

March 12, 1963

D. W. McDANIEL

3,081,117

CLOSURE LATCH

Filed Oct. 31, 1960

3 Sheets-Sheet 1

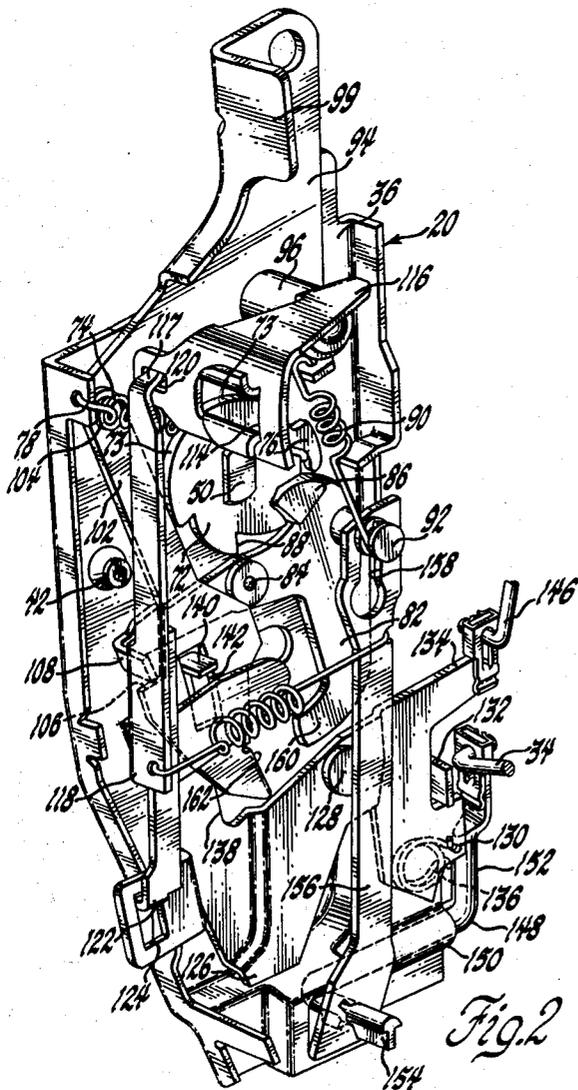
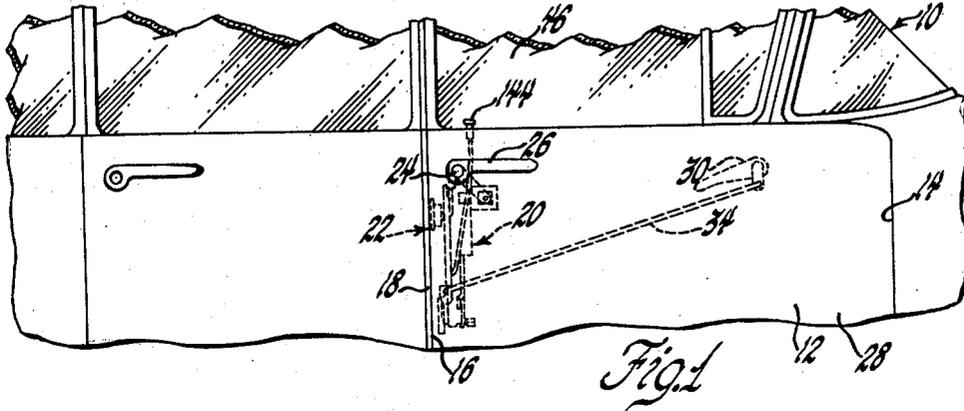


