March 7, 1950 F. M. LAMBERT 2,500,000

INTERLOCK FOR QUICK FASTENING DOORS

Filed Dec. 6, 1946 3 Sheets-Sheet 1

Fig. 1.

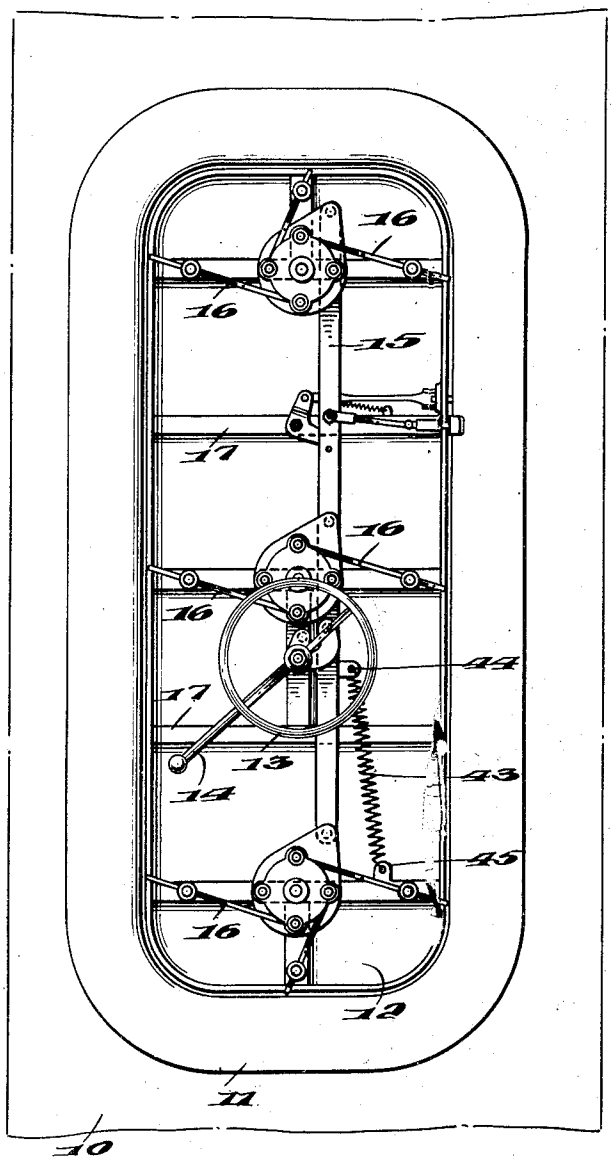


Fig. 6.

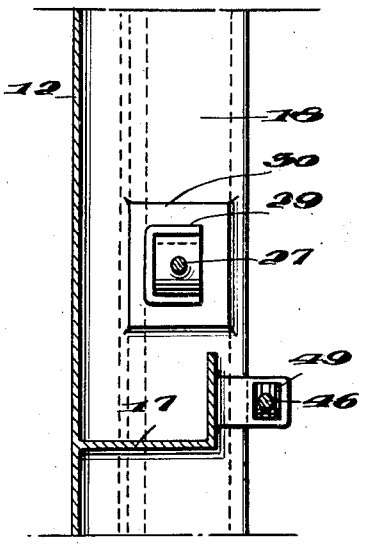
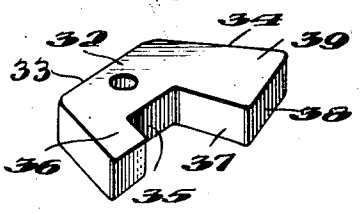


Fig. 7.



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Fig. 2.

