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3,011,816

LATCH MECHANISM

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2 Sheets-Sheet 2

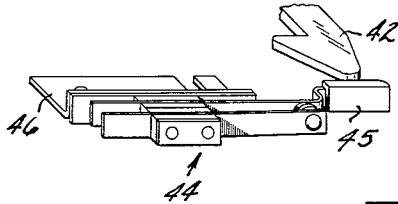


FIG. 5.

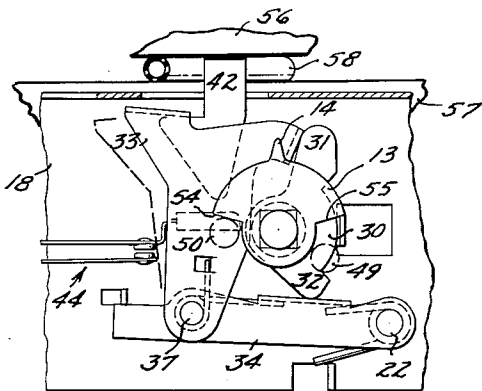


FIG. 6.

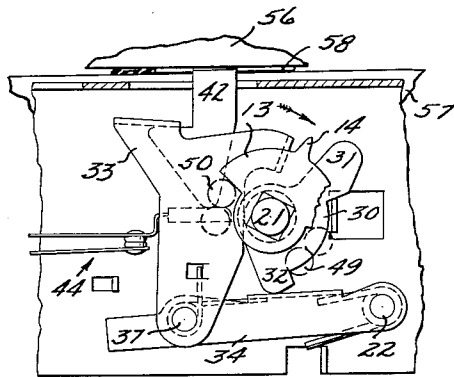


FIG. 7.

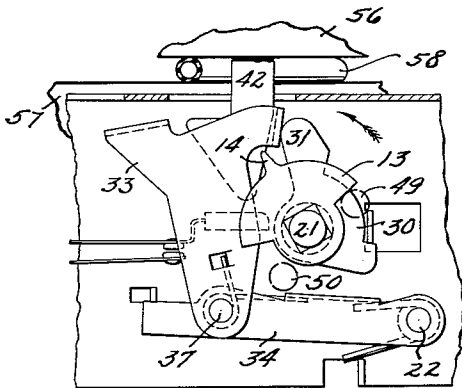


FIG. 8.

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LATCH MECHANISM

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The present invention relates to a latch mechanism and more particularly to a draw-down type of latch mechanism wherein an indicator function is integrated in the structure so that a glance at the latch mechanism indicates its state of engagement or disengagement. Still more particularly the present invention relates to a hold-down latch mechanism which receives a strike, grips the strike, and draws down the strike, thereby firmly closing the strike associated member, for example a door or other closure, while providing visible indicia of the latched or unlatched condition. Further the latch mechanism contemplates energization or de-energization of associated equipment which equipment is intended to function or cease function upon a particular selected condition as between latch and strike.

A wide variety of indicating door locks are well known in the art. However, such devices generally are intended solely to provide visible indicia of a locked or unlocked condition of a door. In most instances the indicia is directly responsible for the condition of lock or unlock as by the use of a blocking mechanism or the like. Few, if any, were intended to indicate intermediate positions of closure or to perform dynamic indicating functions in association with apparatus which may be controlled thereby. In the instant invention the handle portion of the device is biased to return ultimately to a fixed bias position upon release, while leaving the indicator in a set position. Thereafter the set condition may be cancelled by manipulation of the handle causing selected results in the operation of the latch mechanism. Furthermore, the strike which engages in the latch is captivated and drawn into the mechanism by selected action of the handle thereby firmly seating or compressing gaskets or seals on associated doors and cabinet structures. This downward action is also utilized to energize a control circuit, for example in a dishwashing structure, automatic washer structures, and the like, where otherwise the cycling of such structures prior to full closure and sealing would likely result in serious and possibly extensive water damage from pressurized jets of water or other materials within the chamber closed by the interlock between strike and latch.

Collaterally, the latch mechanism of the instant invention will be found to be extremely simple, hence substantially reasonable in price, and relatively easy to service. As will be appreciated by the accompanying description the latch is also amenable to decorative concealment secured to the exterior of a cabinet device, and is readily adaptable to ornamental modification. The latch structure also will be found to include a combination of unique elements integrated in such a way as to insure the utmost in compactness and thinness.

Accordingly one of the objects of the present invention is to provide an entirely new form of draw-down latch structure.

