July 10, 1951 W. M. SCARBOROUGH 2,559,736

LATCH

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FIG. 1

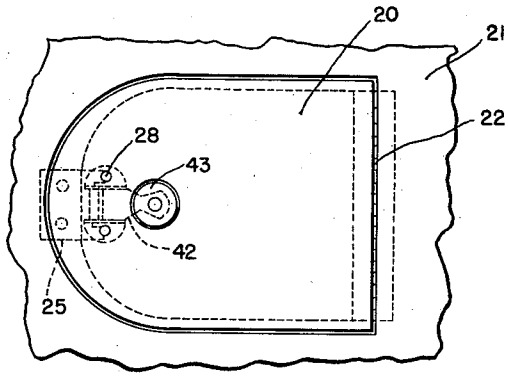


FIG. 10

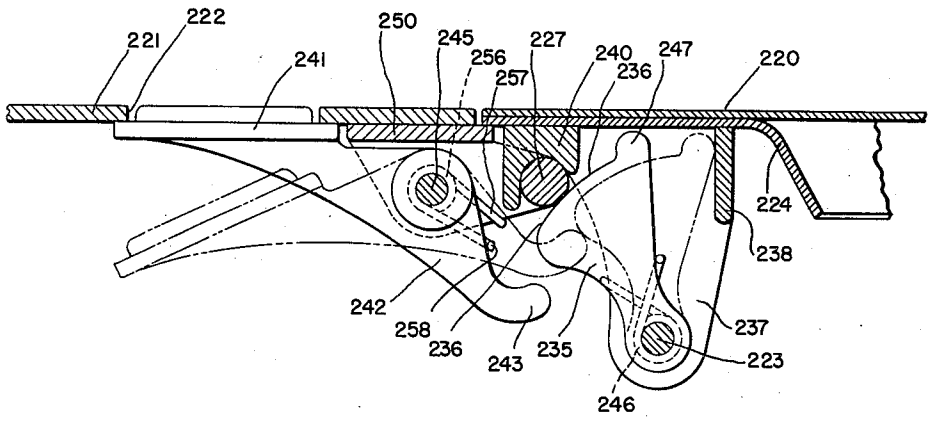
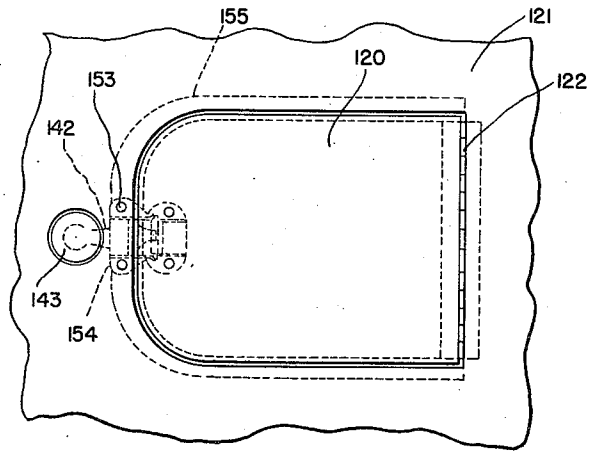


