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G. A. SCOTT ET AL

3,099,471

DOOR LATCH

Filed Jan. 9, 1961

2 Sheets-Sheet 1

FIG. 1

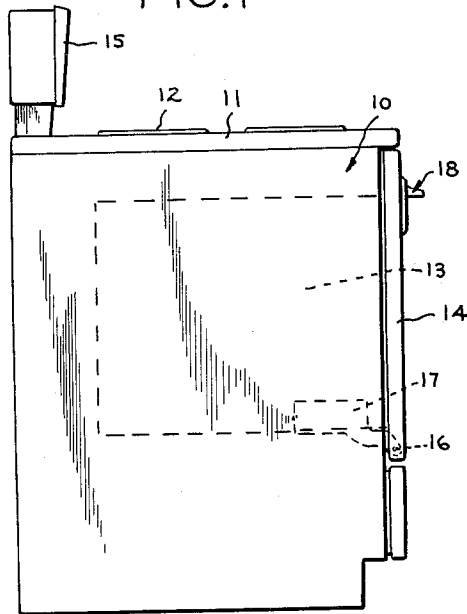


FIG. 2

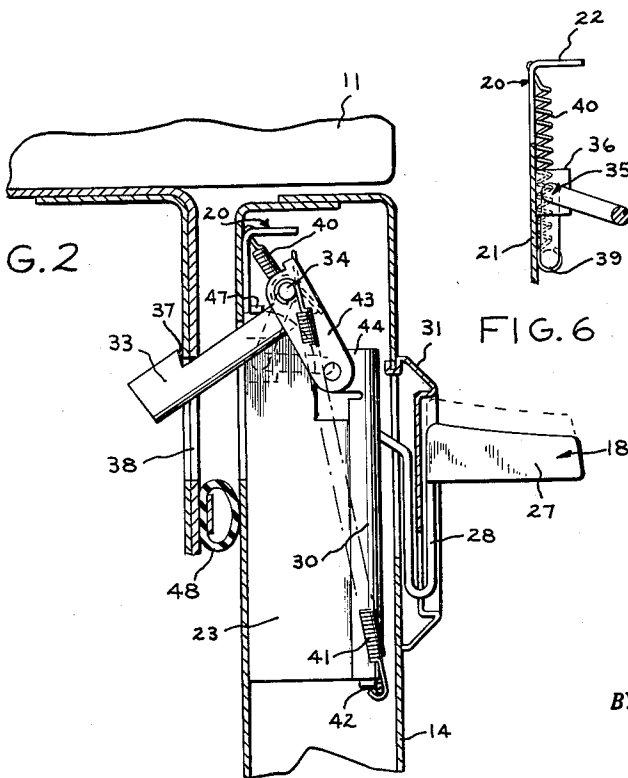


FIG. 6

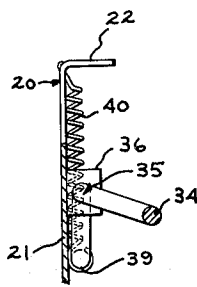
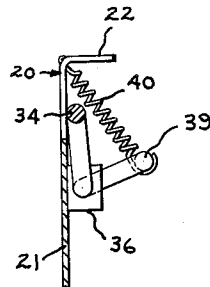


