Dec. 28, 1954 E. B. JACOBSON 2,698,197

DOOR LATCH MECHANISM

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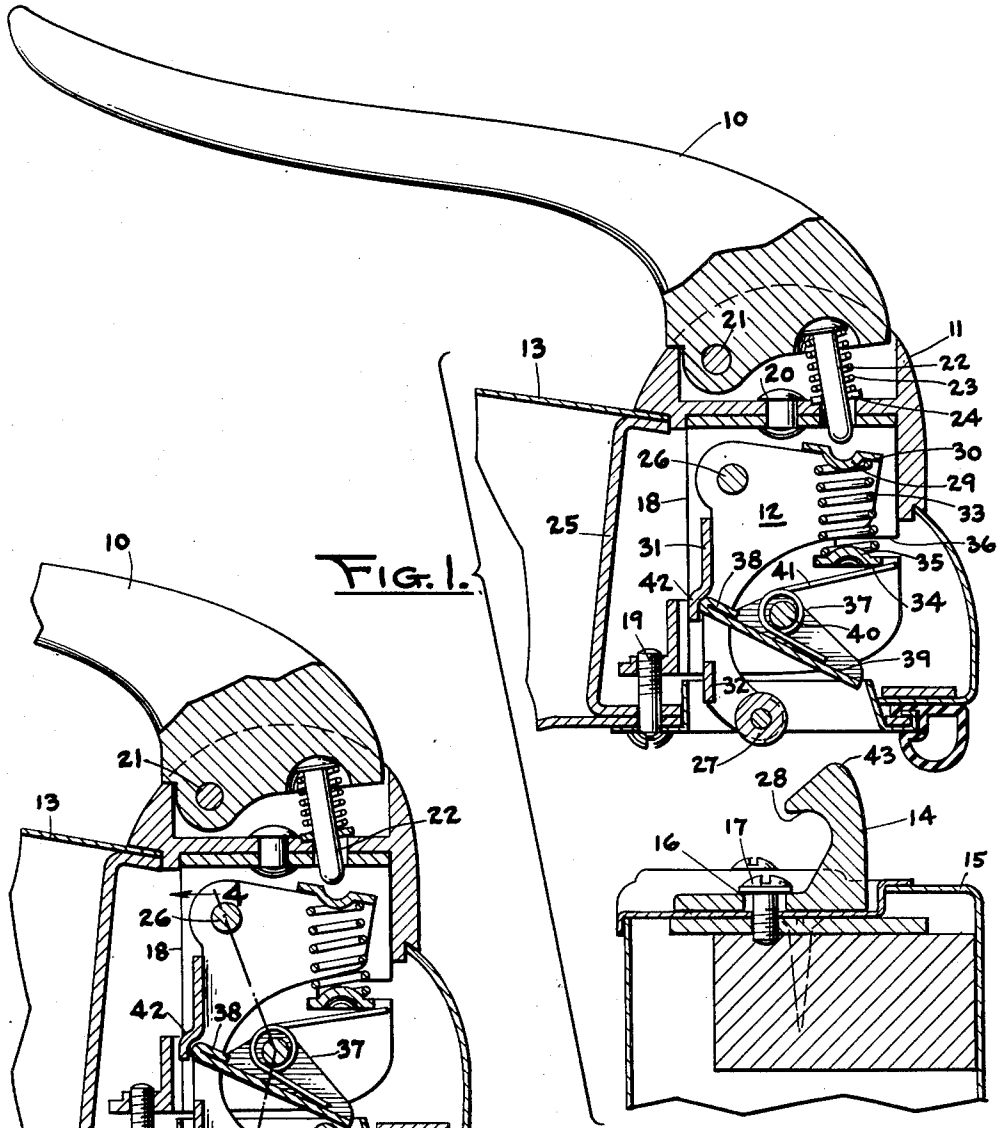

FIG. 1.