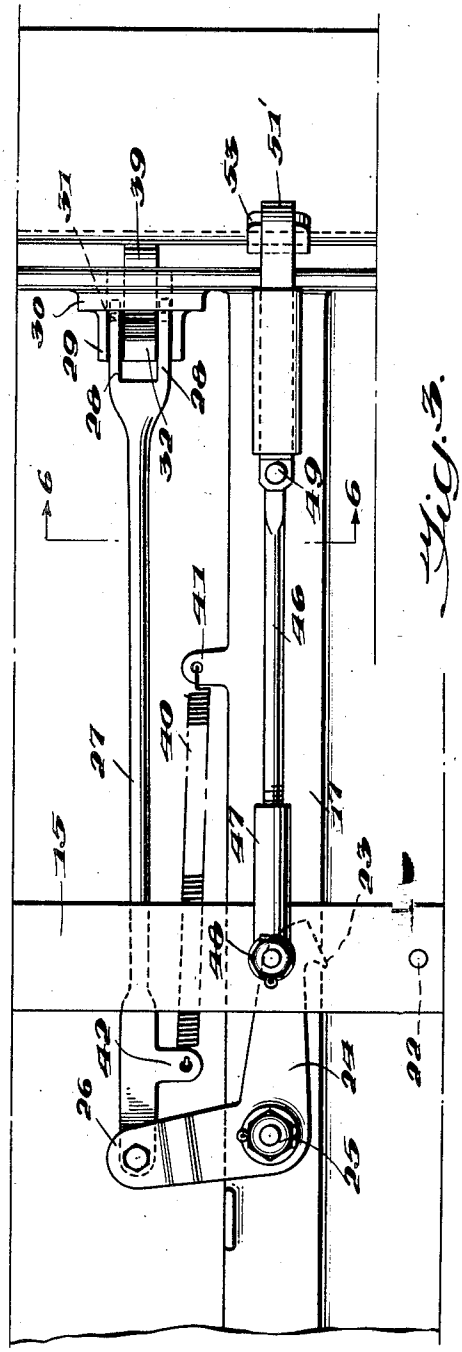
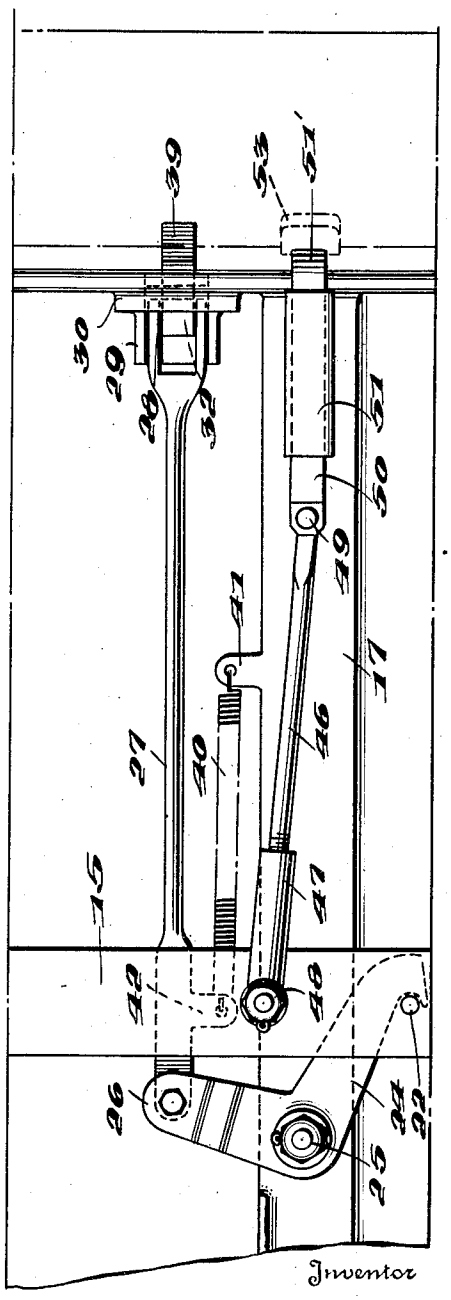


Fig. 3.



