

March 15, 1955

P. P. HARSCH

2,704,219

LATCH

Filed June 28, 1952

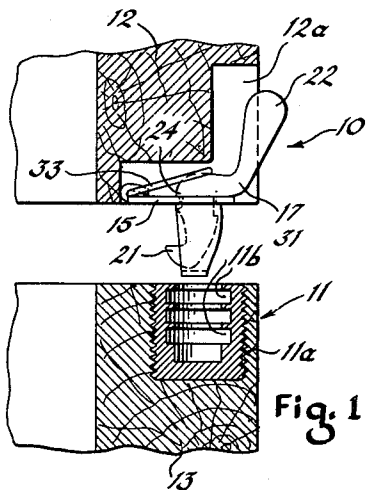


Fig. 1

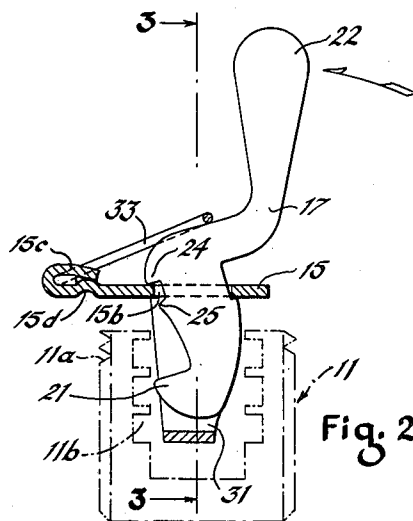


Fig. 2

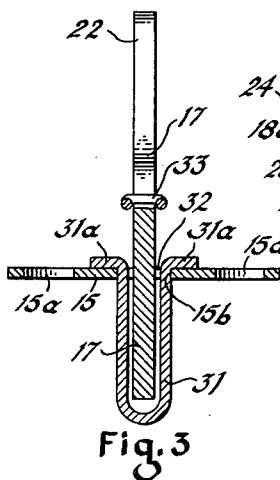


Fig. 3

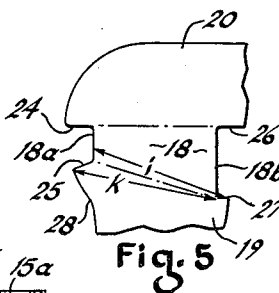


Fig. 5

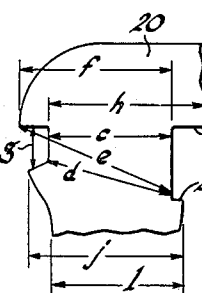


Fig. 5a

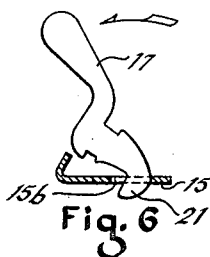


Fig. 6

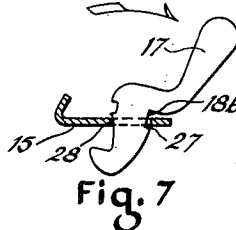


Fig. 7

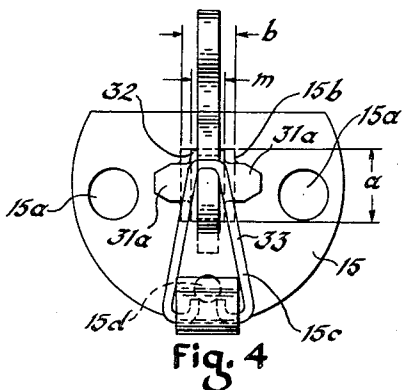


Fig. 4

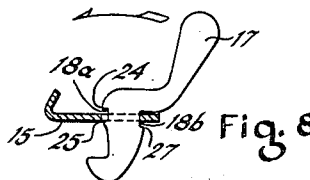


Fig. 8

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2,704,219

LATCH

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Application June 28, 1952, Serial No. 296,221

1 Claim. (Cl. 292—128)

This invention relates to improvements in a latch.

One of the objects of the present invention is to provide a pivotal latch member without a conventional pivot pin.