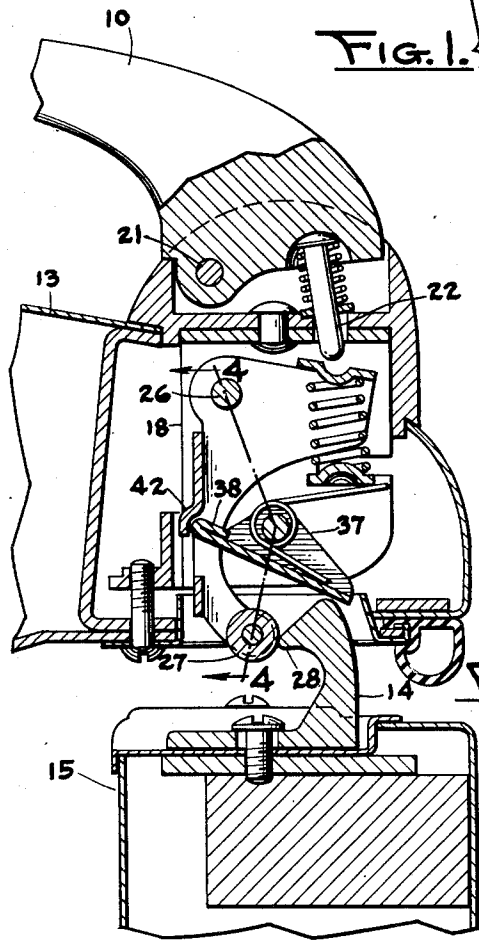

FIG. 2.

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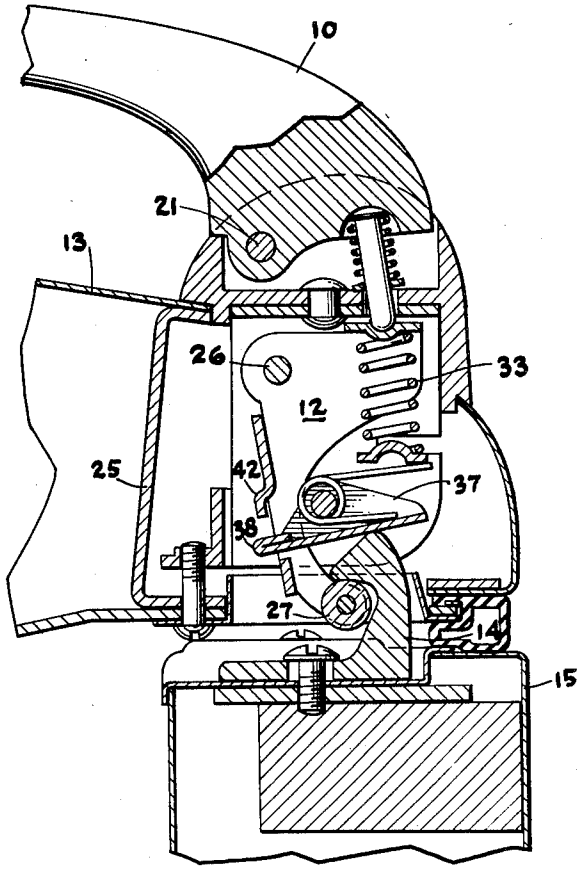

FIG. 3.

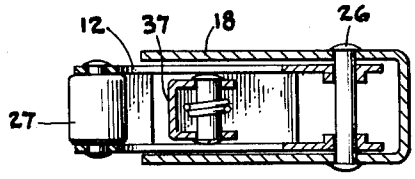

FIG. 4.

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DOOR LATCH MECHANISM

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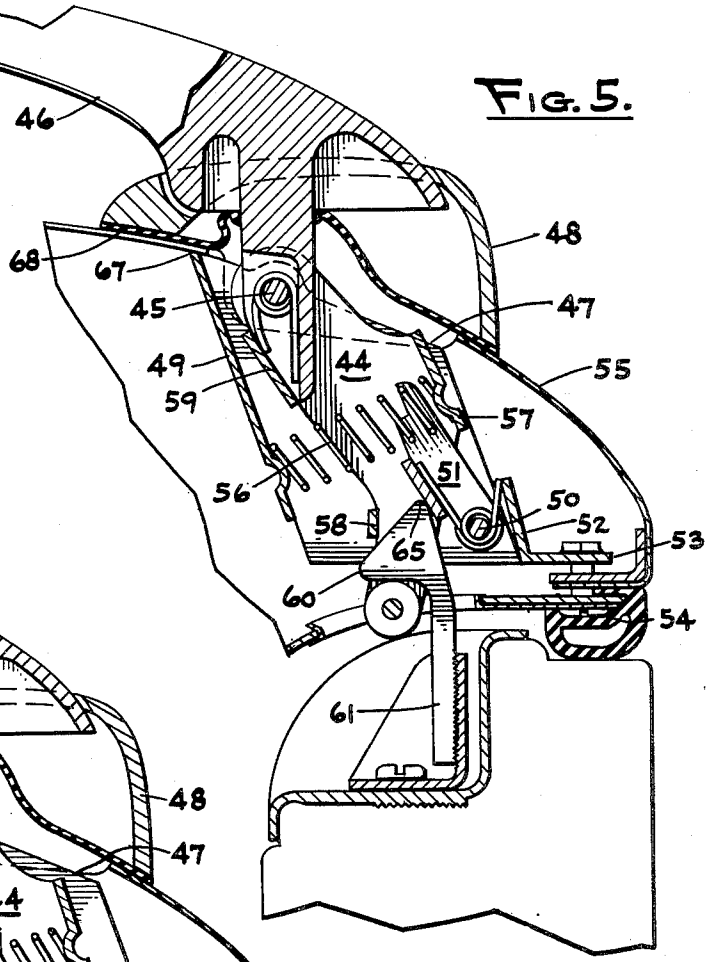
FIG. 5.