Fig. 1

Fig. 2

INVENTOR.
Donald W. McDaniel
BY
Herbert Furman
ATTORNEY

March 12, 1963

D. W. McDANIEL

3,081,117

CLOSURE LATCH

Filed Oct. 31, 1960

3 Sheets-Sheet 2

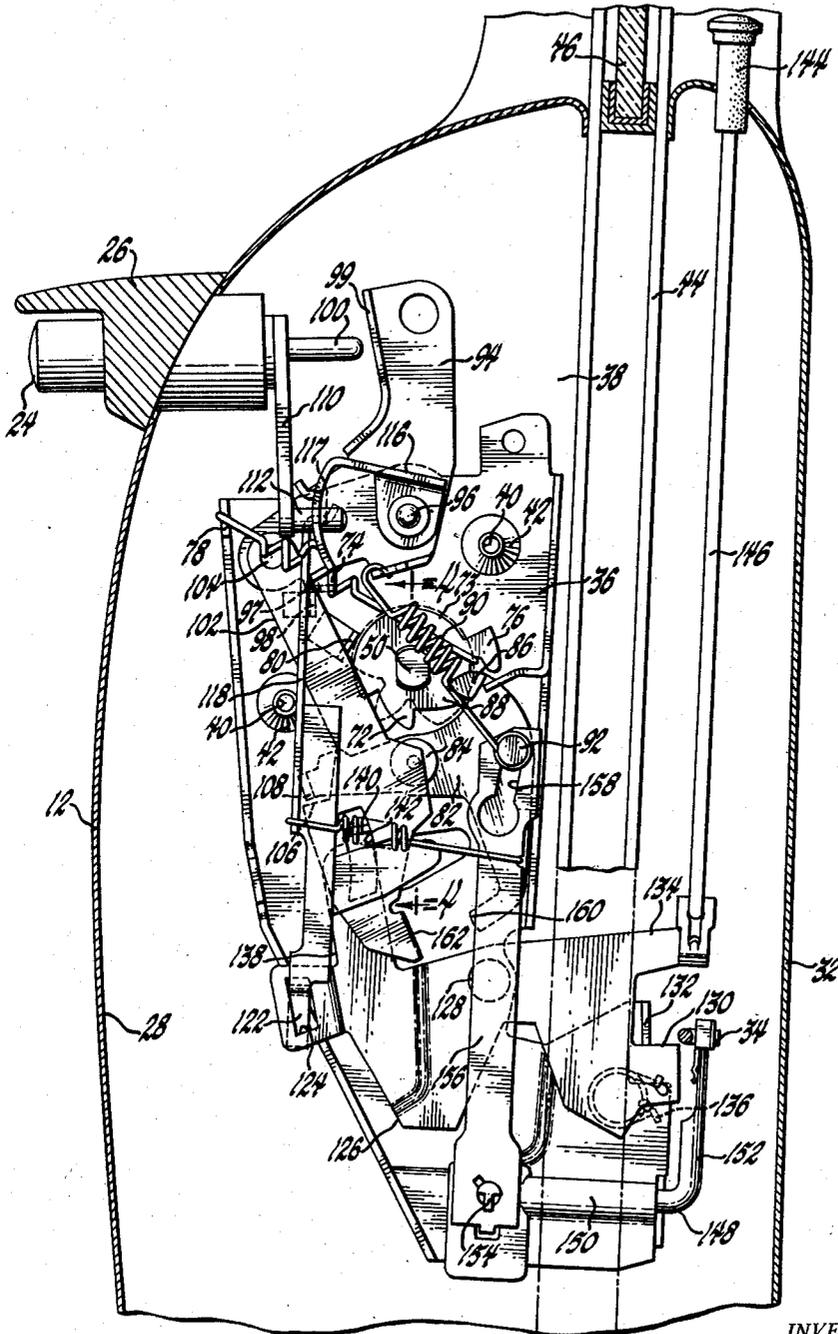


Fig. 3

INVENTOR.