Another object is to provide a latch mechanism which performs a visible indicator function while being subjected to a series of random manual operations.

Still another object is to provide a new and useful latch mechanism wherein the function of selective locking and unlocking is accompanied by a draw-down action very simply coupled with the indicating structure.

Still another object is the provision of such a latch mechanism wherein the draw-down function of the latch

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provides a means to master the electrical controls of associated apparatus thereby preventing costly damage from the use of dishwasher, automatic washers, and like equipment wherein a peripheral door seal, for example, is relied upon to prevent materials within a cabinet from escaping through the hatch or door opening.

Further objects include the simplicity of the instant latching mechanism, its ready adaptability to exterior mounting, and its presentation of new decorative approaches by reason of its simplicity of mounting, and of course its overall economic impact in relation to cabinet design and safety.

Other objects will be readily appreciated as the description proceeds including variants and combinations of the principal objects indicated above.

In the drawing:

FIGURE 1 is a perspective view of the latch mechanism of the present invention mounted or enclosed and concealed in the simple exterior escutcheon element and showing the handle in its normally biased condition with the indicator element in its neutral or ready condition.

FIGURE 2 is a rear elevation of the latch mechanism substantially encased in the escutcheon element of FIGURE 1 and having the housing partially cut away to reveal the simple operating elements thereof.

FIGURE 3 is a side elevational section through the structure shown in FIGURE 2 and taken on the line III-III of FIGURE 2.

FIGURE 4 is a perspective view indicating the operation of the escutcheon supported spring as biasing the return of the handle to a predetermined position upon release after manual actuation.

FIGURE 5 is a perspective view of a strike element in draw-down engagement with the switch pad thereby closing the associated switch for electrical control over apparatus served by the latch mechanism.

FIGURE 6 is partial elevation view illustrating the entering of the strike element, as for example secured to one of the doors served by the latch mechanism and indicating that the strike is engaged loosely in the latch without disturbing the indicator or switch elements.

FIGURE 7 is an elevational view as in FIGURE 6, but showing the "cocking" action of the latch as it is drawn downward carrying the strike and illustrates the visible indicia element indicating that the gasket, for example, intermediate door and cabinet is fully depressed and that the switch has been closed for master energization of washer cycling or the like.

FIGURE 8 illustrates, in elevation view, as in FIGURES 6 and 7, the release of the strike by manual movement of the handle and following movement by the indicator member.

General description

In general the structure of the present invention comprises a latch mechanism having a support frame mounting which also provides mounting means for securing the structure to door, cover, or other similar structure involving a closure and to an ornamental or decorative enclosing escutcheon. An actuating shaft is provided transversely therethrough and journaled therein. The shaft is provided with an upset portion and an indicator plate over the upset portion so that the indicator plate moves in accord with the shaft position. A handle extends through the escutcheon element and the handle is provided with two extending lugs which are in selected engagement with the indicator plate, the lugs imparting movement of the handle to the indicator plate and thence to the shaft. A cam is mounted on the shaft and moves with the shaft. A pivot pin is journaled in the frame in a transverse relation thereto and parallel with said shaft but offset therefrom. The pivot pin pivotally carries a spring biased lever. To the lever is secured a latch member in pivotal

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relation. The latch member is resiliently biased in respect to the lever to a normally closed position. In this manner a strike may overcome the biased condition in the latch pivot upon thrust entry thereby allowing the latch element to close and grasp or captivate the strike. The cam, then, by selected movement of the shaft engages the lever and tilts or pivots the lever on its pivot and against its bias. This draws the strike into the mechanism, the latch moving with the draw-down action of the lever. The cam in movement with the shaft overruns and locks against the lever in this drawn-down position and concurrently carries with it the visible indicia element, for example the indicator plate with a pointer. This also closes an attached switch structure which may, for example, energize a master circuit to a dishwasher cabinet. Upon release of the handle, a spring bias acting on the handle returns it to a preselected position which movement in the handle does not disturb the indicator element or the shaft. When it is desired to release the latch from its draw-down position the handle is simply rotated in an opposite direction from the movement causing the drawn down. In this case the opposite lug on the handle engages the corresponding shoulder on the indicator plate thereby moving the shaft with it and rocks the cam out of locked engagement with the lever. The bias on the lever, plus any pressures developed by the draw-down of the cabinet cover, for example, compression on a cabinet or door engaging gasket, frees the latch for movement in the direction of the strike. This motion does not free the grip of the latch on the strike. The strike is still captivated by the latch. Continuing movement of the handle causes cam engagement with the latch element thereby tilting it on the axis provided for the latch element on the lever arm. This backs off the grip allowing the strike to spring free of the latch and opening the cabinet. As will be appreciated the indicator element plays a functional role in the actuation structure and accurately traces the movement of the actuating shaft. Further the shaft will be observed to move in accord with only a part of the handle movement, in accord with selected engagement between the handle lugs and the indicator plate. The devices in accord with this structure are readily mounted to the exterior of cabinets and cabinet doors for controlling engagement with strikes mounted on the opposite cabinet member. The mounting is made quite simple and the mechanism can be substantially wholly concealed by ornamental or decorative trim. The latches in accord with the invention have performed very well in field testing and in commercial usage have found ready acceptance.