FIG. 5



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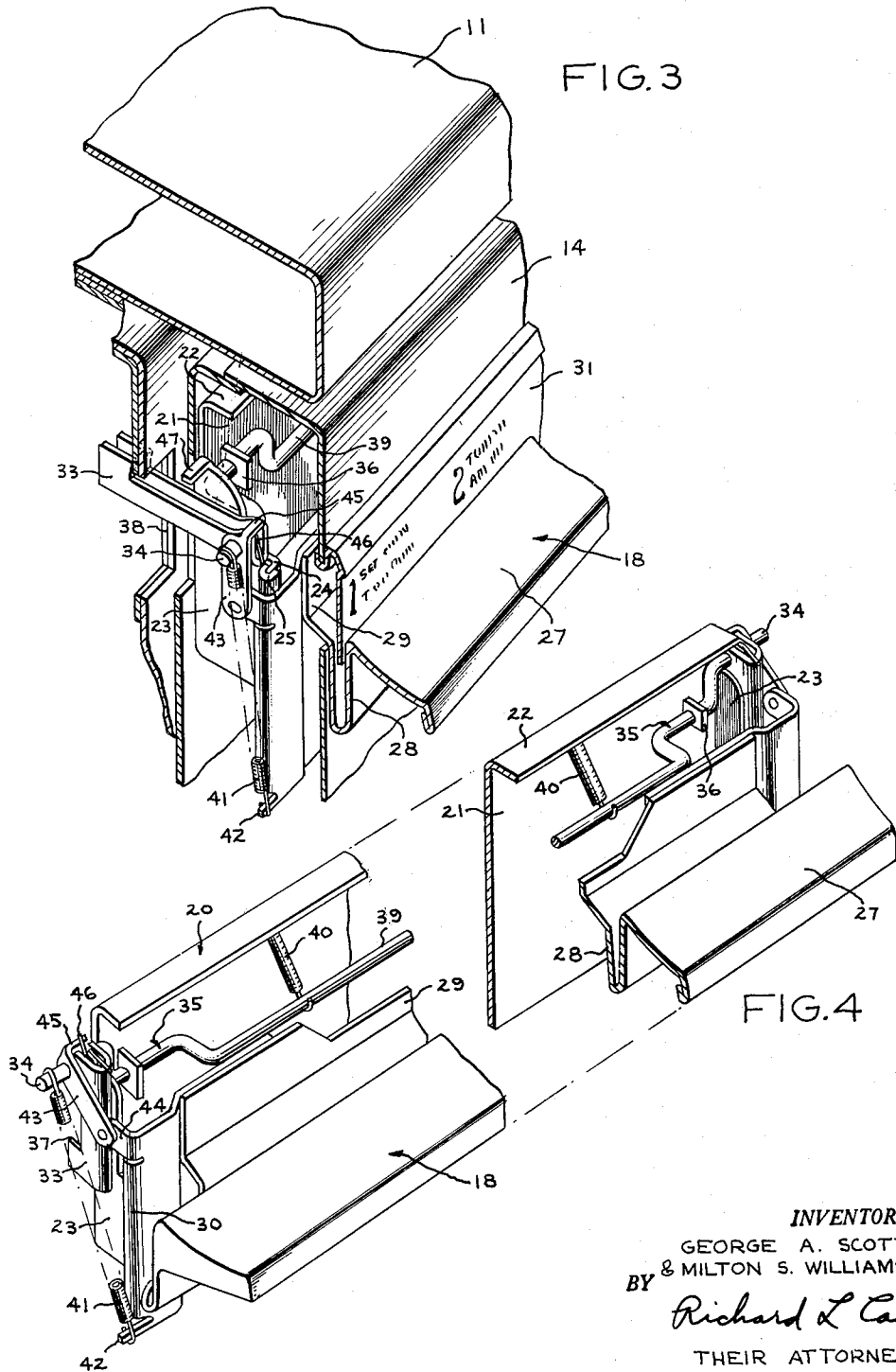
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DOOR LATCH

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10 Claims. (Cl. 292-7)

The present invention relates to a latch mechanism for holding a pivoted door in a closed position.

This invention was first conceived during the development of a new concept in baking ovens for domestic use wherein the interior oven walls may be cleaned automatically by a high temperature cleaning cycle. Such a high temperature oven is described in an earlier copending application of Bohdan Hurko, Serial No. 27,926 filed May 9, 1960, which application is assigned to the General Electric Company, the assignee of the present invention. The food soil and grease spatter that accumulates on the oven walls may be completely removed automatically by raising the temperature of the oven to a heat-cleaning temperature within the range of about 750° F. to 950° F. so as to burn off all foreign matter from the oven walls. In such a high temperature oven it is of primary importance to latch the door before the cleaning cycle is set in motion and the oven temperature is raised above the normal cooking temperature of about 550° F. This insures that the oven door may not be opened before the completion of the heat cleaning cycle, otherwise a flash fire or small explosion might occur. Up until now it has never been necessary to latch an oven door in the closed position as with some other major appliances such as automatic dishwashers, refrigerators, and clothes dryers.

The primary object of the present invention is to provide a latch mechanism that is easy to operate and of compact size for mounting either in a door or the door frame, where the latching means has a swinging motion which will pull the door closed tightly.

A further object of the present invention is to provide a novel door latch where the latch means is retractable out of sight when in the unlatched position.

A further object of the present invention is to provide a door latch that may be mounted within an oven door and where the operating handle of the latch is capable of linear motion and serves in the place of the standard handle for opening and closing the door during the normal use of the oven.