Donald W. McDaniel

BY

Herbert Furman

ATTORNEY

March 12, 1963

D. W. McDANIEL
CLOSURE LATCH

3,081,117

Filed Oct. 31, 1960

3 Sheets-Sheet 3

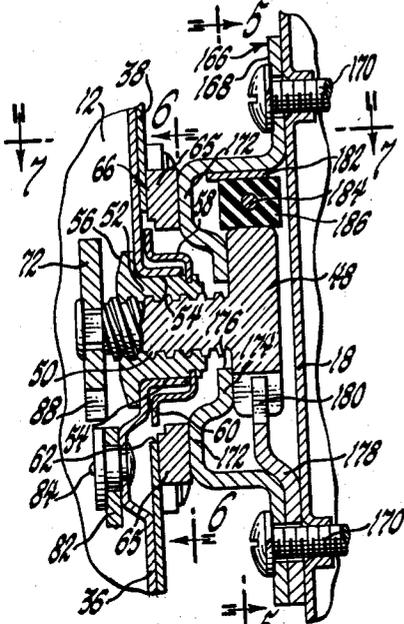


Fig. 4

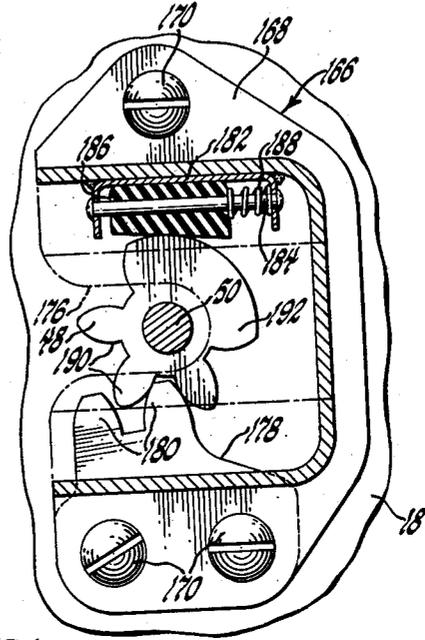


Fig. 5

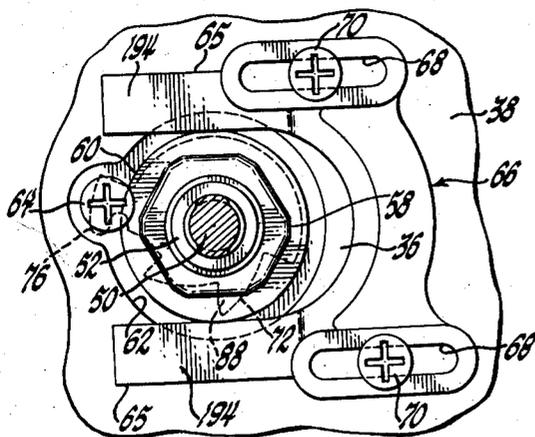


Fig. 6

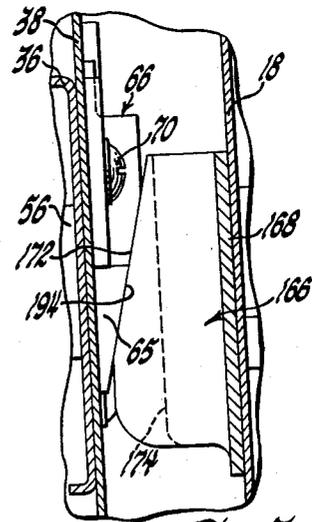


Fig. 7

INVENTOR.

Donald W. McDaniel

BY

Herbert Juman

ATTORNEY

1

3,081,117

CLOSURE LATCH

Donald W. McDaniel, Farmington, Mich., assignor to
General Motors Corporation, Detroit, Mich., a corpo- 5
ration of Delaware

Filed Oct. 31, 1960, Ser. No. 66,006

7 Claims. (Cl. 292-216)

This invention relates to closure latches and more particularly to vehicle closure latches of the type including interlock means for preventing shifting movement between a swingable closure member and a support member which is adapted to be latched to the closure member.

In the past, there have been several types of interlock means provided between a vehicle closure member, such as a door, and a vehicle body member, such as a pillar, which is adapted to be latched to the closure member. One general type of interlock means comprised oppositely extending generally vertical flanges on the door and on the pillar which were disposed in overlapping spaced relationship with respect to each other in the closed position of the door. Another general type of interlock means comprised a door latch having an extension on the rotary bolt housing thereof which was disposed in overlapping spaced relationship with respect to the teeth of a striker member mounted on the pillar.

The interlock means of the latch of this invention provides a tight engagement over a large surface area between a rotatable latch bolt and a bolt engaging surface portion of a striker member to thereby provide a positive interlock in the closed position of the door regardless of manufacturing tolerances. In the preferred embodiment of the invention, the latch bolt assembly includes a toothed bolt secured to a lead screw having a high lead thread, with the lead screw being threadedly received within an adjustable nut secured to the latch assembly which is adapted to be mounted on the free swinging edge portion of a vehicle door. Upon rotational movement of the bolt from latched to unlatched position, the lead screw threads outwardly of the latch assembly to move the bolt laterally outwardly of the edge portion of the door. Conversely, when the bolt moves from unlatched to latched position, the lead screw threads inwardly of the latch assembly to move the bolt laterally inwardly of the edge portion of the door. The striker assembly, which is adapted to be mounted on a body pillar, includes striker teeth which mesh with the teeth of the bolt to rotate the bolt as the bolt moves between its latched and unlatched position. The striker assembly also includes a housing receiving the bolt and having a bolt engaging surface portion located between the bolt and the edge portion of the door in the closed position of the latter and in juxtaposed relationship to one surface or side of the bolt. When the bolt moves from an unlatched to a latched position, the bolt moves into tight surface to surface engagement with the bolt engaging portion of the striker assembly to tend to pull the door longitudinally of the body and toward the pillar. Further, a striker member mounted on the edge portion of the door is provided with spaced generally wedge shaped portions which are engageable by complementary wedge shaped portions on the striker assembly in the closed position of the door, with these wedge shaped portions being held in tight engagement with each other by the engagement of the bolt with the bolt engaging surface portion of the striker assembly and the tendency of this engagement to pull the door longitudinally of the body and toward the body pillar. The adjustability of the nut relative to the latch assembly ensures that the range of lateral movement of the bolt can be adjusted as required to ensure that the bolt will move into tight surface to surface engagement with the