FIG. 6



INVENTOR.
WILLIAM M. SCARBOROUGH
BY
Richard W. Trenton
ATTORNEY

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FIG. 2

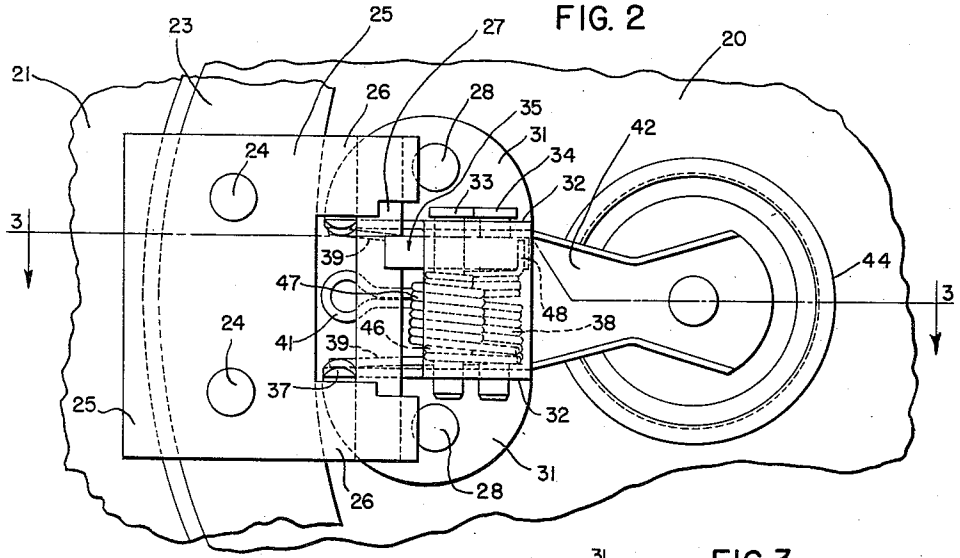


FIG. 3

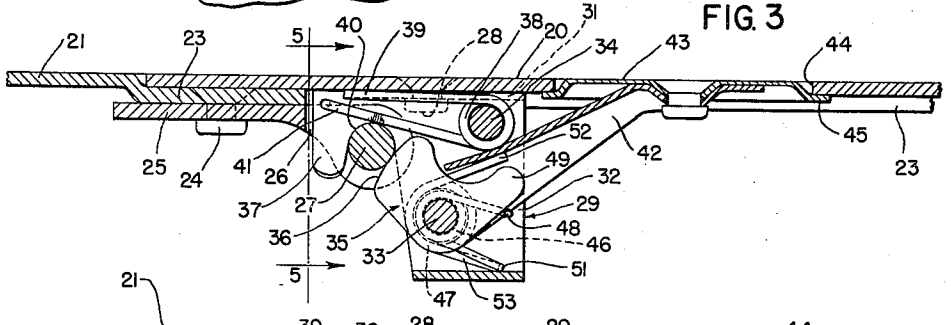


FIG. 4

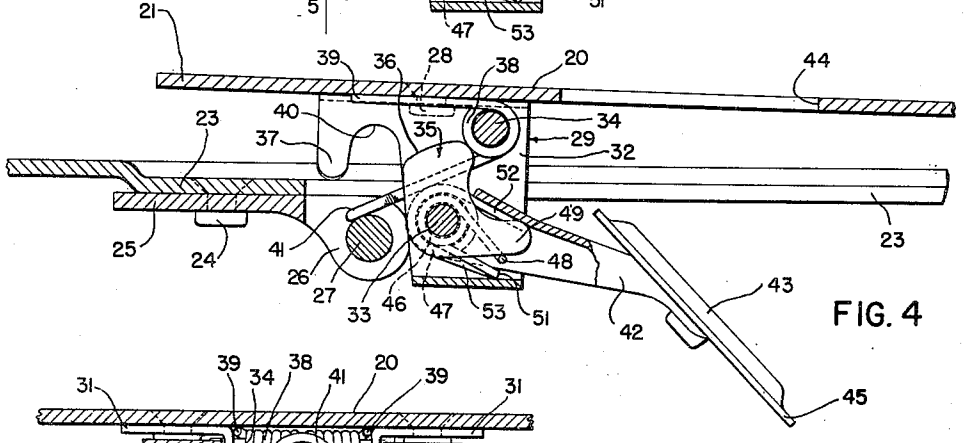
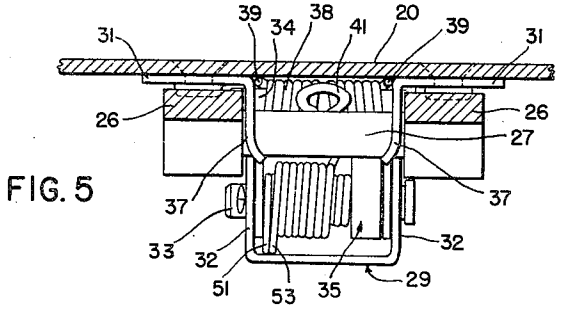


FIG. 5



INVENTOR.