A still further object of the present invention is to provide a novel door latch for use in a high temperature oven where the movement of the operating handle of the latch serves to uncover the operating instructions which are located therebehind for operating the oven during the automatic oven cleaning cycle, whereby these instructions are hidden from view when the door is unlatched and the oven is to be used for normal cooking operations.

The present invention, in accordance with one form thereof, embodies a novel latch mechanism for a pivoted door. The mechanism may either be mounted in the door or in the door frame. While we have elected to illustrate the invention as it would be used on a front-opening drop-door of an oven, it will readily be apparent to those skilled in this art that such a mechanism has general utility in the latch art and it may be so used wherever it is found advantageous. The latch mechanism includes an operating handle that is capable of linear motion and a pivoted latch means connected to the operating handle by linkage means so that movement of the handle will effect a comparable movement of the latch means. It is important that the latch means pull the door closed tightly so that the door actually seals the

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door opening. This action is provided by an eccentric crank means which serves as a shifting pivotal axis for the latch means.

Other improvements are to provide a fixed stop to cooperate with the latch means so as to retract the latch means out of sight when the door is unlatched. Also a return spring means may be provided to hold the operating handle in the latched position as well as to counter-balance the handle and return the handle to the unlatched position once it is shifted slightly from the latched position. One of the many advantages of this type of door latch is that the operating handle has the appearance of a standard oven door handle and it functions as such during normal cooking operations. Moreover operating instructions for the oven cleaning cycle may be positioned behind the operating handle out of sight during normal cooking and plainly in view once the latch operating handle is moved to the latched position.

Our invention will be better understood from the following description taken in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

FIGURE 1 is a left side elevational view of a free-standing range having an oven door embodying the latch mechanism of the present invention.

FIGURE 2 is a fragmentary cross-sectional side elevational view taken near the top of the oven door adjacent the door handle and showing the latch mechanism of this invention located within the door with the operating handle moved downward in a partially latched position.

FIGURE 3 is a fragmentary isometrical cross-sectional view taken on the same plane as FIGURE 2, but showing the operating handle in its lowermost fully latched position.

FIGURE 4 is an isometric view of the subassembly of the latch mechanism of the present invention removed from the oven door and showing the operating handle in the unlatched position.

FIGURE 5 is a diagrammatic showing of the return spring that cooperates with the rock shaft of the latch mechanism illustrating the position of the spring when the latch mechanism is in its unlatched position of FIGURE 4.

FIGURE 6 is a diagrammatic showing similar to that of FIGURE 5 showing the return spring in its over-center position to constitute a spring biasing force holding the operating handle in its latched position.

Turning now to a consideration of the drawings and in particular to FIGURE 1, there is shown for illustrative purposes only a free-standing electric range 10 having a top cooking surface 11 with a plurality of surface heating elements 12, an oven cavity 13, a front-opening drop-door 14, and a backsplash 15 arranged along the back edge of the cooking surface 11 and in which are located the various manual controls for governing the energization of the heating elements of the range. This invention is concerned with a latch mechanism for locking the oven door 14 in the closed position although its use is not restricted to an oven door. However, to give a specific example of the utility of this latch mechanism it will be described in cooperation with an oven and the door of the oven. Accordingly, no further mention will be made of the details of construction of the range 10 since they form no part of the present invention.

As shown in FIGURE 1 the oven door 14 is hinged along its bottom edge about the pivotal axis 16 of the hinge brackets 17 that are in turn fastened integrally to the body of the range 10. The upper portion of the door 14 is provided on its front face with a door handle 18 having the outward appearance of a standard oven door handle that is in use today. However, this door handle 18 is the operating handle of the latch mechanism

of the present invention that is positioned within the door as is best shown in FIGURES 2, 3, and 4 of the drawings. FIGURES 2 and 3 show the latch in the partially latched position and the fully latched position respectively while FIGURE 4 is an isometric showing of the latch mechanism completely removed from the door. Accordingly, the best understanding of this invention can be gained by referring to FIGURE 4 for a detailed explanation of its principle of operation.

The two main elements of the latch mechanism are the operating handle 18 and the latch base 20. The latch base 20 is a sheet metal member of elongated shape that is welded or otherwise fixedly held within the oven door. The latch base 20 has a vertical back wall 21, a narrow top flange 22, and parallel side walls 23 which extend perpendicularly to the back wall 21. As seen in FIGURE 3, the vertical free edges of the two side walls 23 are folded outwardly as at 24 to form side bearing rails that lie in a common plane parallel to the back wall 21. A hard surfaced sleeve 25 of low frictional resistance such as glass filled Teflon or an equivalent high temperature bearing material is formed over the rails 24 to serve as smooth rails on which the operating handle 18 is supported and guided for linear motion between the unlatched position of FIGURE 4 to the latched position of FIGURE 3.