2

bolt engaging surface portion of the striker assembly regardless of manufacturing tolerances.

The primary object of this invention is to provide a closure latch having new and improved interlock means.

This and other objects of the invention will be readily apparent from the following specification and drawings wherein:

FIGURE 1 is a partial side elevational view of a vehicle body embodying a closure latch according to this invention;

FIGURE 2 is a perspective view of the latch assembly;

FIGURE 3 is an enlarged sectional view showing the latch assembly in mounted position on a vehicle door;

FIGURE 4 is an enlarged partially broken away view showing the latch bolt assembly in latching engagement with the striker assembly;

FIGURE 5 is a sectional view taken generally along the plane indicated by line 5-5 of FIGURE 4;

FIGURE 6 is a sectional view taken generally along the plane indicated by line 6-6 of FIGURE 4; and

FIGURE 7 is a view taken generally along the plane indicated by line 7-7 of FIGURE 4.

Referring now to FIGURE 1 of the drawings, a vehicle 10 includes a front door 12 swingably mounted at its forward edge 14 on body 10 by suitable hinges for movement between open and closed positions, and latched at its rearward free swinging edge 16 to body pillar 18 by a closure latch according to this invention.

The closure latch generally includes a latch assembly 20 mounted on the free swinging edge portion of door 12 and a striker assembly 22 mounted on body pillar 18. The latch assembly 20, except for the latch bolt assembly which will be fully described hereinafter, is fully shown in detail and claimed in the copending application of Leslie et al., Serial No. 754,815, filed August 13, 1958, now Patent No. 2,955,865, and assigned to the assignee of this invention. Reference may be had to this copending application for a more detailed description of the latch assembly. Generally, the latch assembly 20 is of the type which includes keyless locking, automatic undocking and both inside and outside locking.

The latch assembly may be operated from outside the vehicle by means of a push button assembly 24 which is slidably mounted in an outside door handle 26 mounted on the door outer panel 28. The inside door handle 30 is rotatably mounted on the door inner panel 32 and connected to the latch assembly by a remote rod 34 to provide the inside operating means for the latch assembly.

The latch assembly 20 is mounted on door 12 by locating the frame 36 thereof against the lock pillar face 38 of the door, with the frame being secured to face 38 by a number of bolts 40 received within tapped embossments 42 of the frame. The major portion of the frame 36, as shown in FIGURE 3, is mounted outboard of the glassrun channel 44 for the vertically movable door window 46.

Referring now particularly to FIGURES 4 through 6 of the drawings, the latch bolt assembly includes a toothed bolt 48 which is integral with a lead screw 50 having a high lead thread. Screw 50 is threadedly received within a threaded nut 52, with the bolt being located outboard of the face 38 of door 12. The cylindrical outer surface of the nut 52 is slidably and rotatably received within a like shaped flanged opening 54 of frame 36. An annular flange 56 on the inner end of the nut limits outward movement of the nut relative to the frame 36, and a cage 58 staked to the outer end of the nut limits inward movement of the nut relative to the frame 36 by engagement of the flange 60 of the cage with frame 36. An opening 62 is provided in the face 38 of door 12 in order that the flange 60 of the cage may engage the frame 36. The axial position of the bolt 48 relative to the frame 36 is

adjusted by rotating the cage 58 to in turn rotate the nut 52. The rotative position of the cage relative to the frame 36 is set by means of a screw 64, the head of which overlaps flange 60.