WILLIAM M. SCARBOROUGH

BY

Richard W. Trautman

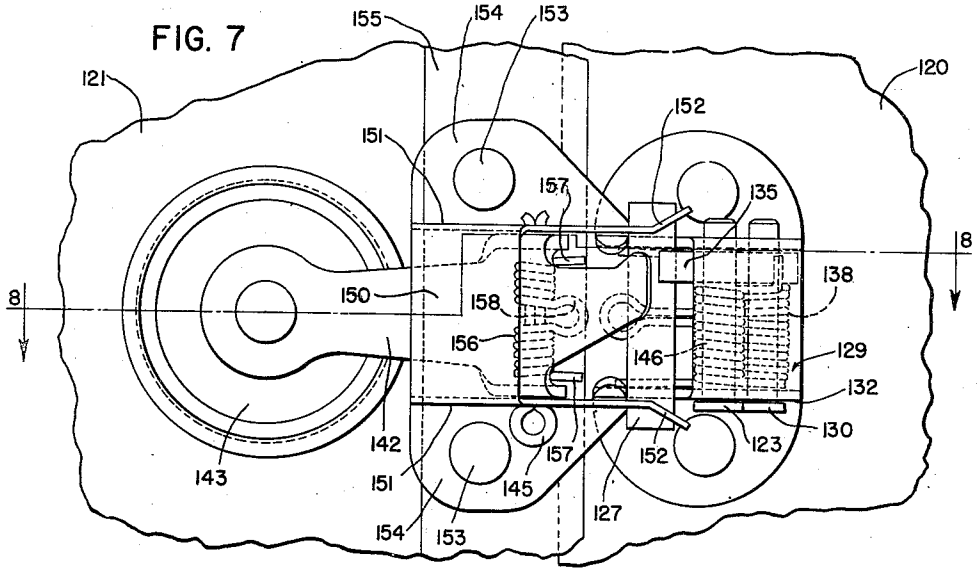
ATTORNEY

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FIG. 7



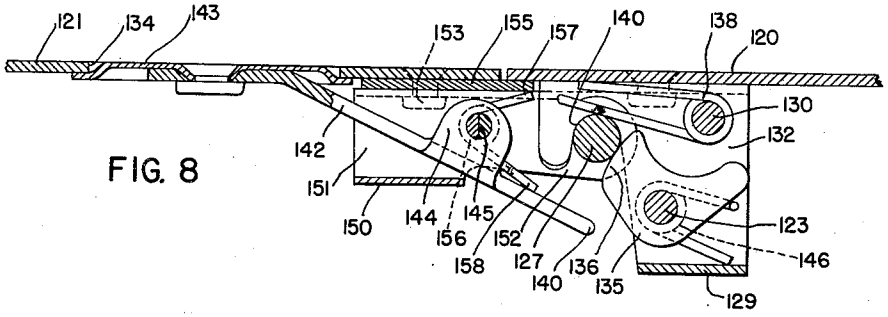


FIG. 8

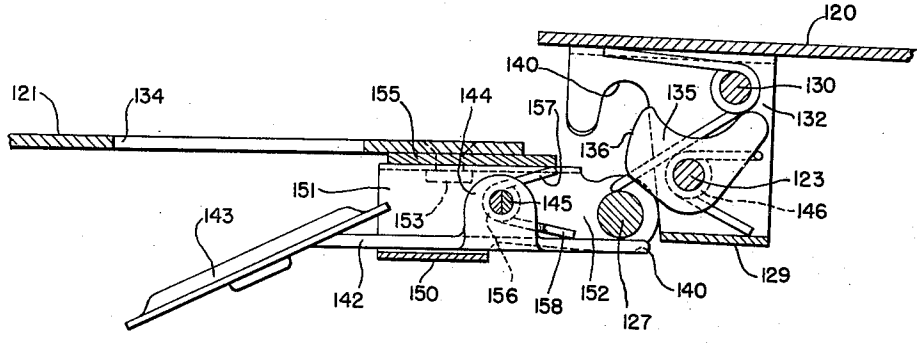


FIG. 9

INVENTOR.
WILLIAM M. SCARBOROUGH

BY
Richard W. Trevarton
ATTORNEY

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UNITED STATES PATENT OFFICE

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William M. Scarborough, Kenmore, N. Y., assignor to Curtiss-Wright Corporation, a corporation of Delaware

Application November 27, 1945, Serial No. 631,108

4 Claims. (Cl. 292—226)

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This invention relates to latches and particularly to an improved cam type latch for access doors and like closures.

The latch of the present invention is adaptable to various types of closures, and is especially applicable to installations, such as access doors on aircraft and other vehicles, where it is desirable that the door and the latch operating element be made flush with the door framing structure, and to installations where it is important that small displacing motions of the latch operating element or of the closure relative to the framing structure will not result in release of the latch.

According to the present invention the latch, preferably in the form of a cam adapted to tighten in relation to the latch keeper in response to vibration or other small displacing motions of the related parts, may be released by substantial inward movement of an operating element, such movement also resulting in outward displacement of the closure relative to the framing structure. In this manner any need for special tools to open the closure is obviated and the outer surface of the structure may be devoid of handles or the like projecting elements.

