 6 is a transverse, sectional view, taken on the line 6—6 of Fig. 4.

Fig. 7 is an elevational view of the operating lever and its guide.

Fig. 8 is a side elevational view of the cam sleeve of the operating mechanism detached from its operating shaft.

Referring more in detail to the drawings:

In Fig. 1, the numeral 1 designates the frame of the closure device which is customarily employed for closing ventilation pipes (not shown) and which is adaptable for use in connection with other conduits or openings, such as portholes. The frame is substantially annular and has a flattened lower portion 2 for receiving and supporting an operating mechanism 3.

An external, laterally outwardly-directed flange 4 surrounds the external periphery of the frame 1 at its inner marginal edge and is provided with a plurality of openings 5 to permit passage of fastening devices for securing said frame in place. The frame has a complementary flat, base plate or sheet 6 disposed within and suitably fastened to its internal peripheral surface at its outer marginal edge so as to extend parallel to the flange 4. As is clearly shown in Figs. 3 and 5, a circular opening 7 is formed substantially concentrically in the sheet 6 and is

adapted to receive an annular band or collar 8 which is suitably secured therein. The collar has an outwardly directed, flat ring 9 connected to its outer marginal edge and the ring is disposed concentrically of said collar as well as parallel to the sheet 6.

The opening 7 is adapted to be closed by a circular closure member or plate 10 having an inverted Y-shaped yoke 11 preferably made integral with the internal surface thereof and having a pair of legs 12 projecting or depending beyond the periphery of the plate 10 (Fig. 1). Cylindrical collars 13 are carried by the lower ends of the yoke legs 12 so as to be disposed in spaced, axial alignment, the collars having their bores extending at a tangent to the plate 10 and parallel to the flattened portion of the frame.

For pivotally supporting the plate, the operating mechanism 3 is provided with a cylindrical shaft 14 which extends longitudinally of the flattened frame portion 2 in parallel relationship thereto and which rotatably and slidably engages within the collars 13. A bearing collar or bushing 15 is secured to the frame 1 adjacent its flattened portion for receiving the outer portion of the shaft 14 and the inner or opposite end of said shaft is journaled within a suitable bearing bracket 16 projecting perpendicularly inwardly from said flattened portion. The bushing 15 is contiguous to and terminates adjacent the right-hand collar 13 (Figs. 1 and 2). In order to provide sealing engagement between the plate 10 and the collar 8 of the opening 7, a peripheral groove or channel 17 (Figs. 3 and 5) is formed in the external surface of said plate and receives an annular, complementary packing ring or element 18, of rubber, or other suitable material. The inner marginal edge of the collar 8 projects inwardly beyond the inner surface of the sheet 6 so as to be engaged by the packing element 18 upon closing of the plate 10.

An annular locking member or ring 19 concentrically surrounds the opening 7 and is provided with an external, radial flange 20 to permit fastening of the same to the inner surface of the sheet 6 by a plurality of suitable clips 21 (Figs. 1, 4 and 5), which are preferably spaced an equal distance apart. Due to this mounting of the locking ring, the same is rotatable about its axis and relative to the opening. Inwardly-directed, radial lugs 22 are formed on the locking ring for coacting with arcuate, peripheral wedge elements or extensions 23 preferably made integral with the plate 10 and projecting radially therefrom. The wedge elements 23 are relatively elongate and have their arcs swung about the axis of the plate so as to be disposed in the path of the lugs 22 upon rotation of the locking ring 19. For latching the closure plate in its closed position and forcing the packing ring 18 into sealing engagement with the collar 8, each wedge element has the counter-clockwise end portion of its inner flat surface inclined or bevelled to provide a cam or wedge surface 24 (Fig. 6). Prior to latching of the plate, the lugs 22 are disposed counter-clockwise of the wedge surfaces 24 (Fig. 1) whereby clockwise rotation of the locking ring moves the outer flat surfaces of said lugs into engagement with and up said wedge surfaces (Figs. 4, 5 and 6).