Specific description

Referring to the drawings and more particularly to FIGURE 1, the inventive latch structure is shown as concealed in the ornamental escutcheon receptacle 11 with the handle 12 exposed and the indicator plate 13, including pointer 14, exposed to view. A strike opening 15 is provided through the escutcheon member 11. As will be appreciated this escutcheon structure and latch mechanism may be recessed in or mounted on a cabinet or door face for receiving a strike element extending from the opposite cabinet or door member upon closure. The illustrated escutcheon member 11 is an enclosure having an open back as better appreciated by reference to FIGURE 3 and is secured, as by concealed fasteners 16 and 17, to the latch mechanism frame 18 which is in turn easily secured to a cabinet or door face (not shown) as by fastener provisions 19 through the frame 18. As will be appreciated the escutcheon 11 and handle 12 readily admit of attractive design variations, but as will be seen both are integral elements in the latch structure, the escutcheon 11 providing auxiliary framing and the handle 12 providing means for actuation.

In FIGURES 2 and 3 it will be appreciated that a generally channel shaped frame 18 is provided which is

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arranged to journal and support the elements comprising the latch mechanism. The legs 19 and 20 of the channel shaped frame 18 are apertured to receive the main shaft 21 and pivot pin 22. The main shaft 21 is located slightly off center from the frame and the parallel pivot 22 is located below the shaft 21 and to one side thereof. This relationship is shown in FIGURE 2. The frame 18 is also perforated to provide spring stop 23, cam stop 24 and lever stop 25, the cut away portions of the frame 18 being bent inwardly in the relationship shown. The web portion 26 of the frame or housing 18 is provided with an opening 27 which, upon assembly is in register with the strike opening 15 in escutcheon member 11. A portion of the shaft 21 is upset or out-of-round as by the square shank portion 28. With reference to FIGURE 3 the upset portion 28 of the shaft 21 projects outwardly from the frame 18 and through the escutcheon 11. The shaft 21 passes transversely through the frame 18 and a cam 30 is secured thereon for rotation therewith intermediate the legs 19 and 20 of the frame 18. The cam 30 is provided with two lobes 31 and 32. The upper lobe 31, as represented in the FIGURE 2 is the latch engaging lobe and upon counterclockwise movement, as illustrated engages a latch member 33. Upon clockwise rotation, as shown, the lower lobe is engaged by a lever 34 and the lever 34 is moved by the lower lobe 32. In either motion of the cam 30 the clockwise and counterclockwise motion of the cam is limited by the cam stop 24 engaging the lobe 31 or 32.

The lever 34 is a channel shaped member provided with a thrust receiving pedestal 35. At one end the lever 34 is pivotal on the fixed pin 22. The lever 34 extends in a general horizontal direction beneath the shaft 21 and beyond the vertical extension of the shaft axis as shown in FIGURE 2. First resilient means 36, illustrated as a torsion spring about the pivot pin 22 and bearing against the spring stop 23 and the lever 34, urges the lever upward about the pin 22 toward engagement with the lobe 32 of the cam 30 and limited by the lever 34 engaging the lever stop 25. The latch element 33 is pivotally secured to lever 34 as by latch pin 37. A second resilient means 38, illustrated as a torsion spring is provided on the pin 37 and bears on the lever 34 and the latch member 33 at the latch spring stop 39 provided in one leg of the latch member 33. This biases the latch about the pin 37 toward resilient engagement with the upper lobe 31 of the cam 30. The latch member 33 is channel shaped with the web portion cut partially away to provide a strike grip 40 of the remaining portion. As observable in FIGURE 2 the strike grip 40 engages the flange 41 of the strike 42 thereby retaining or captivating the strike 42. The latch 33 is also provided with a cam following face 43 which is engageable with the upper lobe 31 of the cam 30. As appreciated from FIGURE 2 the latch 33, at the entry of strike 42, is urged against the resilient bias of spring 38 moving the latch member 33 into the position indicated by the phantom-line shown in FIGURE 2. As will be appreciated this does not disturb the ready position of shaft 21 and the strike grip 40 closes on or captivates the strike 42 by reason of the spring bias 38. A switch 44 secured to the frame 18 and intermediate the legs thereof is provided with an extension pad 45 which extends below the path of the strike 42. The switch 44 is secured to the frame 18 by the switch base plate 46. As will be seen the strike 42 is moved selectively down by action of the lobe 32 of cam 30 on the lever 34 and the strike 42 contacts the pad 45, thereby closing the switch 44 (FIGURE 5). The movement of the cam 30 is dependent upon rotational movement of the shaft 21 and the shaft 21 is moved by rotation of the indicator plate 13. As will be appreciated the indicator plate 13 is in turn moved by positive manual movement of the handle 12 away from its rest or center position illustrated in FIGURE 1.