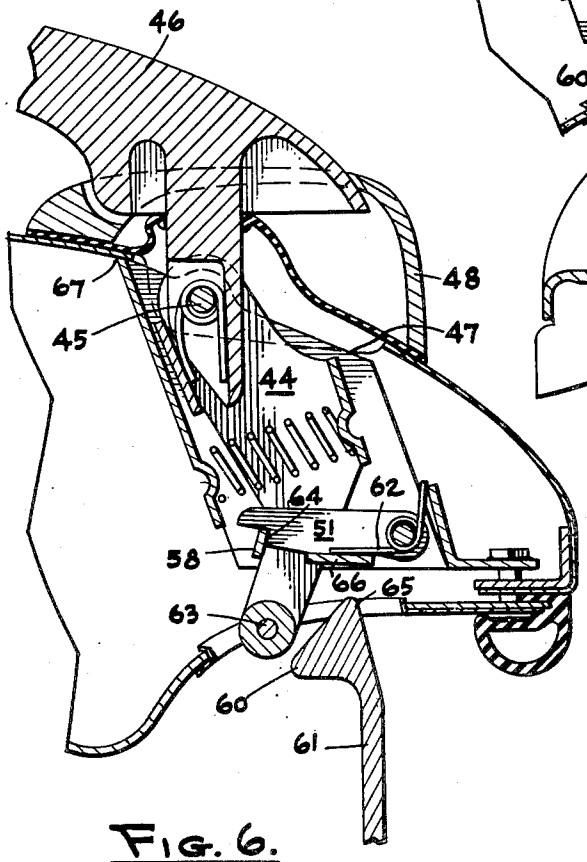


FIG. 6.

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2,698,197

DOOR LATCH MECHANISM

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Application August 1, 1949, Serial No. 107,908

10 Claims. (Cl. 292—336)

This invention provides a door latch mechanism particularly well adapted for use in connection with refrigerators. The general operating components of such a device include a keeper fixed with respect to the body of the refrigerator, a bolt associated with the door and disposed to engage the keeper when the door is in the closed position, a bolt positioning system, a manual actuator for disengaging the bolt from the keeper, and a trigger mechanism for maintaining the bolt in a position permitting the door to be closed. A mechanism embodying the present invention can be provided with suitable sealing means preventing the flow of air from the interior of the refrigerator outwardly through the various openings and passages surrounding the mechanism.

A feature of principal importance provided by the present invention is relative freedom from the effects of wear on the trigger mechanism. In the preferred form of the present invention, a bolt is pivotally mounted for rotation upon an axis that will permit it to swing into and out of engagement with the keeper. Such a bolt is conventionally provided with a roller or other engaging portion establishing the actual contact with the keeper, and a biasing system is provided urging the bolt in the direction of the locking position. The bolt is preferably pivoted upon a member fixed with respect to the door, and manual operating means are also provided to rotate the bolt to the unlocked position by means of forces transmitted to the bolt through a suitable chain of components. Preferably one of these components passes through a sealed aperture in order to prevent the flow of air around the openings provided by the mechanism with consequent heat loss and danger of condensation.