The operating handle 18 is likewise an elongated member of thin metal stock having a decorative, outwardly projecting, hand-engaging portion 27, a deep recessed channel 28 behind the hand-engaging portion 27, and a vertical back surface 29 whose side edges are doubled back on themselves as at 30 for nearly the entire height of the back plate 29 for encompassing the sleeves 25 of the side bearing rails 24 of the latch base 20. Accordingly, it should be understood that the operating handle 18 is capable of vertical reciprocating motion from a topmost or unlatched position to a lowermost or latched position.

One application of the novel latch mechanism of this invention is with the high temperature oven having an automatic oven cleaning cycle. Since this design of oven is completely new to housewives and there are several operating steps which must be taken in sequence in order to initiate the cycle and retain absolute safety in the kitchen, it has been considered necessary to provide use and care instructions which are readily available when needed and are not seen during the normal use of the oven for cooking. The purpose of the deep recessed channel 28 of the operating handle 18 is to afford room for the incorporation of an instruction panel 31 which is staked or otherwise fastened to an edge of an opening in the front panel of the oven door 14 to extend down into the recessed channel 28 as is best seen in FIGURES 2 and 3. A typical set of instructions would be as follows:

- (1) Set oven knob to clean.
- (2) Turn oven temperature knob past clean and release when indicator light goes on.
- (3) Open oven door only after light is out.

It is made clear by studying both FIGURES 2 and 3 that the operating instructions are hidden when the operating handle 18 is at its uppermost unlatched position shown in dotted lines in FIGURE 2, and is clearly visible when the handle 18 is in its lowermost latched position of FIGURE 3.

In addition to the operating handle 18 and the latch base 20, the latch mechanism includes a parallel pair of vertically swingable latch members 33, there being a latch member at each side edge of the back plate 21 of the latch base 20. These latch members 33 are each freely supported on a crank arm 34 of a rock shaft 35. The rock shaft is pivotally supported adjacent its opposite ends on parallel tabs 36 which project outwardly from the back plate 21 toward the operating handle 18. As best seen at the right side of FIGURE 4, the crank arm 34 is of generally L-shape having one portion extending vertically perpendicular to the pivotal axis of the rock shaft 35

and then a second portion extending at a right angle to lie in a parallel relation to the pivotal axis of rock shaft 35. The latch member 33 is of folded U-shape cross-section throughout its length, as best seen at the left side of FIGURE 4, to give it the necessary amount of strength and rigidity. It also has a hook formed on its free end 37 which is adapted to engage in a slotted opening or keeper portion 38 of the front wall of the door frame or oven body. The rock shaft 35 has another crank arm 39 located between the shaft supporting tabs 36 and disposed in a plane at slightly less than a right angle to the plane of the L-shaped crank arm 34 as is best seen in FIGURE 5. The purpose of the second crank arm 39 is to serve as a limit means to stop the travel of the operating handle 18 once it reaches the fully latched position of FIGURE 3. This is accomplished by the crank arm 39 striking the backplate 21 of the latch base as is seen in FIGURE 6. Moreover, tension springs 40 are each fastened at one end to the crank arm 39 and at its opposite end to the top edge of the back plate 21 as best seen in FIGURES 4 and 5. These tension springs 40 provide a counter-balancing or returning force to assist in lifting the operating handle back to its unlatched position of FIGURE 2 once the operating handle is slightly raised from its latched position of FIGURE 3. A second set of tension springs 41 are arranged at each end of the latch mechanism to act in parallel with springs 40. This second set of springs 41 are connected between the tips of the crank arm 34 and fingers 42 at each side of the lower portion of the operating handle 18. When the door is tightly latched the latch members 33 are nearly perpendicular with the inner surface of the door and the crank arms 34 are rotated below the pivotal axis of the rock shaft 35 as shown in FIGURE 6 to be in an over-center condition to resist the door-opening force exerted by the gasket 48 when it is compressed. This will be better understood hereinafter once a complete understanding is gained of the operation of the mechanism as a whole. A second important function of the tension springs 40 is to serve to hold the operating handle in the latched position. This function is accomplished by the tension springs 40 being carried beyond the pivotal axis of the rock shaft 35 as seen in FIGURE 6 when the operating handle 18 reaches its lowermost full latched position to give an over-center action so that the force of the tension springs serves to increase the latching force rather than decrease it.