The handle 12 is on the shaft 21 by means of a set

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screw 47 through the hub portion of the handle and extending into the annular groove 48 on the shaft 21. As will be appreciated this connection of the handle 12 is not a driving connection. It is best shown in FIGURE 3. In FIGURE 4 the handle 12 is illustrated to show the pair of extending lugs 49 and 50 which project in spaced apart parallel relation on either side of the shaft recess 51 and parallel thereto. As observed the lugs 49 and 50 are not symmetrically arranged in respect to the handle 12, but one of the lugs 49 is lower in position than the lug 50. The lugs ride upon a resilient bias provided by the spring rod 52 biasing the handle into a predetermined position upon release of manual pressures. The spring 52 is secured to the escutcheon member as by the fasteners 53 shown in phantom line in FIGURE 4. The lugs 49 and 50 extend, as shown in FIGURE 3 into the plane path of the indicator plate 13. Thus as the handle 12 is rotated selected engagement occurs as between handle 12 and indicator plate 13 causing selected rotation of the shaft 21 and affecting the positioning the indicator 13 but not interfering with the return of the handle upon release to the position dictated by the spring rod 52. This is so because only one of the lugs 49 and 50 is in moving contact with the indicator plate 13 during any movement of the handle. Thus, as will be seen in the lock position, the handle is freed for spring return.

The indicator plate 13 is best illustrated in FIGURE 6. It is a flat plate having an upset opening there-through mating with the upset portion 28 of the shaft 21. It is provided with two shoulders 54 and 55 which are positioned to be engaged one or the other by movement of the corresponding lugs 49 and 50. The pointer 14 is visible on the outside of the escutcheon member 11. As shown in FIGURE 6 the latch mechanism is in the ready or rest position as indicated in FIGURE 2. The strike 42 has rocked the latch 33 back, as shown in phantom line, to admit the strike 42 and has then closed upon the strike 42 without disturbance of the handle position as indicated by the position of lugs 49 and 50 and the pointer 14. This has occurred as the door 56 to which the strike 42 is attached, for example, is loosely closed against the cabinet 57, for example, to which the latch mechanism is secured. The gasket 58 intermediate the two members is but mildly affected.

In FIGURE 7 clockwise movement is imparted to the handle 12 thereby causing movement in the indicator plate 13 and concurrent movement in the shaft 21 and lugs 49 and 50, as shown. This causes rotation of the cam 30 and the lobe 32 of the cam 30 urges depression of the lever 34. This moves the pivot 37 downward drawing with it the latch 33 and gripped strike 42. With the strike 42 comes the door 56 and thus compresses the gasket 58. This motion also closes the switch 44 when the strike 42 engages the switch pad 45. If this switch is the master switch for an appliance such as a dishwasher, this arms the cycling circuits for operation. The appliance cannot be operated until this gasket depressed condition obtains. Now on release of the handle 12 the handle 12 is returned to its rest position by the spring rod 52 but the indicator plate 13 remains with the shaft 21 indicating that locked operating conditions exist in the latch mechanism.