As shown in Fig. 1, the outer end of the shaft 14 projects through the frame 1 and has a suitable handle or lever 25 mounted thereupon so as to permit manual movement of said shaft. For locking the lever 25 in adjusted positions, an

arcuate guide 26 (Fig. 7) is welded or otherwise secured to the marginal edge of the flange 4 above said shaft 14 so as to be disposed between said flange and the lever 25. The guide 26 has an opening 27 formed in each end thereof and these openings are adapted to be engaged by a locking pin element 28, carried by the inner end of the lever, upon swinging of said lever so as to permit locking of the same in its forward and rearward positions. The locking pin element 28 preferably extends transversely through the lever and a short sleeve or collar 29 which projects laterally from said lever. A cap 30 is mounted upon the outer end of the collar 29 and the pin element 28 has screw-threaded connection therein to permit ejection and retraction of said pin relative to the guide.

In order to effect pivotal swinging of the closure plate 10 by rotation of the shaft 14, a cam sleeve 31 (Fig. 8) is fixed to and movable with said shaft between the collars 13 by a pin 32 or other suitable means. The sleeve 31 is releasably connected to the right-hand collar (Fig. 1) by a clutch 33 which preferably includes a lug 34 projecting from the end of said sleeve and a complementary coacting recess 35 formed in the adjacent end of said collar. As shown, one surface of the lug 34 and the coacting wall of the recess 35 are inclined to permit release of the clutch 33 upon clockwise rotation of the sleeve 31 (Fig. 3) relative to the collar 13.

For maintaining the clutch engaged, a short screw or pin 36 projects radially from the sleeve and coacts with an arcuate guide bracket 37 which is fastened to the inner surface of the plate 6 and encircles the lower portion of said sleeve (Fig. 3). So long as the pin 36 is in engagement with the bracket 37, the lug 34 engages within the recess 35, whereby the closure plate may be pivoted or swung relative to the opening 7 by rotation of the shaft 14. Disengagement or release of the clutch 33 occurs upon continued clockwise rotation of the sleeve relative to the collar 13 after swinging of the plate to its closed position and such disengagement or release is accomplished by the inclined surface of the lug 34 and complementary wall of the recess 35 coacting to force said sleeve longitudinally away from said collar.

The bracket 37 extends at a right angle to the sleeve and has its upper end portion or surface 38 inclined laterally away from the coacting sleeve pin 36 so as to permit longitudinal movement of the sleeve away from the collar upon said pin being moved into engagement with the inclined surface. As soon as the clutch is released, the collar is disconnected from the sleeve to permit continued clockwise rotation of said sleeve while said collar remains stationary. A thrust bearing or washer 39 is interposed between the sleeve 31 and the left-hand collar 13 to prevent binding therebetween upon longitudinal movement and continued rotation of said sleeve.

For rotating the locking ring 19 so as to move its lugs 22 into frictional engagement with the wedge elements 23 of the closure plate and latch the latter in its closed position upon further clockwise rotation of the sleeve 31, a pin and slot connection is provided between said ring and sleeve. As is clearly shown in Fig. 3, a lateral pin 40 is suitably mounted on the locking ring and engages within a helical or spiral slot 41 which is formed in the sleeve. The initial or right-hand end portion of the slot 41 is straight

and extends at a right angle to the axis of the sleeve as shown by the number 42 (Figs. 2 and 8) to permit opening and closing pivotal swinging of the closure plate without rotation of the ring. Upon release of the clutch and longitudinal sliding of the sleeve to the right, the engagement of the pin 40 within the initial slot portion 42 causes a slight clockwise rotation of the locking ring and continued clockwise rotation of said sleeve (Fig. 3) moves said pin out of said initial slot portion and into engagement with the main portion of the slot 41. Due to this engagement, the locking ring is rotated in a clockwise direction so as to revolve its lugs 22 into frictional engagement with the wedge elements 23 of the closure plate and thereby latch the latter in its closed position. Unlatching and opening of the closure plate is accomplished by simple rotation of the sleeve 31 in a counter-clockwise or opposite direction (Fig. 3). It is pointed out that the initial slot portion 42 extends through approximately 90° or one-quarter of the cam sleeve circumference, while the main portion of the slot 41 makes substantially an entire revolution (Fig. 8). However, only one-quarter or 90° of this revolution is utilized in latching the closure plate.