The preferred embodiments of the invention include means for guiding the closure into latched relationship to its frame in which the several latch elements will function positively irrespective of minor changes in relationship due to vibration, wear or normal manufacturing tolerances.

The invention also provides a latch mechanism of simple and durable construction whose major components may be produced of sheet metal by inexpensive stamping operations.

The foregoing and other objects and advantages will be more apparent from the following description of typical embodiments of the invention shown in the accompanying drawings, wherein:

Figure 1 is a front elevational view of an access door and surrounding framing structure with a latch in accordance with the invention associated therewith;

Figure 2 is an enlarged rear elevational view, inverted with respect to Figure 1, of the latch mechanism and adjacent parts of the door and framing structure;

Figure 3 is a sectional view taken along line 3—3 of Figure 2;

Figure 4 is a sectional view similar to Figure 3 with the parts in unlatched condition and the door in partially opened position;

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Figure 5 is a detail sectional view taken along 5—5 of Figure 3;

Figure 6 is a front elevational view similar to Figure 1 with an access door and the framing structure therefor provided with a modified latch mechanism;

Figure 7 is an enlarged rear elevational view, inverted with respect to Figure 6, of the latch mechanism of Figure 6 and adjacent parts of the door and its framing structure;

Figure 8 is a sectional view taken along line 8—8 of Figure 7;

Figure 9 is a sectional view similar to Figure 8 but with the parts in unlatched relation and the door in partially opened position; and

Figure 10 is a sectional view similar to Figures 3 and 8 but illustrating a further modification of the invention.

As shown in Figures 1 to 3 inclusive the access door 20 is mounted in flush relation to framing structure 21 which may comprise the skin of an airplane fuselage construction, the door being pivoted to the framing structure by a piano hinge 22 and when closed seating upon a flange 23 of the framing structure. Secured by rivets 24 to the framing structure is a keeper plate 25 having spaced lateral extensions 26 carrying at their outer extremities a keeper pin 27. A latch carrying bracket 29 which may comprise a metal stamping of substantially channel form has flanges 32 extending outwardly from the web portion thereof provided with lateral extensions 31 secured to the inner face of the door by suitable means such as rivets 28. The spaced flanges 32 of the element 29 have extending aligned openings through which extend a pair of pins 33 and 34. Pin 33 constitutes a pivot for a latch member 35 having a cam lobe 36 for engagement with an inner face portion of the keeper 27. A substantially opposite face portion of the pin is adapted to seat, as shown in Figure 3, in recesses 40 formed in the flanges 32, 32 of member 29. At one edge of the recess 40 in each flange 32 is an inwardly extending finger portion 37 which serves to guide the member 29 into operative relation to the keeper, the fingers 37 having converging tips to facilitate their entry between extensions 26, 26 of plate 25.

Supported by the pin 34 and disposed between flanges 32, 32 is a torsion spring 38 having end portions 39, 39 bearing upon the inner face of door 20 and having a medial portion 41 comprising an arm adapted to bear upon an outer face portion of the keeper pin. Pivoted to the pin 33 is an actuating lever 42 which may be stamped

from sheet metal into the generally channel shaped formation shown, the flanges of the lever 42 having openings passing the pivot pin 33 and being held against axial displacement relative to the pin by flanges 32, 32 of member 29. Secured by suitable means to the free end of lever 42 is a cover plate 43 which normally closes an opening 44 in the access door 20 and is provided with a flange 45 for limiting outward movement of the cover to a position in which its outer surface is substantially flush with the outer surface of the door.

Also supported by the pivot pin 33 and confined against axial movement between the latch 35 and one flange of lever 42 is an inner torsion spring 46 and an outer torsion spring 47. One end portion 48 of inner spring 46 engages an arm 49 of the cam 35 for urging the latter counterclockwise as the parts are viewed in Figure 3, the other end 51 of the spring bearing against the web of channel member 29. The outer torsion spring 47 has one end portion 52 thereof bearing against the lever 42 for urging the latter counterclockwise to the position there shown in Figure 3, the other end 53 of spring 47 bearing against the web of the member 29.