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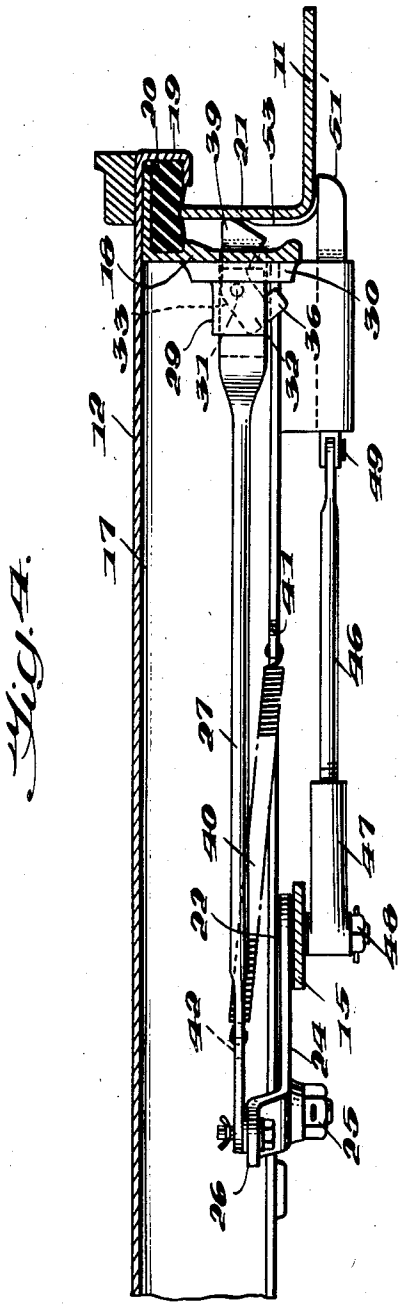


Fig. 4.

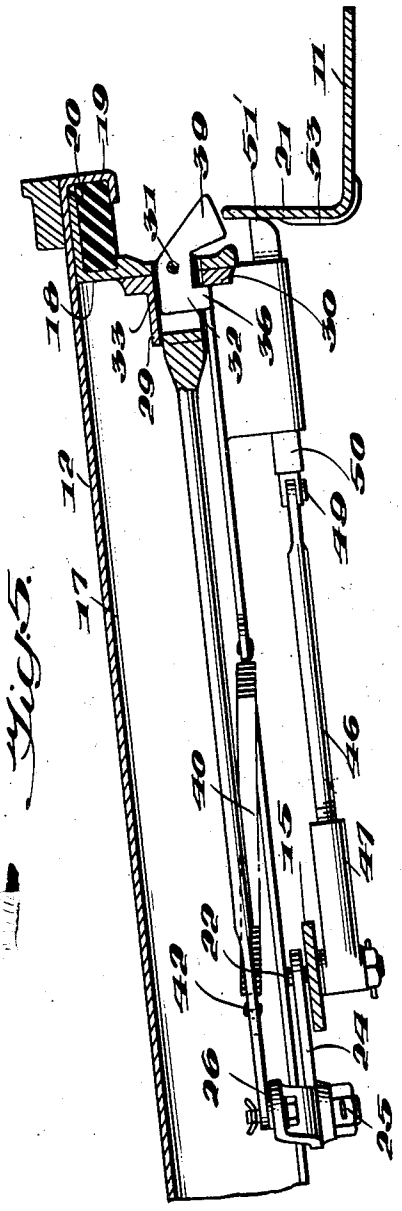


Fig. 5.

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UNITED STATES PATENT OFFICE

2,500,000

INTERLOCK FOR QUICK FASTENING DOORS

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Application December 6, 1946, Serial No. 714,519
In Great Britain December 5, 1945

6 Claims. (Cl. 292—335)

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This invention relates to an interlock for quick fastening doors and more particularly to an interlock construction for use with quick acting fastening means for ship doors, hatches and the like.