Another object of the present invention is to provide a pivotal latch readily assembled without special tools.

Another object of the present invention is to provide a pivotal latch member not having a conventional pivot pin and readily assembled without special tools.

Another object of the present invention is to provide a latch characterized by its structural simplicity, the ease of assembly of its parts, its strong and sturdy nature and its low manufacturing cost. Other features of this invention reside in the arrangement and design of the parts for carrying out their appropriate functions.

Other objects and advantages of this invention will be apparent from the accompanying drawings and description and the essential features will be set forth in the appended claim.

In the drawings,

Fig. 1 is the sectional view through the latch and a coacting catch mounted in the walls of a lid and base respectively of a box with the latch in its latching position but not engaging the catch;

Fig. 2 is an enlarged view of the latch from Fig. 1 in its unlatching position but adapted to cooperate with the catch shown in dot-dash lines;

Fig. 3 is a vertical sectional view of the latch taken along the line 3—3 of Fig. 2;

Fig. 4 is a top plan view of the latch shown in Fig. 2;

Figs. 5 and 5a are enlarged views of the central portion of the latch member; while

Figs. 6, 7 and 8 are sectional views disclosing the movements required in assembling the latch member into the aperture of the anchoring plate.

Those familiar with the latch art will recognize that this invention may be applied in many ways, but it has been chosen in this application to illustrate the same in connection with the walls of a box lid and base. The latch, generally shown at 10, is mounted in a recess 12a of the wall 12 carried by the box lid and is adapted to engage a catch, generally shown at 11 in Fig. 1. The catch 11 has screw threads 11a on its periphery adapted to secure it in a hole in the box base wall 13 and has annular grooves 11b in its bore for engagement by the depending hook-shape portion of latch 10.

The latch 10 includes an anchoring plate 15 mounted on the wall 12 by screws or other type fastening devices passing through the securing holes 15a, as seen in Fig. 4. The anchoring plate 15 has a rectangular aperture 15b therethrough having a given length dimension a, as shown in Fig. 4, in the plane of latching action and coplanar with the latch member, as will be brought out in more detail later. As shown in Fig. 4, the rectangular aperture 15b is of uniform width b throughout its length.

A latch member 17 is normally carried by the anchoring plate 15 and the lid 12, with said latch member being movable between a latching position (shown in Fig. 1 but with the latch member 17 not engaging the catch 11) to an unlatching position shown in Fig. 2. The latch member is generally Z-shape (a reversed Z shown in the drawings) formed as a one-piece member of uniform thickness. Since it is a one-piece member substantially flat in structure, it can be easily formed as a die-cut stamping from a sheet metal plate.

The latch member 17 consists of three distinct portions 18, 19 and 20, as defined by the dot-dash lines in Fig. 5. The first portion 18, formed as a neck, extends swingably

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through the aperture 15b and swings between the latching position in Fig. 1 and the unlatching position in Fig. 2. The second portion 19 is located on the lower or catch side of the anchoring plate 15 and has a catch engaging portion for gripping catch 11. In the present disclosure, this is shown specifically as the hook-shape portion 21 for engaging one of the annular grooves 11b in the catch 11. This hook-shape portion 21 forms the lower end bar of the Z while the middle or diagonal bar of the Z includes the first portion and the upper part of the second portion. The third portion 20 includes a handle 22 located on the upper side of the anchoring plate 15 (on the side opposite to the catch 11) for pivoting said latch member. This handle 22 protrudes through the recess 12a in wall 12, as shown in Fig. 1, and is formed by the upper end bar of the Z having its distal end bent upwardly.

Fig. 5 is an enlarged view of the central portion of the latch member 17 clearly showing that the neck 18 of the first portion is located between the second and third portions 19 and 20. The opposite sides of the neck are formed by the surface 18a on the left and a second surface 18b on the right. Shoulders are formed at opposite ends of each of the opposite sides as shown at 24 and 25 at opposite ends of the side surface 18a, and at 26 and 27 at opposite ends of the side surface 18b. An undercut 23 is formed between the shoulder 25 and the hook-shape portion 21 on the left side of portion 19 of the latch member 17.