Operation

The operation of a closure operating mechanism constructed as described is as follows:

When the closure plate 10 is in its open position, the pin 28 is engaged within the opening 27 formed in the forward or left-hand end of the guide 26 (Fig. 7) so as to maintain the lever 25 forward and said plate in its open position. By loosening the pin 28 and retracting the same from the guide opening, the lever may be swung rearwardly (Fig. 1) or to the right (Fig. 7) so as to rotate the shaft 14 and sleeve 31 in a clockwise direction (Fig. 3). Due to the provision of the clutch 33, the collars 13 are rotated with the sleeve so as to swing or pivot the yoke 12 and the plate toward the opening 7 whereby the packing ring 18 engages the collar 8. This pivotal movement of the plate without rotation of the locking ring 19 is permitted by the pin 40 of said ring engaging within the initial portion 42 of the slot 41, while the coaction of the sleeve pin 36 with the bracket 37 maintains the clutch engaged during such movement.

Upon continued clockwise rotation of the sleeve, the collars remain stationary and the inclined wall of the clutch recess 35 coacts with the complementary surface of the clutch lug 34 so as to force or slide said sleeve longitudinally away from the right-hand collar and toward the left-hand collar. The inclined surface 38 of the bracket 37 permits such longitudinal movement of the sleeve. Simultaneously with the release of the clutch, the longitudinal sliding of the sleeve moves the ring pin 40 to the left so as to rotate the locking ring 19 in a clockwise direction and engage its lugs 22 with the wedge elements 23 of the closure plate. Further clockwise rotation of the sleeve causes the ring pin 40 to travel through the spiral slot 41 so as to further rotate the locking ring 19 in a clockwise direction and revolve its lugs 22 into frictional engagement with the inclined surfaces 24 of the wedge elements 23 (Fig. 2). This rotation continues until the aforesaid frictional engagement forces the packing ring 18 into tight sealing contact with the collar 8 (Fig. 3). In this position, the closure plate is latched in its closed position.

Although not illustrated, the shaft 14 may be locked against rotation by engaging the pin 28 of the lever 25 in the rear opening 27 of the guide 26 (Fig. 8) and thereby positively assure the closure plate being maintained in its closed position.

In order to unlatch and swing the plate to its open position, the operation is exactly the reverse of the closing operation. The pin 28 is retracted and the lever 25 swung forwardly in one continuous motion so as to rotate the shaft 14 and its sleeve 31 in a counter-clockwise direction (Fig. 3) and thereby rotate the locking ring in the same direction (Fig. 2) by causing the ring pin 40 to travel through the spiral slot 41. Thus, the lugs 22 are moved out of engagement with the wedge elements 23 of the plate so as to unlatch the same.

Upon unlatching of the plate, the sleeve pin 36 moves into engagement with the inclined surface 38 of the bracket 37 so as to slide the sleeve 31 longitudinally toward the right-hand yoke collar 13 and engage the clutch 33. At the same time, the ring pin 40 has travelled to the forward end of the spiral slot so as to be disposed adjacent the rear end of the initial slot portion 42 and, upon full engagement of the sleeve pin with its coacting bracket and the clutch lug within the clutch recess, engages within said initial slot portion. Thus, continued rotation of the sleeve by forward swinging of the lever 25 results in rotation of the collars 13 and forward swinging of the yoke 12 and closure plate. The plate is secured in this position by engaging the pin 28 within the opening 27 in the forward end of the guide 26.

From the foregoing, it is manifest that an improved operating mechanism has been provided for rapidly closing and latching, or unlatching and opening, a closure device in a single, continuous motion, whereby the use of only one hand is required and the necessity for more than one operating mechanism is obviated.

While I have shown but one embodiment of my invention, it is apparent that the device is susceptible to modification without departing from the spirit of the invention. I do not wish, therefore, to be limited by the disclosures set forth, but only by the scope of the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. An operating mechanism for a closure device having a closure plate adapted to be swung into and out of overlying closing relation to an opening, arcuate wedge elements projecting radially from the plate and having their external lateral surfaces tapered longitudinally, a yoke for supporting and swinging the plate and having a pair of axially-aligned spaced collars, an annular locking ring surrounding said opening and rotatable about its axis, the ring having inwardly-directed radial lugs adapted to overlie and coact with the tapered surfaces of the wedge elements so as to latch said plate in its closed position, the mechanism including, an operating shaft journaled in the yoke collars and slidable longitudinally thereof, a cam sleeve secured to the shaft between said collars and having a circumferential slot formed therein, the slot having an initial short portion