In United States Patent 2,373,480, issued to me on April 10, 1945, there is described a quick acting door latching construction in which a plurality of dogs are operable by a single operating means. The operating linkage for the dogs includes a common vertical link bar so connected with the various dogs that movement of the bar in one direction causes movement of all the dogs to a latching position, while movement of the bar in the opposite direction causes movement of the dogs to an unlatched position.

I have now provided for use with mechanisms of the type described in the above-mentioned patent an interlock mechanism which automatically retains the dogs in their unlatched or undogged positions as long as the door is not in its closed position, and which, upon movement of the door to closed position, automatically releases the dogs and moves them to the semi-dogged position which is described in the above-mentioned patent.

The maintaining of the dogs in their undogged position as long as the door is open is of great advantage in applications where the closing and dogging of the door in the shortest possible time may be a matter of the greatest importance. For example, where damage control on ships depends on the immediate closing of watertight doors to seal off portions of the ship which are taking water, the safety of the entire ship might depend on the matter of a few seconds in the closing of a watertight door located in a critical position. Should it be necessary to first move the dogs of the open door from a dogged to an undogged position in order to close the door, and then manually to return the dogs to their dogged position to fasten the door shut, the few extra seconds required for the manual operations might mean the loss of the ship. This is particularly true where not one but several doors must be closed, in which case the sealing off time would be multiplied.

It is an object of this invention to provide an interlock arrangement for use with a quick acting door fastening means whereby the door fastening members are positively retained in inoperative positions as long as the door is open, and

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whereby the fastening members are released and are moved to latching positions as soon as the door is moved to its closed position. The arrangement prevents inadvertent moving of the door fastening members to their operative positions while the door is open.

Another object of the invention is to provide an arrangement as set forth in the preceding object, and which is particularly adapted for use with structures of the type described in the above-mentioned patent. It should be pointed out, however, that the interlocking arrangement is not limited to use on such structures, the embodiment described in the present application being only a preferred embodiment of the invention.

Another object of the invention is to provide an interlock arrangement including a novel tripping device which cooperates with the edge of the door frame.

These and other objects of the invention will be apparent from the following specification and the accompanying drawings, taken in conjunction with the above-referenced patent.

In the drawings:

Figure 1 is a front elevational view of a door and door frame showing the novel interlock in conjunction with a door fastening linkage of the type described in U. S. Patent 2,373,480;

Figure 2 is a detail front elevational view of the interlock with the door in its closed position;

Figure 3 is a view similar to Figure 2 but with the door partly open;

Figure 4 is a detail cross sectional view looking down on the structure shown in Figure 2;

Figure 5 is similar to Figure 4 but taken with the parts in the positions which they occupy in Figure 3;

Figure 6 is a vertical sectional view taken of line 6—6 of Figure 2; and

Figure 7 is a detail perspective view of the trip member.

Referring now to Figure 1, there is shown a portion of a bulkhead 10 in which is mounted by welding or other suitable means a door frame 11 to which is hinged a door 12 by hinge means which are not shown. By means described in detail in the above-referenced U. S. Patent, rotation of a door carried hand wheel 13 by gripping the rim of the wheel or by grasping and turning an operating lever 14 attached to the wheel causes

vertical movement of a linkage bar 15 which controls the operation of a plurality of dogging bars 16. Upward movement of link 15 causes retraction of the bars 16 to inoperative positions, while downward movement of link 15 causes bars 16 to slide to latching or dogging positions in which their outer ends extend past the edge of door 12. In the latter position, the ends of the bars 16 engage the inner surface of the door frame when the door is closed, thereby preventing opening of the door. In the mechanism described in the above-mentioned patent, the dogging bars have a semi-dogged position in which they effectively prevent opening of the door but in which they do not urge the door tightly shut. Further movement of the wheel 13 by means of lever 14 in the dogging direction applies leverage to the dogging bars 16 to seal the edge of the door to the frame.