Before going into a detailed discussion of the relative dimensions of the latch member 17 and the rectangular aperture 15b, one should consider briefly the broad aspects of this invention. First, the latch member 17 can readily be pivoted from the latching position in Fig. 1 to the unlatching position in Fig. 2 by actuation of the handle 22. During this pivotal movement, the latch member 17 always lies in the same plane, and this plane of latching action is coplanar with the dimension a of the rectangular aperture 15b. Second, the latch member 17 can easily be assembled into rectangular aperture 15b by following the order of movements shown in Figs. 6, 7 and 8 of the drawings. No pivot pin is required between the latch member 17 and the anchoring plate 15, and for all practical purposes, the latch member 17 is effectively locked in the rectangular aperture 15b so that it will not disassemble therefrom during movement between latching and unlatching positions.

The shoulders on neck 18 and the relative dimension of the parts in Figs. 5 and 5a play an important part in the pivotal mounting of the latch member 17. Shoulder 24 engages the top surface of the anchoring plate 15 adjacent rectangular aperture 15b, as shown in Figs. 1 and 2, so that a coacting pivot means is provided on the latch member 17 and on the top side of the anchoring plate 15. This shoulder 24, being a pivoting projection at the junction of the first and third portions of the latch member 17, serves as a fulcrum on the top surface of the anchoring plate 15 as the latch member 17 is moved from the latching position in Fig. 1 to the unlatching position in Fig. 2 for moving the handle 22 in a counterclockwise direction.

To provide freedom of movement between the latch member 17 and the anchoring plate 15 between the position shown in Figs. 1 and 2, the width of neck 18, between the surfaces 18a and 18b in the plane of latching action and in the plane of the anchoring plate 15 when the latching member 17 is swung between the latching position (Fig. 1) and the unlatching position (Fig. 2), must be less than but not substantially less than the length dimension a of aperture 15b in the plane of latching action of latch member 17. The width of the neck 18 is shown by dimension c (Fig. 5a) in the Fig. 1 position and by dimension d in the Fig. 2 position, so therefore both dimensions c and d must be less than dimension a of the aperture 15b.

The neck 18 is kept within the rectangular aperture 15b during movement between latching and unlatching positions by the two shoulders 24 and 25. These shoulders are spaced apart a distance g (Fig. 5) greater than but not substantially greater than the thickness of the anchoring plate 15, and these shoulders straddle op-

posite sides of the plate. As mentioned before, shoulder 24 engages the upper side of the anchoring plate to serve as a pivot. The other shoulder 25 serves as a retaining means to keep the neck 18 in the rectangular aperture 15b during pivoting of the latch member between latching and unlatching positions. Shoulder 25 prevents any tendency to lift the neck 18 out of the rectangular aperture 15b as the handle 22 is raised in moving from the latching to the unlatching position.

Limit stops are provided to control the length of swing of the latch member 17 between the latching and unlatching positions. The limit stops are provided by the shoulders 26 and 27 on the right-hand side of the neck. These shoulders are spaced apart a greater distance than the thickness of the plate so that the latch member 17 can be swung far enough to disengage the hook-shape portion 21 from the annular grooves 11b in the catch 11. The shoulder 26 serves as a limit stop by engaging the top surface of the anchoring plate 15 to determine the latching position of the latch member 17, as shown in Fig. 1, while the shoulder 27 serves as a limit stop to engage the lower surface of the anchoring plate 15 to determine the unlatching position shown in Fig. 2.