The most troublesome source of wear in such a mechanism as is outlined above is in the trigger system maintaining the bolt in a position permitting the door to be closed. In the present invention an interfering member is so positioned as to prevent the movement of the bolt in the direction of the locked position under the urging of the biasing means as long as the interfering member is in a given position. Biasing means are also provided tending to urge this interfering member to this interfering position. Means are also provided operating in conjunction with the interfering member for removing the same from interfering position in response to the forces generated in the closing of the door. The preferred form of the trigger mechanism combines the interfering member and releasing means in the form of one pivotally mounted piece, with the rocking action of this piece about its pivot resulting in the engagement and disengagement of the interfering member with the bolt. The opposite end of this pivotally mounted piece is disposed to contact a member fixed with respect to the body of the refrigerator, preferably a portion of the keeper itself. As the door is closed, a point is reached in which the keeper contacts the trigger mechanism causing the interfering member to be rotated out of interfering position.

It will be obvious that the continued operation of such a mechanism over long periods of time would result in considerable wear at the point of engagement between the trigger means and the bolt. The present invention, however, provides for the removal of any tendency to generate wear at this point. The position of the bolt determined by the interfering member is such that the closing of the door causes the contact of the roller or engaging part of the bolt with a portion of the keeper in such a manner that the bolt is urged slightly toward the open position

resulting in the removal of all forces previously generated between the bolt and the trigger means. With the bolt then supported solely by the keeper, continued movement of the door toward the closed position causes the trigger mechanism to be actuated to remove the interfering member from interfering position. As the door continues in its closing movement, the bolt is then free to pass over the retaining portion of the keeper and assume the locked position without being restrained by any portion of the trigger means. The actuation of the handle or other release means results in movement of the bolt in the direction of the open position far enough to permit the biasing means associated with the trigger to move the interfering member to interfering position and to thereby prevent movement of the bolt toward the locked position after the forces had been released upon the handle.

Another important feature provided by the present invention is a system for supporting the latch mechanism in the door. The accumulation of manufacturing tolerances in articles made of sheet metal is a continuous source of trouble in attaching the latch mechanism and the keeper in proper cooperating relationship. To adequately support the latch mechanism against the forces involved, it is usually necessary to utilize more than one anchoring point in the door. Since considerable variation in the location of mounting holes will inevitably take place, it is the conventional practice to provide considerable adjustment and re-alignment during the installation of the latch mechanism. Any variation in the position or attitude of the various supporting surfaces must be compensated for by the use of shims or the trimming and bending of the various panels involved. Since these operations are not exactly the same for all of the units produced, it follows that the operations are not routine and are consequently relatively expensive. The mounting system provided by the present invention tends toward the elimination of dependence upon the position of the various sheet metal surfaces as far as the secure and accurate support of the latch mechanism is concerned.

In the preferred form of the mounting system provided by the present invention, the latch mechanism is, in effect, suspended between two pivot points. One of these pivot points is provided preferably by the same pin that acts as the hinge for the handle and also for the bolt. This pin is also caused to pass through a projection on the escutcheon, and the escutcheon is permitted to abut against the outer surface of the refrigerator door. Thus, as the latch mechanism is pulled inwardly, this action is eventually resisted by the pressure of the escutcheon against the outer surface of the door. At the opposite end of the latch mechanism, a bracket is pivoted for sufficient rotation to permit the alignment of a threaded opening so as to engage a screw passing through the panels of the door. As the latch mechanism is caused to rotate about the pin engaging the escutcheon, it would be obvious that the bracket must be permitted to rotate slightly in order to maintain the parallelism between the surface containing the threaded opening and the panels through which the aforesaid screw passes. The bracket can be pivoted about the same pin that acts as a hinge for the trigger in a modified form of the present invention. With the arrangement outlined above, the tightening of the screw results in a development of tension between the two pivots and thereby suspends the latch mechanism. The forces securing the latch mechanism in position are generated between the screw and the pressure of the escutcheon against the outer portion of the door.

These and other features and details of the present invention will be analyzed by discussion of the particular embodiments which are illustrated in the accompanying drawings. In these drawings,

Figure 1 is a section through a mechanism embodying the present invention, with the latch mechanism shown in the open or unlocked position and the door of the refrigerator ajar.

Figure 2 is an illustration of the same mechanism illustrated in Figure 1, with the latch mechanism at the point of contact with the keeper in the direction of the closing motion of the door.

Figure 3 is a view of the same mechanism shown in

Figures 1 and 2, with the mechanism shown in the locked position.

Figure 4 is a section taken along the planes 4—4 of Figure 2.

Figure 5 is a section showing a modified form of the present invention in the locked position. This view also illustrates the "suspension" type of mounting.