disposed at a right angle to the axis of the sleeve and a communicating spiral portion, a pin projecting laterally from the locking ring and engaging within said slot, a clutch connection between one end of the sleeve and the adjacent collar, an arcuate bracket disposed circumferentially of said sleeve and having an inclined outer end portion, and a radial pin carried by the sleeve adjacent the bracket and coacting with said bracket for maintaining the clutch connection between said sleeve and collar, whereby initial rotation of the shaft rotates the sleeve and collars so as to swing the plate into overlying closing relation to the opening and causes the initial portion of the slot to revolve relative to the ring pin, continued rotation of said shaft and sleeve revolving the sleeve pin into engagement with the inclined end portion of its coacting bracket so as to permit longitudinal movement of the shaft and sleeve relative to the collars and thereby bring the spiral portion of said slot and said ring pin into registration as well as releasing the clutch connection, further rotation of said shaft and sleeve forcing the ring pin to travel through said spiral slot portion and rotate the locking ring about its axis so as to move the lugs into latching position relative to the wedge elements of the plate.

2. An operating mechanism for a closure device having a closure plate adapted to be swung into and out of overlying closing relation to an opening, arcuate wedge elements projecting radially from the plate and having their external lateral surfaces tapered longitudinally, a yoke for supporting and swinging the plate and having a pair of axially-aligned spaced collars, an annular locking ring surrounding said opening and rotatable about its axis, the ring having inwardly-directed radial lugs adapted to overlie and coast with the tapered surfaces of the wedge elements so as to latch said plate in its closed position, the mechanism including, an operating shaft journaled in the yoke collars and slidable longitudinally thereof, a sleeve fixed to the shaft between said collars and movable with said shaft, a clutch connection between the sleeve and one of the collars whereby rotation of said shaft swings the plate into closing relation to the opening, coacting means associated with said sleeve for maintaining the clutch connection during initial rotation of the shaft and permitting disengagement of the same upon continued rotation and longitudinal sliding of said shaft, and a pin and slot connection between the sleeve and the locking ring for causing rotation of said ring upon such continued rotation of the shaft and sleeve subsequent to the closing movement of said plate whereby the lugs of the ring move into latching position relative to the wedge elements of the plate.

3. An operating mechanism for a closure device having a closure plate adapted to be swung into and out of overlying closing relation to an opening, arcuate wedge elements projecting radially from the plate and having their external lateral surfaces tapered longitudinally, a yoke for supporting and swinging the plate and having a pair of axially-aligned spaced collars, an annular locking ring surrounding said opening and rotatable about its axis, the ring having inwardly-directed radial lugs adapted to overlie and coast with the tapered surfaces of the wedge elements so as to latch said plate in its closed position, the mechanism including, an operating shaft journaled in the yoke collars and slidable longitudi-

nally thereof, a sleeve carried by the shaft and movable therewith, a clutch connecting the sleeve to one of the collars whereby initial rotation of said shaft in one direction swings the plate into its closing position, coacting means associated with said sleeve for maintaining the clutch in engagement during initial rotation of the shaft and permitting disengagement of the same upon continued rotation and longitudinal sliding of said shaft, and a pin and slot connection between the sleeve and locking ring for causing rotation of said ring upon such continued rotation of the shaft and sleeve subsequent to the closing movement of said plate whereby the lugs of the ring are moved into latching position relative to the wedge elements of the plate.

4. An operating mechanism for a closure device having a closure plate adapted to be swung into and out of overlying closing relation to an opening, means connected to the plate for supporting and swinging the same, cam means mounted on said plate, a rotatable locking member surrounding the opening, the member having latching means for coacting with the cam means of the plate upon swinging of the latter to its closed position and rotation of said member so as to latch said plate in such position, the mechanism including, a collar carried by the connecting means of the plate, a rotatable shaft journaled in the collar and slidable longitudinally thereof, a sleeve fixed to the shaft so as to be movable therewith, a clutch connecting the sleeve to said collar whereby initial rotation of said shaft in one direction swings the plate into its closing position, coacting means associated with said sleeve for maintaining the clutch in engagement during initial rotation of the shaft and permitting disengagement of the same upon continued rotation and longitudinal sliding of said shaft, and a pin and slot connection between the sleeve and locking member for causing rotation of said member upon such continued rotation of the shaft and sleeve subsequent to the closing movement of said plate whereby the lugs of the member are moved into latching position relative to the wedge elements of the plate.