It is important to retain latch member 17 in the rectangular aperture 15b during normal operation as the latch member 17 is swung between the latching and unlatching positions and to keep the pivoting shoulder 24 in engagement with the top surface of anchoring plate 15. The distance from the right side of the neck 18b to the crest of the pivoting shoulder 24 formed opposite thereto must be greater than the length a of aperture 15b in the plane of latch action. The distance between the right side of the neck and the crest of the shoulder for the unlatching position in Fig. 2 is shown by dimension e and for the latching position of Fig. 1 by dimension f (Fig. 5a), and both dimensions are greater than dimension a of aperture 15b. Also, the distance from the crest of each limit stop shoulder 26 and 27 to the side of the neck 18a opposite thereto must be greater than the length a of aperture 15b, and this relationship may be expressed as the somewhat indefinite dimension h (Fig. 5a) and the dimension i (Fig. 5) are each greater than dimension a . Also, the distance j from the crest of the retaining means shoulder 25 to the crest of the corresponding stop means shoulder 27 is greater than the given dimension a of the aperture 15b so that the latch member 17 will not accidentally be lifted from the rectangular aperture 15b.

The latch member 17 can be easily assembled into the aperture 15b of the anchoring plate 15 by following the sequence of operations shown in Figs. 6, 7 and 8 of the drawings. For easy assembly without special tools, the parts must have certain relative dimensions and a definite sequence of operation must be followed. First, the latch member 17 is rotated counterclockwise until it assumes the position shown in Fig. 6 whereupon the hook-shape portion 21 is lowered into the aperture 15b. Second, since the width of the second portion between the undercut 28 and the distal end of the hook-shape portion 21 is less than the length of aperture 15b, designated as dimension a , the latch member 17 can be rotated clockwise and lowered into the aperture 15b until it approaches the position shown in Fig. 7. Since the distance l (Fig. 5a) from the bottom of the undercut 28 to the crest of the lower stop means shoulder 27 is less than the dimension a of aperture 15b in the plane of latching action, clockwise movement of the latch member will cause the stop shoulder 27 to travel down through the aperture 15b until it is below the lower surface of the plate 15. Third, since the distance k (Fig. 5) from the right side 18b of the neck to the crest of the retaining shoulder 25 is less than dimension a of the aperture 15b, counterclockwise movement of the latch member 17 will cause the shoulder 25 to move down through and below the aperture 15b, as shown in Fig. 8. The latch member 17 will then be properly positioned in the aperture 15b. It should be apparent that the neck 18, the shoulders, and the second portion 19 of the latch member are so constructed that after the hook-shape portion 21 is inserted into the aperture 15b (Fig. 6), the handle 22 must be first rotated in one direction (clockwise in Fig. 7) and then in the opposite direction (counterclockwise in Fig. 8) for assembly of the parts. Reverse movements are required for disassembly.

The plane of latching action in which the plate-like

latch member 17 pivots is in the plane of the drawing surface in Figs. 1 and 2 and is perpendicular to the drawing surface in Figs. 3 and 4. The movement of the latch member 17 is restricted to this plane by the U-shape guide member 31 in Figs. 2 and 3 fitting into the aperture 15b and reducing its width from a dimension b in Fig. 4 to a dimension m . Each leg of the U-shape has its upward distal end forming an upwardly and outwardly bent lug 31a having a neck corresponding in length to the dimension a and fitting in the aperture 15b, as shown in Fig. 2, to properly position the guide member 31 in the aperture 15b. Of course, it should be apparent that the aperture 15b can have a width m instead of a width b and guide member 31 will not be needed. The aperture side walls will give some support to the side walls of latch member 17, but this structure will not be as satisfactory as that with guide member 31.

The effective aperture in anchoring plate 15 having the width dimension m , measured perpendicular to the dimension a and to the plane of latching action, is wider than but not substantially wider than the thickness of latching member 17 so that it can be easily pivoted between latching and unlatching position, while member 17 is supported by the sides of the aperture.