Figure 6 indicates a section of the same mechanism shown in Figure 5, with the various parts of the mechanism in the unlocked position, with the trigger in the interfering position.

Referring to Figure 1, a latch mechanism is shown having a handle **10**, an escutcheon **11**, and a bolt generally indicated at **12**. This mechanism is installed within the door **13**, and operates in cooperation with the keeper **14** fixed with respect to the body portion **15** of a refrigerator. The position of the keeper **14** can be adjusted laterally to obtain the correct position with respect to the latch mechanism through the provision of the elongated hole **16** and the attaching screws **17**. A fixed frame **18** is attached to the door by means of the screws **19**, and is fixed with respect to the escutcheon by means of the rivet indicated at **20**. The handle **10** is shown pivoted at **21** in the escutcheon member, and rotation of the handle causes linear movement of the pin **22** against the action of the spring **23**. The passage surrounding the pin **22** is sealed by the sealing washer **24** in order to prevent the passage of air therethrough. A suitable diaphragm **25** isolates the mechanism from the interior of the door.

The bolt **12** is pivoted at **26**, and is permitted sufficient rotation about this point to cause the engagement and disengagement of the roller **27** with the retaining portion **28** of the keeper **14**. The operation of the handle **10** in a clockwise direction causes a downward movement of the pin **22** resulting in urging the bolt **12** in a clockwise direction through the engagement of the lower extremity of the pin with the recess **29** on the bolt. The preferred form of the bolt **12** shown in the drawings comprises a pair of opposed side plates connected by the transverse members **30**, **31** and **32**. The recess **29** in the transverse section **30** forms a projection on the opposite side thereof and provides a convenient locating projection for the compression spring **33** serving to bias the bolt **12** in a counterclockwise direction and urge the bolt thereby into locking position. The opposite end of the spring **33** is supported upon the spring seat **34** having a similar projection **35** to that mentioned above serving to locate the opposite end of the spring **33**. The spring seat **34** is supported by the edge of the slot **36** formed in the opposite sides of the frame **18**. With the spring seat in the position shown, a small detent or notch maintains it in the assembled position.

In the view shown in Figure 1, the bolt is held in the position shown against the action of the spring **33** by the operation of the trigger member **37**. This trigger member comprises the interfering portion **38** and the releasing portion **39**. The trigger member is mounted for rotation about the point **40**, and is biased in a clockwise direction by the spring **41**. In the position shown in Figure 1, the interfering portion **38** cooperates with the concave surface formed by the displaced portion **42**. As the trigger member is rotated in a counterclockwise direction through the engagement of the releasing portion **39** with the end **43** of the keeper, such rotation causes the interfering portion **38** to pass downwardly and beyond a position in which it is possible for it to engage the portion **42** of the bolt **12**. With the trigger in this position, the bolt is free to follow the contours of the keeper and to pass to the locked position under the urging of the spring **33**.

The position of the bolt shown in Figure 1 is such that the closing of the door causes the collision of the roller member **27** with the tip of the retaining portion of the keeper as indicated in Figure 2. Continued movement of the door beyond this point of contact causes the bolt to be rotated slightly in a clockwise direction and to thereby release the contact previously maintained between the bolt and the interfering portion **38** of the trigger. Further movement of the door beyond this point causes the engagement of the releasing portion **39** with the end **43** of the keeper and the trigger is then rotated without the necessity of any scuffing or friction between the interfering portion **38** and the formed section **42** of the bolt. All the wear consequent upon the releasing operation of the trigger is thereby eliminated.

As the door continues in the direction of the closed position beyond the point shown in Figure 2, the roller **27** is free to follow the contour of the keeper and the bolt proceeds to the fully locked position shown in Figure 3 under the urging of the spring **33**.

Referring to Figures 5 and 6, a modified form of the present invention is shown in which a unique mounting system for a latch mechanism is illustrated. In these views, certain modifications in detail design are to be noted over those indicated in the previous figures of the drawing, but the latch mechanism in general operates upon the same principles. In this modification, the bolt **44** is shown pivoted about the pin **45**, and this same pin forms a hinge connection uniting the bolt **45**, the handle **46**, and the projection **47** on the escutcheon **48**. The frame **49** is suspended between the pins **45** and **50**, the latter acting also as the pivot for the trigger **51**. The anchor bracket **52** supports the pin **50**, and the extension **53** is provided with a threaded hole for cooperation with the screw **54**. As the screw **54** is tightened, a pull is generated between the pins **45** and **50** which is resisted by the engagement of the escutcheon **48** and the projection **47** with the outer panel **55** of the door.