It is necessary to convert the vertical force bearing down on the operating handle 18 to a force that will swing the latch members 33 into latching engagement with the slotted opening 38 of the oven front. This is accomplished by a pair of link members 43 each pivoted at one end to the crank arm 34 and at its opposite end to a tab 44 formed on the top edge of the side of the operating handle 18. A finger 45 extends from each link member 43 over the adjacent latch member 33. This finger 45 cooperates with a torsion spring of wire form 46 which is located within latch member 33 and is centered around the pivotal axis thereof on the crank arm 34 to normally swing the latch member 33 into latching engagement with the slotted opening 38 of the oven front. It would not be well to have the latch members 33 project from the inner face of the door when the door is open although this is a normal tendency of the torsion springs 46. However, this is avoided by the use of a fixed stop 47 that extends sidewardly from the side wall 23 of the latch base so that when the crank arm 34 swings counter-clockwise from the position of FIGURE 2 to the unlatched position of the mechanism the latch members 33 will engage against the fixed stop 47 and thereby swing counter-clockwise to the more or less vertical position shown in FIGURE 4.

Hence as the operating handle 18 is depressed the crank arm 34 will swing clockwise and the latch member 33 will likewise move clockwise although continuing to bear against the fixed stop 47. Only when the latch member

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is engaged within the slotted opening 38 of the oven front do the latch members 33 move away from the fixed stops 47. Then the crank arms 34 tend to pull back on the latch members while continuing to swing downwardly. This action pulls the door tightly closed. The oven front is provided with a resilient gasket 48 of silicone rubber or the like which is engaged by the inner surface of the door 14 and this gasket is compressed by this tight latching action of the door so that the door is tightly sealed to prevent or regulate the escape of smoke odors, vapor, and heat from around the door.

As seen in the latched position of FIGURE 3, the latch members 33 are disposed more or less horizontally. When the handle 18 is raised by exerting an upward force thereon the tension springs 40 are brought outwardly to pass through the pivotal axis of the rock shaft 35 and then the tension of these springs 40 and the secondary springs 41 will quickly return the operating handle 18 to the unlatched position shown in dotted lines in FIGURE 2. Then the latch members 33 are substantially vertically disposed as best seen in FIGURE 4.

Having described above our invention of a novel latch design of rugged construction having a pair of spaced latch members and an operating handle capable of linear motion while the latch members have both a swinging and a tightening motion, it will readily be apparent to those skilled in this art that the handle does not detract from the appearance of the door and that it may be grasped both for opening and closing the door. It is provided with operating instructions for the oven which are readily available when they are necessary and are removed out of sight when they are not needed. Moreover, the door is capable of being tightly closed so as to compress the door gasket and provide a good sealing action around the door opening. The latch mechanism is totally enclosed within the door when the door is opened so as not to be seen nor be in the way. While we have elected to illustrate the invention as being part of the door it should be obvious that the parts could be reversed and the mechanism be mounted on the door frame or range body. Then the operating handle could be manipulated by a horizontally movable lever that has an arm that is guided by the body and is connected to the handle so that horizontal movement of the lever will effect vertical movement of the operating handle in a reciprocating manner.

Other modifications of this invention will occur to those skilled in this art and it is to be understood, therefore, that this invention is not limited to the particular embodiments disclosed but that it is intended to cover all modifications which are within the true spirit and scope of this invention as claimed.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. A latch mechanism for a pivoted door, there being a door frame element and a door element hinged along one edge to the door frame for gaining access to an opening through the door frame, the latch mechanism being supported on one of the door and door frame elements, keeper means on the opposite element from the latch mechanism, the latch mechanism including an operating handle and at least one pivoted latch member, said latch member being capable of engagement with and disengagement from its respective keeper, said latch member being pivoted on an eccentric crank arm, a fixed stop cooperating with said latch member as a fulcrum until the latch member engages its keeper, then the continued movement of the eccentric crank arm pulls the latch member back so as to pull the door tightly closed, the fixed stop serving to retract the latch member into the supporting elements of the latch member when the latch mechanism is in the unlatched position.