Referring to Figs. 1, 4 and 5 of the accompanying drawings, it is apparent that door 12 has a plurality of spaced reinforcing ribs 17 which terminate in a flange-like marginal reinforcing member 18 on the inner face of the door. The margin of the door 12 is turned over at 19 to form a mounting for a resilient gasket 20 which cooperates with a flange 21 integral with door frame 11. It is the gasket 20 which provides the watertight seal when the lever like final movement of the dogging bars 16 urges the door tightly against the door frame.

In order to retain the dogging bars in their inoperative positions when the door is open, I have provided the vertically extending link bar 15 with a projection 22 positioned in proximity to one of the reinforcing ribs 17 so as to be engageable with the hook-shaped end portion 23 of a bell crank lever 24 pivotally mounted at 25 to one of the ribs 17. The upper end 26 of lever 24 is pivoted to the end of a horizontally extending rod 27, the other end of which is bifurcated, having upper and lower spaced arms 28. The bifurcated end of rod 27 rides in a U-shaped guideway 29 welded to a small plate 30 which lies flat against and is welded to the inner surface of flange-like member 18. Aligned openings in plate 30 and member 18 permit movement of arms 28 through member 18.

Pivotally mounted between arms 28 by means of rod 31 is a trip member 32 which, as shown in Figures 4, 5 and 7 is of novel construction. The surface of member 32 which faces the door has two obliquely disposed vertically extending flat surfaces 33 and 34. Opposite surface 33 and parallel thereto is a shorter surface 35 which connects a projection 36 extending at right angles thereto and an obliquely disposed surface 37 which, together with surface 34 and an angularly disposed end surface 38, defines the door frame engaging portion 39 of the trip member.

When arm 27 is in its extended position as shown in Figure 5, the inner surface of projection 36 of trip member 32 abuts against the inner surface of plate 30. Because of the pivotal mounting of trip member 32 on rod 31, the trip member 32 is rotated to the position in which it is shown in Figure 5 upon movement to the right of arm 27. When this occurs, projection 36 abuts plate 30 and surface 33 of the trip member lies against the vertical portion of guide 29 and thereby defines the position of orientation of the trip member. A spring 40 connected at one end to a lug 41 carried by rib 17 and connected to its other end to a lug 42 welded to rod 27 near pivot point 26 urges rod 27 toward its extended position and thereby tends to rotate bell crank lever 24 in a clockwise direction. The engagement of projection 36 with the surface of plate 30 and the engagement of surface 33 of the trip member with the vertical portion of guide 29 defines the limit of movement of rod 27 to the extended position, that is to the right as viewed in Figures 1 through 5.

When rod 27 and trip member 32 are in their extended position, the end portion 39 of trip member 32 extends beyond and overlaps flange 21 of door frame 11 so that rod 27 and trip member 32 can only occupy the extended position when the door is open.

With the door open, surface 38 of trip member 32 is disposed at an angle to the door and rod 27 is in its extended position. Movement of the door to closed position causes surface 38 to engage the edge of flange 21 of the door frame. Continued movement of the door to its closed position causes a cam-like action on trip member 32 to rotate the trip member in a counter-clockwise direction as viewed in Figures 4 and 5 until surface 33 has moved out of its contact with the vertical portion of guide 29 and surface 34 of the trip member has moved to a position of contact with the vertical portion of guide 29. The angular disposition of surface 38 which causes counter-clockwise rotation of trip member 32 also causes movement of rod 27 toward a retracted position which it occupies in Figures 1, 2 and 4. As long as the door is closed the abutment of the tip of trip member 32 with the surface of flange 21 of the door frame retains the rod 27 and the cooperating parts in the retracted positions in which they are shown in Figure 2.