The lead screw 50 and nut 52 mount the latch bolt 48 on the door for both rotational movement between latched and unlatched positions and movement laterally of the face 38 of the door along the axis of rotation of the lead screw as the bolt moves between its latched and unlatched positions. Bolt 48 is shown in latched position in FIGURE 5 and will rotate counterclockwise when moving from this position to an unlatched position. Upon counterclockwise rotational movement of the bolt, the lead screw 50 will thread out of the nut 52 to move the bolt 48 laterally outwardly of the face 38 of door 12. Likewise, upon movement of the bolt 48 from an unlatched to a latched position, the bolt will rotate in a clockwise direction to thereby thread the lead screw 50 into the nut 52 and move the bolt 48 laterally inwardly of the face 38 of door 12 as the bolt moves from an unlatched to a latched position. The adjustment of the bolt 48 by rotating the cage 58, as previously described, allows the operator to adjust the range of lateral movement of the bolt 48 as the bolt moves between its latched and unlatched positions.

The legs 65 of a generally U-shaped striker or abutment member 66 are located on opposite sides of the cage 58, with the member 66 including a pair of slots 68 receiving bolts 70 in order to adjustably mount the member on the face 38 of door 12. The function of the member 66 will be fully described hereinafter.

As shown in FIGURES 2 and 3, a toothed ratchet 72 is staked to the free end of the lead screw 50 inboard of the frame 36 so as to be rotatable with bolt 48. The ratchet 72 is continuously biased in a counterclockwise direction by a coil tension spring 74 having one end hooked over a lug 76 of the ratchet and the other end hooked in an apertured ear 78 of the frame 36.

The spring 74 continually biases bolt 48 to an unlatched position by biasing the ratchet 72 counterclockwise as viewed in FIGURES 2 and 3, with this movement of the ratchet being limited by engagement of the lug 76 with a lanced out tab 80 of frame 36 to thereby limit rotational movement of the bolt when moving from a latched to an unlatched position.

A detent lever 82 pivotally mounted at 84 on frame 36 includes a foot 86 engageable with one of the teeth 88 of ratchet 72 in order to hold the ratchet in position as shown in FIGURES 2 and 3 against the action of the spring 74 and hold bolt 48 in latched position. Inasmuch as the ratchet 72 shifts laterally of frame 36 with the bolt 48 when the bolt moves between its latched and unlatched positions, foot 86 is of enlarged thickness, as shown in FIGURE 2, in order to engage the teeth 88 regardless of the lateral position of the ratchet 72 relative to the frame 36. When bolt 48 is in unlatched position, foot 86 engages the arcuate surface 73 of ratchet 72 and then successively engages the teeth 88 as the bolt moves to latched position and the teeth 88 successively ratchet past foot 86.

A coil tension spring 90 having one end hooked to a shouldered stud 92 secured to lever 82 and the other end hooked to an outside operating lever 94 biases lever 82 counterclockwise, as viewed in FIGURES 2 and 3 to bias the foot 86 into engagement with the teeth 88.

The outside operating lever 94 is pivotally mounted on a stub shaft 96 secured to frame 36, with the lever being located against the action of spring 90 by a tab 97 thereof engageable with a lanced tab 98 of frame 36. Lever 94 includes a lateral flange 99 which is engageable by the push rod 100 of the push button assembly 24 in order to swing this lever clockwise, as viewed in FIGURES 2 and 3. An intermittent link 102 pivoted at 104 to lever 94 includes a shoulder 106 which is engageable with a lateral web 108 of lever 82 in order to swing the

lever 82 clockwise and move the foot 86 out of engagement with a tooth 88 of the ratchet 72 to allow the spring 74 to rotate the ratchet 72 counterclockwise and thereby move the bolt 48 from a latched to an unlatched position. Thus, the door 12 may be unlatched from the outside by means of the push button assembly 24 and the engagement of the push rod 100 thereof with the outside operating lever 94 to swing this lever clockwise about the shaft 96 and shift the link 102 upwardly to move the shoulder 106 into engagement with the tab 108.

The intermittent link 102 is also swingable counterclockwise about the pivot 104 to a position wherein the shoulder 106 is located inwardly of tab 108 or to the right as viewed in FIGURES 2 and 3 so that the link will free wheel and not move the detent lever 82 upon actuation of the push button assembly 24 so as to lock the door 12 from the outside thereof. This locking is accomplished from the outside of the door by providing the usual lock cylinder assembly, which is part of the push button assembly 24, with a shiftable lever 110 mounting a lateral pin 112 at the lower end thereof. Pin 112 is received within a flanged opening 114 of a locking lever 116 coaxially mounted on shaft 96 with lever 94. The upper offset end 117 of a shiftable link 118 is received within an opening 120 of lever 116, and the lower offset end 122 of link 118 is received within a slot 124 provided in the offset arm of a locking lever 126 pivoted at 128 to the frame 36. Lever 126 is held in either unlocked position, as shown in FIGURES 2 and 3, wherein an arm 130 thereof engages an offset tab 132 of frame 36, or a locked position wherein an arm 134 thereof engages tab 132, by means of an overcenter coil torsion spring 136 having one end hooked to arm 130 and the other end hooked to frame 36. An arm 138 of lever 126 includes a lateral tab 140 which is received within an arcuate slot 142 in the intermittent link 102.