2. A latch mechanism for locking a pivoted door in a closed position, there being a door frame element and a door element hinged along one edge to the door frame for gaining access therethrough, the latch mechanism being supported on one of the door and door frame elements, a

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pair of keepers on the opposite element from the latch mechanism, the latch mechanism including an operating handle that is capable of reciprocating movement and a pair of pivoted latch members which swing in parallel planes, said latch members being joined together by a rock shaft and being mounted on crank arms of the rock shaft so as to be capable of engagement with and disengagement from the respective keepers, and link means connecting the operating handle to the crank arms of the rock shaft so that linear motion of the operating handle will affect swinging motion of the latch members so the latch members will engage within the keepers on the opposite element, the last portion of the swinging movement on the latch member tending to pull the door closed tightly, and return spring means connected between the rock shaft and the element on which the latch mechanism is supported which cooperates with the rock shaft for locking the latch mechanism in the latched position by an over-center travel of the spring, the return spring also serving as a counter-balance spring to assist in moving the operating handle to the unlatched position after the operating handle is shifted slightly from the latched position.

3. A latch mechanism as recited in claim 2 with the addition of fixed stop means cooperating with each latch member as a fulcrum until the latch members swing out and engage the respective keepers, then the continued movement of the crank arms of the rock shaft pull the latch members back so as to pull the door tightly closed, the fixed stop means serving to retract the latch members into the supporting element of the latch mechanism when the latch mechanism is in the unlatched position.

4. A latch mechanism for an oven door, there being a door frame and a front opening drop door hinged along the bottom edge of the door frame, the latch mechanism being supported within the door along the top edge thereof, a pair of keepers formed in the front face of the door frame near the top thereof, said latch mechanism including a supporting base fixedly mounted within the door structure, said supporting base including side bearing rails, and an operating handle supported for sliding engagement on the said side bearing rails, the operating handle extending outwardly through the front of the door and being capable of linear motion, the latch mechanism including a parallel pair of pivoted latches that are joined together on a rock shaft which is in turn pivotally supported from the latch base, the latches serving to act in unison and being capable of engagement with and disengagement from the respective keepers, the latches being freely supported on crank arms of the rock shaft, there being spring means exerted against the latches to normally urge the latches into a latched position, and link means joining the operating handle with the crank arms of the rock shaft so that linear motion of the operating handle will affect swinging movement of the latches, the crank arms serving to pull the latches back so as to pull the door tightly closed once the latches engage the keepers.

5. A latch mechanism as recited in claim 4 with the addition of fixed stop means cooperating with each latch to serve as a fulcrum therefor until the latches engage their respective keepers, then the continued movement of the crank arms will pull the latches back so as to pull the door closed tightly, the fixed stop means serving to retract the latch member into the door when the latch mechanism is in the unlatched position.

6. A latch mechanism as recited in claim 5 with the addition of spring means connected with the rock shaft so that when the crank arm swings to the latched position the spring will be moved over-center to provide a biasing force tending to hold the operating handle in the latched position, this spring means also serving as a counter-balance for returning the handle to its unlatched position once the handle has been moved slightly from its latched position.

7. A latch mechanism for a pivoted door comprising a latch base fixedly mounted within the door and a latch

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operating handle slidably supported for linear motion on the latch base, the handle having a hand-engageable portion extending through an opening in the front face of the door, latch means pivotally mounted about a swinging pivot means that is supported from the latch base, and link means pivotally connected between the latch means and the handle so that linear motion of the handle will effect swinging motion of the latch means; the latch means being retractable completely within the door when the door is open, said latch means being pulled back within the door as it approaches a fully latched position so as to close and hold the door tightly, said latch means being substantially perpendicular to the inner surface of the door when the latch means is engaged within a keeper in the fully latched position.

8. A latch mechanism as recited in claim 7 wherein the latch base includes fixed stop means that is engaged by the latch means when the door is unlatched so as to retract the latch means completely within the door when the door is open.

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9. A latch mechanism as recited in claim 8, wherein spring means bias the handle into the unlatched position as well as hold the handle in the fully latched position against inadvertent opening of the latch.

10. A latch mechanism as recited in claim 7 wherein the latch means includes at least two latch members that are pivotally supported on crank arms at the ends of a rock shaft, and a door frame on which the door is hinged, said door frame having a pair of slotted openings serving as keepers for receiving the latch members.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

927,240	Hoffman	July 6, 1909
2,274,711	Krause	Mar. 3, 1942
2,378,654	Pekny	June 19, 1945
2,789,852	Eads	Apr. 23, 1957