With regard to the details of the modified latch mechanism shown in Figures 5 and 6, it will be noted that the bolt **44** is biased in a counter-clockwise direction by the action of the spring **56**. The spring operates between a suitable locating projection upon the frame **49** and a similarly formed projection upon a cross-member **57** of the bolt. Similar to the bolt structure shown in the previous figures of the drawing, the bolt **44** is formed by a pair of spaced plates having the contour shown in the drawing and joined by suitable cross-members such as **57**, **58**, and **59**.

With the mechanism "open," the position of the parts is as indicated in Figure 6. It will be noted that the trigger **51** cooperates with the cross-member **58** of the bolt **44** in order to maintain the bolt is a position just short of clearing the end **60** of the keeper **61**. The trigger **51** is biased in the direction of the interfering position by the action of the spring **62**. As the door swings to the closed position, the roller **63** contacts the end **60** of the keeper, resulting in moving the bolt in a clockwise direction sufficient to disengage the interfering ledge **64** of the trigger **51**. As the door continues in its closing movement, the outer end **65** of the keeper cooperates with the surface provided by the cross-member **66** of the trigger resulting in the movement of the trigger out of interfering position and into the attitude shown in Figure 5.

The type of structure shown in Figures 5 and 6 makes possible another type of action resulting in securely positioning the latch mechanism with respect to the door. It will be seen that the cutout on the outer panel **55** may be of such proportions that the projection **47** will not be urged into contact with the right hand end of the cutout by the action resulting from the tightening of the screw **54**. The frame **49** of the mechanism may be extended to form a clamping surface **67** disposed on the opposite side of the outer panel **55** with respect to the abutting surface **68** provided by the underside of the escutcheon **48**. With the panel **55** clamped between the point **67** and the abutting surface **68** by the tendency of the screw **54** to rotate the mechanism in a clockwise direction about the point **45**, it will be seen that a secure positioning of the mechanism is effected without necessarily generating contact between the projection **47** and the right end of the cutout as viewed in Figures 5 and 6. Preferably, the cutout in the panel **55** is of such proportions as to admit the cross-wise dimension of the latch mechanism so that the same may be inserted from the outside and then moved laterally with respect to the panel **55** to cause the engagement of the clamping point **67**. The screw **54** or some equivalent force-applying means can then be brought to bear causing relative rotation between the mechanism and the escutcheon to generate the aforementioned clamping action. The broad aspects of a mechanism insertable through a hole in the outer door panel for assembly to the door are shown and claimed in my application Serial No. 78,576, filed on February 26, 1949, now Patent No. 2,639,182, dated May 19, 1953.

The particular embodiments which have been shown in the accompanying drawings are for illustrative purposes

only, and are not to be considered as a limitation upon the scope of the appended claims. In these claims it is the intent of the inventor to claim the entire invention to which he is entitled in view of the prior art.

I claim:

1. In a latch mechanism for a door, said mechanism being adapted for cooperation with a keeper having an outer cam surface, and having a bolt and means for positioning said bolt, trigger means comprising: a disengageable restraining member adapted to interfere with the movement of said bolt toward locking position, said member having a portion thereof disposed to contact a projection fixed with respect to said keeper on the closing of said door whereby said member is disengaged from interfering position, said bolt being held clear of said restraining member by said outer cam surface at the contact of said member with said projection.

2. In a latch mechanism for a door, said mechanism being adapted for cooperation with a keeper having an outer cam surface, and having a bolt and means for positioning said bolt, trigger means comprising: a disengageable restraining member adapted to interfere with the movement of said bolt toward locking position, said member having a portion thereof disposed to contact said keeper on the closing of said door whereby said member is disengaged from interfering position, said bolt being held clear of said restraining member by said outer cam surface at the contact of said member with said keeper.

3. In a latch mechanism for a door, said mechanism being adapted for cooperation with a keeper having an outer cam surface, and having a bolt and means for positioning said bolt, trigger means comprising: a pivotally mounted disengageable restraining member adapted to interfere with the movement of said bolt toward locking position, said member having a portion thereof disposed to contact said keeper on the closing of said door whereby said member is disengaged from interfering position by rotation about said pivotal mounting, said bolt being held clear of said restraining member by said outer cam surface at the contact of said member with said keeper.