In order to lock the door from the outside of the body, the lock cylinder assembly is operated by a suitable key to shift the lever 110 upwardly and thereby swing lever 116 clockwise about shaft 96. This will shift link 118 upwardly and move lever 126 from its position, as shown in FIGURE 2, to a position clockwise thereof wherein the leg 134 engages the tab 132 as spring 136 goes overcenter. This clockwise movement of the lever 126 swings the intermittent lever 102 counterclockwise about the pivot 104 by engagement of the tab 140 with the slot 142 to thereby move the shoulder 106 inwardly or to the right with respect to the tab 108 and thereby uncouple the intermittent lever 102 from the detent lever 82.

Locking of the door from the inside of the body is accomplished by depressing the push button 144 which is connected to the arm 134 of lever 126 by a shiftable rod 146.

Unlocking of the door from the inside of the body by means of the handle 30 and the rod 34 is accomplished by the use of a lever 148 which is journaled within an offset 150 of the frame 36. One arm 152 of lever 148 is pivoted to the rod 34, and the other arm 154 of the lever is pivoted to the lower end of a shiftable link 156, the upper slotted end 158 of which is pivotally and slidably received in the stud 92 fixed to the detent lever 82. Upon rotational movement of the handle 30 to shift the rod 34 forwardly of the body, lever 148 will be rotated so as to swing the arm 154 downwardly and in turn shift the link 156 downwardly. This will swing the detent lever 82 clockwise to move the foot 86 out of engagement with a tooth 88.

Automatic undogging is accomplished by the engagement of the foot 160 of the detent lever with an offset tab 162 of the intermittent link 102 to swing the intermittent link clockwise about the pivot 104 and again move the shoulder 106 into opposition to the tab 108 and to also return the lever 126 to its position as shown in FIGURES 2 and 3 by engagement of the tab 140 of lever 126 with the slot 142 of link 102. The automatic un-

dogging can be accomplished either by operation of the handle 30, when the door is in a closed position and the latch assembly 20 is in a locked position, or by closing the door after first placing the latch assembly 20 in locked position by means of push button 144 or the lock cylinder assembly.

Keyless-locking is accomplished by first depressing the push button 144, in the open position of the door, to shift rod 146 downwardly and move lever 126 from its position, as shown in FIGURES 2 and 3, to its other position wherein the leg 134 thereof engages the tab 132. This will swing the intermittent link 102 clockwise to move the shoulder 106 thereof out of opposition of the tab 108 of detent lever 82. Thereafter the push button assembly 24 is moved inwardly so as to swing the lever 94 clockwise about shaft 96 and thereby shift the intermittent link 102 upwardly so that the tab 162 of the link is out of opposition to the foot 160 of lever 82. Thereafter, the door is closed with the push button 24 being held in its inward position until the door is fully closed. The rotational movement of the detent lever 82 as the teeth 88 ratchet past foot 86 will cause the foot 160 of the lever to move by and underneath tab 162 rather than engage this tab so that lever 126 remains in its position. When the door is fully closed and detent 82 is in engagement with a tooth 88, the operator releases the push button assembly 24 so as to return the intermittent link 102 downwardly to its position wherein the tab 162 and foot 160 are in opposition to each other.

Referring now particularly to FIGURES 4, 5 and 7 of the drawings, the striker assembly 18 will be described. The assembly includes a housing 166 provided with a lateral flange 168 which is bolted at 170 to pillar 18. The central portion of the housing is embossed outwardly and provided with a pair of wedge shaped ribs 172 which are spaced apart and interconnected by an inwardly located bolt engaging surface portion 174 which is slotted at 176 to receive lead screw 50. An offset striker plate member 178 located between the housing 166 and pillar 18 is secured in place by the pair of lower bolts 170. Member 178 includes a pair of teeth 180. A U-shaped bracket 182 is secured to a wall of the upper of the ribs 172 and mounts a fixed pin 184. A shoe 186 having a tapered lower surface is slidably mounted on the pin 184 and is biased outwardly of pillar 18 or to the left, as viewed in FIGURE 5, by a spring 188 which encircles the pin 184.