As soon as the door is moved to its open position spring 40 urges rod 27 to the right causing projection 36 to again engage plate 30 so that continued movement of rod 27 to the right pivots trip member 32 in a clockwise direction when viewed from above until the movement of rod 27 to its extended position is halted by the contact of projection 36 with plate 30 and the positioning of surface 33 flat against the vertical portion of guide 29.

The hook-like end portion of 23 of bell crank lever 24 cooperates with projection 22 on link bar 15 so that when the operating wheel 13 is rotated to undog the door to permit opening of the door, bar 15 is moved upwardly to a position such that projection 22 can be engaged by the hook-like portion 23 of the bell crank lever. This engagement occurs when the bell crank lever 24 is moved in the clockwise direction by spring 40. As explained above, the complete clockwise movement of the bell crank lever 24 cannot take place until trip member 32 is moved out of contact with flange 21 of the door frame by opening of the door. Engagement of the hook-like bell crank lever portion 23 with projection 22 retains bar 15 in its upper position and thereby retains the dogging bars 16 in their inoperative positions.

In order that the dogging bars 16 will be moved to a dogging position as soon as projection 22 is released by hook 23 and the door is completely closed, I have provided a heavy spring 43 connected at its upper end to a lug 44 welded to bar 15, and connected at its lower end to a lug 45 welded to one of the lower reinforcing ribs 17. Spring 43 urges bar 15 downwardly so that as soon as lug 22 is released by hook 23 and other interlock elements operate which will be described presently, downward movement of bar

15 takes place with the resulting movement of the dogging bars 16 to their dogging positions.

To assist in the disengagement of projection 22 and hook 23, to assist in insuring that bar 15 moves far enough to permit engagement of projection 22 and hook 23 as the door is opened, and to retain the dogs in their inoperative positions through control of bar 15 until the door is completely shut or open, I have provided an arrangement including rod 46 which is threaded at one end into a cylindrical socket 47 which is in turn pivoted at 48 to bar 15. At its other end, rod 46 is pivotally attached at 49 to an actuator bar 50 which extends through a U-shaped guide 51 welded to the surface of one of the reinforcing ribs 17. The extreme end of actuator 50 is beveled at 51' as shown in Figures 4 and 5, and cooperates with a strike plate 53 mounted on the door frame at the base of flange 21.

When the door is open and hook 23 engaged with projection 22, rod 46 is disposed at a slight angle to the horizontal with its pivot 48 above pivot 49 and with actuator 50 withdrawn partly into guide 51. Upon moving the door toward its closed position, the contact of the beveled end portion 51' of actuator 50 with the edge of flange 21 of the door frame causes a slight movement of actuator 50 and rod 46, causing an upward component to be transmitted to link 15 which assists in the disengagement of hook 23 with projection 22 at the time when the end of trip member 32 engages the edge of flange 21 of the door frame. It will be noted from Figures 4 and 5 that actuator 50 engages the edge of flange 21 prior to the engagement of trip member 32 with the flange so that the inward movement of member 50 takes place before trip member 32 is actuated.

Actuator 50 also serves as means for assuring that link 15 remains in its raised position during the final portion of the opening movement of the door. It will be seen from Figures 4 and 5 that when operating wheel 13 is rotated to move link bar 15 upwardly, actuator 50 will be withdrawn to permit it to clear the door frame as the door is opened. As long as the end of actuator 50 is in contact with the surface of flange 21 during the opening of the door, the connection of the actuator 50 with link 15 prevents downward movement of link 15 and assures that when trip member 32 is clear of flange 21 and moves to the right in Figures 2 and 4 to engage hook 23 with projection 22, the projection 22 will still be in its raised position ready to be engaged by hook 23. The fact that trip member 32 moves out of contact with flange 21 prior to actuator 50 upon opening of the door, makes it possible for actuator 50 to perform the afore-described function and retain the parts in the desired relative relation long enough for rod 27 and bell crank lever 24 to move to their positions as shown in Figure 3.