The resilient means is provided operatively connected between the anchor plate 15 and the latch member 17 for normally urging the latch member 17 into the latching position of Fig. 1. In the present disclosure, it takes the form of a spring loop 33 having its distal ends (Fig. 4) bent inwardly to be held and located in place by a bent over locking lug 15c while the ends straddle a locating bead 15d formed as an integral part of the anchoring plate 15. This spring 33 normally urges the parts into the latching position of Fig. 1 and normally urges the pivot shoulder 24 into contact with the top surface of the anchor plate 15. Then, there is no opportunity for the latch member 17 to assume the position shown in Fig. 8 with the pivot shoulder 24 out of engagement with the anchor plate 15 so that the shoulder 25 can be accidentally lifted upwardly through the aperture 15b from the position shown in Fig. 8 to that shown in Fig. 7. In addition to the spring 33, the dimension j (Fig. 5a) from the crest of shoulder 25 across to the crest of shoulder 27 is greater than dimension a of aperture 15b to normally prevent direct upward lifting of the latch member 17 out of the aperture 15b.

It should be readily apparent that this latch can be quickly and readily assembled without special tools since no pivot pin is used. Labor cost in its manufacture is low since most of the parts are stampings and little machining is required. The assembly cost is small since the parts are easily slipped together and locking lug 15c is easily bent over into place.

The operation of this latch is similar to any conventional latch. When lid 12 in Fig. 1 is dropped, the rounded cam lower surface on the hook-shape portion 21 engages the mouth of the bore on catch 11 to swing the latch member 17 counterclockwise from the latching to the unlatching position until the hook-shape portion 21 aligns with one of the annular grooves 11b in the catch 11. Then, the spring 33 rotates the latch member 17 clockwise into the latching position shown in Fig. 1 with shoulders 24 and 26 bearing down against the upper surface of anchoring plate 15. For unlatching, the handle 22 is pushed inwardly or in a counterclockwise direction against the bias of spring 33. This action pivots the latch member 17 around the fulcrum provided by the pivoting shoulder 24 engaging the upper surface of the latch plate 15 until the stop shoulder 27 engages the lower surface of the anchoring plate 15, as shown in Fig. 2, whereupon the hook-shape portion 21 is removed from its associated annular groove 11b so that the box lid can be raised.

Various changes in details and arrangement of parts can be made by one skilled in the art without departing from the spirit of this invention or the scope of the appended claim.

What I claim is:

In a latch adapted to engage a catch with said latch including an anchoring plate having an aperture therethrough with a given dimension in the plane of latching action, including a latch member movable between latching and unlatching positions and having a first portion extending swingably through said aperture, having a hook-

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shape catch engaging portion on a second portion of the latch member located on the catch side of said aperture and having a handle on a third portion of the latch member located on the opposite side of said aperture for pivoting said latch member, including a spring operatively connected between said anchor plate and latch member for normally urging said latch member into said latching position and including coacting pivot means on said latch member and anchoring plate; the combination with said latch of a neck formed by said first portion between said second and third portions with said neck being less than but not substantially less than the given dimension and with shoulders at opposite ends of the opposite sides of said neck, the two shoulders at opposite ends of one side of said neck being spaced apart a distance greater than but not substantially greater than the thickness of said anchoring plate and straddling opposite sides of said plate, one of said last-mentioned shoulders engaging one side of said anchoring plate as said coacting pivoting means while the other shoulder serves as a retaining means to keep said neck in said aperture during movement of said latch member between latching and unlatching positions, the two shoulders on the other side being spaced apart a greater distance than the thickness of said plate for providing limit stops limiting the swing of said latch member between latching and unlatching positions, the distances from the crest of each limit stop shoulder and from said coacting pivoting means shoulder to the side of the neck opposite thereto and the distance from the crest of the retaining means shoulder to the crest of the

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corresponding stop means shoulder each being greater than said given dimension of said aperture, said latching member having an undercut between said retaining means shoulder and hook-shape portion with the distance from the bottom of said undercut to the crest of said mentioned corresponding stop means shoulder being less than said given dimension of said aperture, the width of said second portion between its distal end and said undercut being less than said given dimension, whereby said handle must be first rotated in one direction and then in the opposite direction for assembly of the parts by insertion of the hook-shape portion into the aperture or for disassembly thereof, said spring being located on said opposite side of said aperture with one end permanently fixed to said anchoring plate and with the other end bearing on a straight surface on the top of said third portion normally urging it toward said plate, said spring being the only means for holding said latch member in assembly with said anchor plate.

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