Assuming now that the door is in an open position and that the operator closes the door, the engagement of the teeth 190 of the bolt 48 with the teeth 180 of the striker plate 178 will rotate the bolt as the bolt moves inwardly of housing 166. As the bolt rotates, the lead screw 50 will thread within the nut 52 so as to shift the bolt 48 laterally inwardly relative to the face 38 of the door 12 so that the face 192 of the bolt moves into tight surface to surface engagement with the portion 174 of the housing 176 to thereby tend to pull the door 12 longitudinally of the body and pull the wedge shaped surface portions 194 provided on the legs 65 of the striker member 66 into tight engagement with the complementary shaped ribs 172 of the housing 166.

The surface to surface engagement of the face 192 of the bolt with the portion 174 of housing 166 provides a door interlock, and full tight engagement is ensured since the bolt moves laterally and into engagement with the portion 174 upon closing movement of the door.

It will be understood, of course, that upon initial engagement of the bolt 48 with the striker member 178, the face 192 of the bolt is slightly spaced from the portion 174 of housing 166. Further, the ribs 172 and the surface portions 194 of the legs 65 of member 66 are arranged so as to be either in full surface to surface engagement in the closed position of the door, or with only a very slight spacing therebetween, since the bolt 48 is not capable of pulling the door 12 any great distance longitudinally

of the body by its engagement with the portion 174. The shoe 186 is frictionally engaged by the bolt 48 and is moved inwardly of housing 166 against the action of the spring 188 as the bolt moves inwardly of the housing to ensure tight engagement of the teeth 190 of the bolt with the teeth 180 of the striker plate member 178.

Upon opening movement of the door by operation of either the handle 30 or push button assembly 24, the foot 86 of the detent lever 82 will move out of engagement with the tooth 88 of the ratchet 72 and the spring 74 will rotate the ratchet as previously described. This will thread the lead screw 50 out of the nut 52 to shift the bolt 48 laterally outwardly of the face 38 of door 12 and toward the pillar 18 as the face 192 of the bolt moves out of engagement of the portion 174 of housing 166. This movement of the bolt will take place as the teeth 190 of the bolt move out of engagement with the teeth 180 of the striker plate member 178 and the door moves to open position. Movement of the bolt out of engagement with the portion 174 releases the force holding the surface portions 194 in tight engagement with the ribs 172 of housing 166.

It may not be necessary in all installations to incorporate the legs 65 of members 66 and the ribs 172 of the housing 166. However, the use of such interengaging wedges provides an additional safety feature other than that provided by the interlock between the bolt 48 and the housing 166.

Although the latch bolt assembly and striker assembly have been described in conjunction with a particular type of latch assembly having certain features, it will be understood, of course, that the latch bolt assembly and the co-operating striker assembly may be used with other types of latch assemblies.

Thus, this invention provides a new and improved closure latch.

What is claimed is:

1. In combination with a vehicle body member having a closure member swingably mounted thereon for movement to open and closed positions and including a jamb face located in juxtaposed relationship to a jamb face of said body member in the closed position thereof, a closure latch comprising, latching means including a latch bolt located intermediate said jamb faces in the closed position of said closure member and movable between latched and unlatched positions, means mounting said bolt on one of said members for movement laterally of said jamb face of said one member upon movement thereof between latched and unlatched positions, striker means mounted on the other of said members and including a bolt engaging portion located in spaced relationship to said bolt in the unlatched position thereof, said bolt being movable laterally of said jamb face of said one member into engagement with said bolt engaging portion upon movement thereof from an unlatched to a latched position to provide an interlock.

2. In combination with a vehicle body member having a closure member swingably mounted thereon for movement to open and closed positions and including a jamb face located in juxtaposed relationship to a jamb face of said body member in the closed position thereof, a closure latch comprising, latching means including a latch bolt located intermediate said jamb faces in the closed position of said closure member and rotatable between latched and unlatched positions, means mounting said bolt on one of said members for movement laterally of said jamb face of said one member upon rotational movement thereof between latched and unlatched positions, striker means mounted on the other of said members and including a bolt engaging portion located in spaced relationship to said bolt in the unlatched position thereof, said bolt being movable laterally of said jamb face of said one member and into engagement with said bolt engaging portion upon rotational movement thereof from an unlatched to a latched position to provide an interlock.