In operation, beginning with the door in the closed and dogged position as shown in Figures 2 and 4, and wheel 13 is rotated to move link 15 upwardly and thereby to effect withdrawal of dogging bars 16 to inoperative positions. Upward movement of link bar 15 withdraws actuator 50 to the position in which it is shown in Figure 3 and during the final portion of the opening movement of the door, the engagement of the end of actuator 50 with the surface of flange 21 of the door frame assures that even though the end wheel should be released, the link 15 will remain in the desired upward position.

As soon as trip member 32 attached to rod 27 moves out of contact with flange 21 of the door frame, spring 40 moves rod 27 to the right in Figure 2 and moves bell crank lever 24 in a clockwise direction to engage the hook-shaped end portion 23 of the bell crank lever with projection 22 on link 15. This engagement retains link 15 in its raised position and thereby retains the dogging bars 16 in their inoperative positions as long as the door is open. The movement of rod 27 to the right by spring 40 causes movement of trip member 32 in a clockwise direction as viewed from above and as explained previously herein to move the surface 33 of trip member 32 into contact with the vertical portion of guide 29 and to move projection 36 of the trip member into contact with plate 30. These contacts and the engagement of hook 23 with projection 22 define the limit of movement of rod 27 and bell crank lever 24.

When the door is moved toward its closed position, the beveled end 51' of actuator 50 first engages flange 21 of the door frame causing link 15 to be urged upwardly slightly to facilitate disengagement of hook 23 with projection 22. The contact of the end portion of actuator 50 with the surface of the flange 21 of the door frame also insures that the dogs will be retained in their inoperative positions until the door is completely closed.

As the door is moved further toward its closed position, surface 38 of trip member 32 engages the edge of flange 21 of the door frame causing counter-clockwise pivoting of trip member 32 as viewed from above and causing movement to the left of rod 27 as viewed in Figure 3. Trip member 32 rotates until surface 34 is flat against the vertical portion of guide 29 so that the contact of surface 38 of trip member 32 with the flange 21 pushes rod 27 to the left to permit continued closing motion of the door. The counter-clockwise rotation of bell crank lever 24 disengages hook 23 from projection 22 so that as soon as the door reaches its closed position and actuator 50 is clear of inner surface of flange 21, spring 43 pulls downwardly on link 15 and thereby automatically moves the dogging bars 16 to extending dogging positions. In the structure disclosed in the above-mentioned patent, operating lever 14 may be rotated further after the door is closed to apply leverage to the dogging bars 16 so as to cause a tight seal of the door to the door frame.

The contact of member 32 with flange 21 of the door frame retains lever 24 in its extreme counter-clockwise position until the door is again opened.

I wish it to be understood that I have shown and described only a preferred embodiment of the invention in accordance with the patent statutes and I fully realize that the invention is susceptible of numerous modifications without departing from the inventive concept. The invention is not to be limited to the preferred embodiment but is intended to cover all modifications of the invention falling within the scope of the appended claims.

I claim:

1. In a quick fastening door construction of the type in which at least one door fastening element is operably connected to a movable controlling member, an interlock arrangement comprising resilient means biasing said movable member in a direction to move said door fastening element to an operative position, detent means operative when the door is open and engageable

with said member to retain said member against movement under the influence of said resilient means to a position in which said fastening element is in an inoperative position, means operable by closing of the door to render said detent means inoperative, and auxiliary means operable to resist the biased movement of said movable member until the door is completely closed, whereupon said resilient means moves said movable member and thereby the fastening element to an operative position.