5. An operating mechanism for a closure device having a closure plate adapted to be swung into and out of overlying closing relation to an opening, means connected to the plate for supporting and swinging the same, cam means mounted on said plate, a rotatable locking member surrounding the opening, the member having latching means for coacting with the cam means of the plate upon swinging of the latter to its closed position and rotation of said member so as to latch said plate in such position, the mechanism including, a collar carried by the connecting means of the plate, a rotatable shaft journaled in the collar and slidable longitudinally thereof, a sleeve fixed to the shaft so as to be movable therewith, clutch means connecting the sleeve to the collar whereby initial rotation of said shaft in one direction swings the plate into its closing position, coacting means associated with said sleeve for maintaining the clutch means in engagement during such initial rotation of the shaft and permitting disengagement of said clutch means upon continued rotation and longitudinal sliding of said shaft, and a pin and slot connection between the sleeve and locking member, the slot having a spiral portion so as to cause rotation of said member upon such continued rotation of the shaft subsequent to the closing movement of said plate whereby the latching

means of the ring are moved into coacting relation to the cam means of the plate, said slot having an initial portion disposed in a single plane so as to permit the member to remain stationary upon initial rotation of the shaft.

6. An operating mechanism for a closure device having a closure plate adapted to be swung into and out of overlying closing relation to an opening, means connected to the plate for supporting and swinging the same, cam means mounted on said plate, a rotatable locking member surrounding the opening, the member having latching means for coacting with the cam means of the plate upon swinging of the latter to its closed position and rotation of said member so as to latch said plate in such position, the mechanism including, slidable means mounted so as to undergo rotation about its axis, means for releasably connecting the slidable means to the plate whereby said plate is swung by rotation of said slidable means, means for maintaining the slidable means connected to the plate during swinging of the latter and permitting release of such connection upon movement of said plate into its closed position, and a pin and slot connection between the locking member and slidable means for causing rotation of said member upon continued rotation of said slidable means subsequent to the plate being moved into its closed position whereby the latching means of the member are moved into latching position relative to the cam means of said plate.

7. In an apparatus of the character described, a member having an opening therein, a closure for the opening, means pivotally mounting the closure on the member, operating means having releasable connection with said closure for pivoting the same relative to said opening, the connection between the closure and operating means being released upon movement of said closure into its closed position, and lock means for latching the closure in its closed position and having loose connection with said operating means so as to remain inoperative during pivoting of said closure, the lock means being moved into latching position upon actuation of the operating means when the closure is in its closed position and disconnected from said operating means.

8. In an apparatus of the character described, a member having an opening therein, a closure

for the opening, means pivotally mounting the closure on the member, operating means having releasable connection with said closure for pivoting the same relative to said opening, means for maintaining the operating means connected to the closure during pivoting thereof and permitting release of such connection upon movement of said closure into its closed position, and lock means for latching the closure in its closed position and having loose connection with said operating means so as to be moved into latching position upon actuation of the operating means when said closure is in its closed position and disconnected from said operating means.

9. In an apparatus of the character described, a member having an opening therein, a closure for the opening, means pivotally mounting the closure on the member, operating means having releasable connection with said closure for pivoting the same relative to said opening, the connection between the closure and operating means being released upon movement of said closure into its closed position, a locking member for latching the closure in its closed position, and a pin and slot connection between the locking member and operating means, whereby said locking member remains inoperative during pivoting of said closure and is moved into latching position upon actuation of said operating means when the closure is in its closed position and disconnected from the operating means.

10. In an apparatus of the character described, a member having an opening therein, a closure for the opening, means pivotally mounting the closure on the member, operating means having releasable connection with said closure for pivoting the same relative to said opening, the connection between the closure and the operating means being released upon movement of said closure into its closed position, a lock ring surrounding the opening and engageable with the closure for latching the same in its closed position, and a pin and slot connection between the ring and operating means whereby said ring remains inoperative during pivoting of said closure and is moved into latching engagement with the closure upon actuation of said operating means when said closure is in its closed position and disconnected from the operating means.

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