3. In combination with a vehicle body member having a closure member swingably mounted thereon for movement to open and closed positions and including a jamb face located in juxtaposed relationship to a jamb face of said body member in the closed position thereof, a closure latch comprising, latching means including a latch bolt located intermediate said jamb faces in the closed position of said closure member and movable between latched and unlatched positions, means mounting said bolt on one of said members for movement laterally of said jamb face of said one member upon movement thereof between latched and unlatched positions, striker means mounted on the other of said members and including a bolt engaging portion located in spaced relationship to said bolt in the unlatched position thereof, said bolt being movable laterally of said jamb face of said one member and into engagement with said bolt engaging portion upon movement thereof from an unlatched to a latched position to provide an interlock and tend to pull said members together, and means on said body member and said closure member held in engagement with each other in the latched position of said bolt by engagement of said bolt with said bolt engaging portion.

4. In combination with a vehicle body member having a closure member swingably mounted thereon for movement to open and closed positions and including a jamb face located in juxtaposed relationship to a jamb face of said body member in the closed position thereof, a closure latch comprising, latching means including a rotary latch bolt movable between latched and unlatched positions and including an axially facing annular surface, means mounting said bolt on one of said members for axial movement thereof relative to said jamb face of said one member upon movement thereof between latched and unlatched positions, striker means mounted on the other of said members and including a bolt engaging surface located in generally parallel spaced relationship to said bolt surface in the unlatched position thereof, said bolt surface being axially movable into engagement with said bolt engaging surface upon movement of said bolt from an unlatched to a latched position to provide an interlock and tend to pull said members together, and means on said body member and said closure member held in engagement with each other in the latched position of said bolt by engagement of said bolt surface with said bolt engaging surface.

5. In combination with a vehicle body member having a closure member swingably mounted thereon for movement to open and closed positions and including a jamb face located in juxtaposed relationship to a jamb face of said body member in the closed position thereof, a closure latch comprising, latching means including a rotary latch bolt movable between latched and unlatched positions and including an axially facing striker engaging surface, means mounting said bolt on one of said members for combined rotational and axial movement relative to said one member upon movement of said bolt between latched and unlatched positions, striker means mounted

on the other of said members and including a bolt engaging surface portion located in juxtaposed spaced relationship to said bolt surface and to said other member, said bolt being located intermediate said bolt engaging surface and said other member in the unlatched position thereof and being movable into engagement with said bolt engaging surface upon movement thereof from an unlatched to a latched position to provide an interlock and tend to pull said members together, and means on said body member and said closure member held in tight engagement with each other in the latched position of said bolt by engagement of said bolt with said striker means.

6. A closure latch comprising, in combination, a latch frame, a latch bolt movable between latched and unlatched positions, a pair of relatively movable members, means interconnecting said members for axial movement of one relative to the other upon relative rotational movement therebetween, means mounting said other member on said frame whereby said one member moves laterally of said frame between terminal positions with respect thereto upon combined rotational and axial movement thereof, means securing said bolt to said one member for movement therewith whereby said bolt simultaneously rotates and moves laterally of said frame upon movement thereof between latched and unlatched positions, a ratchet secured to said one member for movement therewith and movement laterally relative to said frame with said bolt, and a detent lever mounted on said frame and engageable with said ratchet in the terminal positions of said one member relative to said frame to locate said bolt in both the latched and unlatched positions thereof.

7. A closure latch comprising, in combination, a latch frame, a latch bolt movable between latched and unlatched positions, a pair of threadedly interconnected members, means mounting one of said members on said frame whereby said other member moves axially relative thereto and laterally of said frame upon combined rotational and axial movement of said other member relative to said one member, means securing said bolt to said other member for movement therewith whereby said bolt both rotates and moves laterally of said frame upon movement of said bolt between spaced lateral positions with respect thereto corresponding to latched and unlatched positions of said bolt, a ratchet secured to said other member for movement therewith and simultaneous movement with said bolt between spaced lateral positions with respect to said frame, and a detent lever mounted on said frame for swinging movement in a stationary plane and being engageable with said ratchet in the lateral positions of said ratchet relative to said frame to locate said bolt in both the latched and unlatched positions thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

2,378,654	Pekny	June 19, 1945
2,379,050	Voight	June 26, 1945