4. In a latch mechanism for a door, said mechanism being adapted for cooperation with a keeper having an outer cam surface, and having a bolt and means for positioning said bolt, trigger means comprising: a disengageable restraining member adapted to interfere with the movement of said bolt toward locking position, said member having a portion thereof disposed to contact said keeper on the closing of said door whereby said member is disengaged from interfering position, said bolt being held clear of said restraining member by said outer cam surface at the contact of said member with said keeper; and biasing means urging said restraining member to interfering position.

5. Mounting means for a latch mechanism having an escutcheon and a frame, and adapted for use in a hollow door, said door having a cut-out in an outer panel, comprising: an abutting surface on said escutcheon disposed to bear against the outer surface of said door; a projection on said escutcheon adapted to enter said cut-out; pivot means attaching said frame to said escutcheon; anchor means attached to said frame at a point remote from said escutcheon, said anchor means being initially spaced from structure forming said door; and tension means connecting said anchor means to said door and thereby securing said escutcheon and frame to said door.

6. Mounting means for a latch mechanism having an escutcheon and a frame, and adapted for use in a hollow door, said door having a cut-out in an outer panel, comprising: an abutting surface on said escutcheon disposed to bear against the outer surface of said door; a projection on said escutcheon adapted to enter said cut-out; pivot means attaching said frame to said escutcheon; anchor means attached to said frame at a point remote from said escutcheon, said anchor means being initially spaced from structure forming said door; and tension means connecting said anchor means to said door and thereby securing said escutcheon and frame to said door, said frame being suspended between said pivot and anchor means.

7. Mounting means for a latch mechanism having an escutcheon and a frame, and adapted for use in a hollow door, said door having a cut-out in an outer panel, comprising: an abutting surface on said escutcheon disposed to bear against the outer surface of said door; a projection on said escutcheon adapted to enter said cut-out; pivot means attaching said frame to said escutcheon; anchor means pivotally attached to said frame at a point remote from said escutcheon, said anchor means being initially spaced from structure forming said door; and tension means connecting said anchor means to said door and applying force in a direction to generate tension between said pivot connections and thereby securing said escutcheon and frame to said door.

8. Mounting means for a latch mechanism having an escutcheon and a frame, and adapted for use in hollow door, said door having a cut-out in an outer panel, comprising: an abutting surface on said escutcheon disposed to bear against the outer surface of said door, said frame having a portion disposed adjacent a section of said abutting surface; a projection on said escutcheon adapted to enter said cut-out; pivot means attaching said frame in said escutcheon; anchor means attached to said frame at a point remote from said escutcheon, said anchor means being initially spaced from structure forming said door; and tension means connecting said anchor means to said door, said tension means being adapted to urge said frame to rotate about said pivot means and induce clamping action between said frame portion and abutting surface and thereby securing said escutcheon and frame to said door.

9. Mountng means for a latch mechanism having an escutcheon and a frame, and adapted for use in a hollow door, said door having a cut-out in an outer panel, comprising: an abutting surface on said escutcheon disposed to bear against the outer surface of said door, said frame having a portion disposed adjacent a section of said abutting surface; a projection on said escutcheon adapted to enter said cut-out; pivot means attaching said frame to said escutcheon; anchor means pivotally attached to said frame at a point remote from said escutcheon, said anchor means being initially spaced from structure forming said door; and tension means comprising a threaded member connecting said anchor means to said door, said tension means being adapted to urge said frame to rotate about said pivot means and induce clamping action between said frame portion and abutting surface and thereby securing said escutcheon and frame to said door.

10. Mounting means for a latch mechanism having an escutcheon and a frame, and adapted for use in a hollow door, said door having a cut-out in an outer panel, comprising: an abutting surface on said escutcheon disposed to bear against the outer surface of said door, said frame having a portion disposed adjacent a section of said abutting surface; a projection on said escutcheon adapted to enter said cut-out; pivot means attaching said frame to said escutcheon; anchor means pivotally attached to said frame at a point remote from said escutcheon, said anchor means being initially spaced from structure forming said door; and tension means comprising a threaded member connecting said anchor means to said door; said tension means being adapted to urge said frame to rotate about said pivot means and induce clamping action between said frame portion and abutting surface and thereby securing said escutcheon and frame to said door, said cut-out being adapted to receive said mechanism therethrough.

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