If the handle 12 is subsequently moved a short distance in the counterclockwise direction from its biased rest position as shown in FIGURE 6, then the lug 49 carries the pointer 14 and indicator 13 into the ready position releasing the draw-down grip as shown in FIGURE 7 and opening the master circuit as controlled by the switch 44. The captivated strike 42 is not released, however. Further counterclockwise motion as shown in FIGURE 8 is required to cause the upper lobe 31 of the cam 30 to rock the latch 33 back against its spring bias to release the strike 42 (FIGURE 8). In this position the door 56 may be opened and the strike 42 withdrawn. Upon release of the handle 12 the spring 52 (FIGURE

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4) returns the handle 33 to its predetermined position as shown in FIGURE 6 by relation to the lugs 49 and 50.

As will be appreciated the pointer 14 always indicates the condition established within the latch mechanism and no movement of the handle 12 will cause energization of the master switch 44 unless the strike element 42 is engaged and drawn down.

As applied to appliances having a closure such as a door in a cabinet, and wherein agitation of fluids occurs within the cabinet chamber, such devices have proved effective in preventing damage by leakage in that the gasket intermediate the cabinet and closure must be drawn tight before mixing or agitation can commence in the structure. In addition, commercial usage of this device has proved to be sufficiently simple by means of its visible indicia to be easily used and understood by housewives and others of the general public unskilled in complicated mechanics. In the dishwasher and laundry appliance fields the use of the instant latch device has brought attendant economies by reason of its simple installation and service. The presently described latch mechanism has also shown new design horizons in the appliance field and provides a complete dependable thin-profile latch structure of rugged construction since frame, latch, lever and cam are grouped in a general planal arrangement with each other and actuation is accomplished through movement of a member in adjacent planal register therewith.

Having thus described my invention a wide variety of modifications will be appreciated by those skilled in the latch mechanism art. Such modifications are intended to be included herein limited only by the scope of the hereinafter appended claims.

I claim:

1. A latch mechanism comprising: a cam; a lever actuated by rotation of said cam; a latch movably connected to said lever; a shaft selectively moveable by an actuating element and connected to said cam; a first spring bias resiliently urging said lever toward contact with said cam; and a second spring bias on said lever resiliently urging said latch into a preselected position overcome by gripping engagement and by engagement with said cam moving in a direction opposite to the direction requisite for engagement with said lever.

2. An indicator latch structure comprising: an actuating shaft; a cam on said actuating shaft and secured thereto for actuation therewith; an upset shank on said shaft; an indicator plate over said upset on said shaft; a handle on said shaft, said handle having extending lugs selectively engageable with said indicator plate; a lever selectively engageable by said cam; a latch element pivotally secured to said lever and pivotally movable thereon by selected engagement with said cam; and a frame mounting said shaft and lever.

3. An indicator latch structure comprising: an actuating shaft; a cam on said actuating shaft and secured thereto for actuation therewith; an upset shank on said shaft; an indicator plate over said upset on said shaft; a handle having a pair of extending lugs selectively engageable with said indicator plate; a transverse spring biasing said handle upon release to a predetermined position by action upon said lugs; a lever selectively engageable by said cam; a latch element pivotally secured to said lever and pivotally movable thereon by selected engagement with said cam; and a frame mounting said shaft and lever.

4. An indicator latch structure comprising: a housing; a shaft extending transversely through said housing and journaled thereby, said shaft including an out-of-round portion; a cam secured on said shaft for rotation therewith; an indicator plate matingly engaged on said shaft and over said out-of-round portion and having a pair of thrust receiving shoulders; a handle over said shaft and rotatable thereon, said handle including a pair of projecting lugs in spaced apart relation about said shaft and each selectively engageable with one of said shoulders

on said indicator plate upon rotation of said handle; a lever pivoted on said housing; a latch element pivotal on said lever, said lever being positioned for engagement and movement by said cam; a first spring bias urging said lever into a following engagement with said cam; a second spring bias urging said latch into a gripping position; and resilient means acting upon said handle returning said handle to a preselected position after any manual movement thereof.

5. A draw-down indicator latch structure comprising: a frame; a shaft through said frame; a two lobe cam on said shaft; a lever pivotal on said frame and actuated by said cam upon engagement with one lobe of said cam; an upset on said shaft; an indicator plate secured to said shaft over said upset for movement therewith; a latch

pivotaly connected to said lever and moveable therewith and pivotaly actuated by the other of said lobes upon said cam in accord with selected rotation of said shaft; a handle freely turnable on said shaft; a pair of lugs extending from said handle to engage, upon rotation with said handle, said indicator plate; a spring acting upon said lugs and returning said handle to a predetermined position while leaving said indicator in its lock position by reason of said cam depressing said lever; a return spring biasing said lever in a rest position and resiliently biasing said latch to a strike receiving position.

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