2. In a quick acting construction for fastening a door to a door frame and of the type in which at least one door fastening element is operably connected to a movable controlling member, an interlock arrangement comprising means continuously biasing said controlling member and said fastening means toward the operative position of said fastening means, detent means engageable with said controlling member and operable to retain said member and thereby said fastening means against said biased movement, resilient means urging said detent means toward its operative retaining position and operative to retain said detent means in said retaining position as long as the door is open, an operating element for said detent means operable by engagement with the door frame upon closing of the door to move said detent means to an inoperative position, and auxiliary means connected to said movable controlling member and operable by engagement with the door frame to retain said controlling member and said fastening means in the inoperative position after movement of said detent means to an inoperative position and until the door is completely closed, whereupon said auxiliary means releases said controlling member and said fastening means for movement to the operative position.

3. The interlock arrangement of claim 2 in which said auxiliary means is positioned so as to remain in contact with the door frame subsequent to detent releasing contact of said detent operating element with the door frame upon closing of the door, and to remain in contact with said door frame subsequent to movement of said detent operating element to a position clear of the door frame upon opening of the door, whereby said auxiliary means is operative during closing of the door to retain said controlling member and fastening means in inoperative position after movement of the detent means to inoperative position and until the door is completely closed, and is operative during opening of the door to retain said controlling member in position to be engaged by said detent means until said detent operating element moves to a position clear of the door frame permitting said resilient means to move the detent means into retaining engagement with said controlling member, thereby obviating manual retention of said controlling member in said last mentioned position until said detent operating element is clear of the door frame.

4. The interlock arrangement of claim 2 in which the operating element for the detent means comprises an arm carrying a pivoted trip member at its end which cooperates with the door frame, said trip member having a surface disposed at an angle to the door frame and adapted to engage the door frame, whereby said engagement during closing of the door causes a cam-like action between the door frame and the trip member which partly rotates the trip member and pushes the trip member and the arm inwardly against the resistance of said resilient means, thereby moving said detent to an inoperative position.

5. The interlock arrangement of claim 2 in which the operating element for the detent means comprises an arm carrying a pivoted trip member at its end which cooperates with the door frame, a guide member cooperating with said trip member, said trip member having a projection position to engage a stop fixed to the door and having a first surface adapted to abut said guide, the engagement of said projection with said stop and the abutment of said first surface against said guide defining a first position of said trip member, said trip member also having a second surface disposed at an angle to the door frame for engagement with the door frame, and a third surface disposed at an oblique angle to said first surface and adapted to abut said guide to define a second position of said trip member, said resilient means being operable when said door is open and said trip member is clear of the door frame to move said arm to an extended position in which said trip member occupies said first position, the engagement of said second surface of the trip member with the door frame during closing movement of the door causing pivoted movement of the trip member to said second position accompanied by movement of said arm out of said extended position with the resulting movement of said detent to inoperative position.

6. In a door fastening construction having a detent operable to retain the door fastening means in inoperative position as long as the door is open with respect to a cooperating door frame, and in which a biased operating arm having one end cooperating with a guide member normally urges the detent to operative position, the novel feature comprising a trip member pivotally mounted on the end of said operating arm which cooperates with said guide member, said trip member having a projection positioned to engage a stop fixed to the door and a first surface adapted to abut said guide, the engagement of said projection with said stop and the abutment of said first surface against said guide defining a first position of said trip member, said trip member also having a second surface disposed at an angle to the door frame, and a third surface disposed at an oblique angle to said first surface and adapted to abut said guide to define a second position of said trip member, the biased movement of said operating arm being operable when said trip member is clear of the door frame to move said arm to an extended position in which said trip member occupies said first position, the engagement of said second surface of the trip member with the door frame during closing movement of the door causing pivotal movement of the trip member to said second position accompanied by movement of said arm out of said extended position with the resulting movement of said detent to inoperative position.

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The following references are of record in the file of this patent:

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Number	Name	Date
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1,870,746	Pyle	Aug. 9, 1932
2,130,302	Henderson	Sept. 13, 1938

Certificate of Correction

Patent No. 2,500,000 March 7, 1950

FRANCIS M. LAMBERT

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 8, line 10, for the word "position" read *positioned;*

and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 6th day of June, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.