It will be seen that upon closing of the door the entry of fingers 37, 37 of the latch carrying member 29 in the space between the keeper 27 and the body of plate 25 in close relationship to extensions 26, 26 of keeper plate 25 will guide the parts into the relationship shown in Figure 3 wherein the keeper 27 is seated in the recesses 40 of the member 29. After the access door has been closed small relative movement of the door 20 and the framing structure 21 such as those caused by vibration will not affect the function of the latch 35 whose cam lobe 36 is so designed that counter-clockwise movement of the latch is constantly urged by the inner torsion spring 46, acting to cam the keeper into firmly seated relation in the recesses 40, 40. It will also be seen that slight inward movement of the cover 43 and lever 42 will not affect the latching relationship of the cam 35 with the keeper 27, since in the normal condition shown in Figure 3 the extension 49 of the cam is spaced substantially from the web of lever 42.

In order to open the access door the cover 43 is pressed inwardly to a substantial degree as shown in Figure 4. After initial inward movement the latch is engaged by and moves with the lever 42, swinging clockwise as viewed in Figures 3 and 4 to the position shown in the latter where the latch is entirely disengaged from keeper 27. Upon release of the latch the torsion spring 38 functions to effect initial opening movement of the door 20, its arm 41 pressing against the outer face of the keeper 27. With the access door 20 in the partially open position shown in Figure 4 it can be readily grasped and moved to fully open position. In closing the access door, the latter is pushed inwardly against the resistance of spring 38 until the recesses 40 seat the keeper 27. In moving from the position shown in Figure 4 to the latching position of Figure 3 the left hand face of the cam lobe 36, as the parts are viewed in Figure 4, will be engaged by the keeper and rotated clockwise against the resistance of spring 46 until the keeper is substantially seated whereupon the latch spring will effectuate latching action.

Referring now to the embodiment of the invention shown in Figures 6, 7 and 8, the access door 120 is pivoted by a piano type hinge 122 to the framing structure 121. Secured to the door is a latch supporting bracket 129 substantially similar in form to the bracket 29 heretofore described. Extending between flanges 132, 132 of the bracket is a pivot pin 123 for the cam latch 135 which is urged into latching engagement with a keeper 127 by a torsion spring 146. The latter extends around the pin 123 and is retained between one flange 132 of the bracket and the cam latch. A pin 130 also supported by and extending between the flanges 132, 132 carries a torsion spring 138 which functions in substantially the same manner as the spring 38 in Figures 1 through 5 inclusive.

The door framing structure 121 has an opening 134 normally closed by a flanged cover 143 that is secured to an actuating lever 142. The lever is provided with spaced ears 144 through which extends a cotter pin 145 serving to pivot the lever to a bracket 150. This bracket is of channel form with the spaced flanges 151 thereof having openings for receiving the pin 145 and having lateral extensions 152, 152 to which the keeper 127 is joined by welding or other suitable means. The keeper bracket 150 is secured to the framing structure 121 by suitable fasteners 153 extending through ears 154, 154 formed on the inner ends of the flanges 151. As shown in the drawings a reinforcing strip 155 extending around the access opening in the structure 121 to reinforce the latter and to provide a seat for the edge of door 120, is disclosed between the bracket ears 154 and the member 121. Lever 142 is normally urged clockwise to the position shown in Figure 8 wherein the flange of cover 143 is seated upon the edge of the opening 134 by a torsion spring 156 extending about the pin 145. The spring has end portions 157 engaging the member 155 while a medial portion thereof constitutes an arm 158 engaging the lever 142.

The operation of the latch is substantially the same as that previously described, pressure applied to the cover 143 swinging the lever 142 counterclockwise from the position shown in Figure 8 until the end 140 of the lever engages lobe 136 of the latch and moves the latter clockwise about its pivot pin 123 until it is disengaged from the keeper 127. Upon such disengagement the spring 138 will move the door 120 to the partially opened position shown in Figure 9 wherein it may be readily grasped and moved to fully opened position. As in the case of the latch mechanism shown in Figures 1 to 5 it will be seen that slight displacement of the parts due to vibration or accidental inward movement of cover 143 will not effect release of the latch mechanism but that the spring 146 will exert a constant urge upon the latch to ever tighten the relation between the latch, its keeper 127 and the keeper seat designated 140.

Referring now to the form of the invention shown in Figure 10, the general arrangement of parts is similar to that shown in Figures 6 and 8. In this structure, however, the door 220 is provided with a reinforcing frame 224 to which is secured by suitable means a cast or forged latch carrying bracket comprising a keeper seat 240, spaced flange portions 237 for carrying the latch pin 223, and a flange connecting web 238. The latch 235 has a cam lobe 236 which, in counter-clockwise movement of the latch, serves to press keeper 227 against the seat 240, such motion being urged by torsion spring 246 which extends around the pin 223 between the latch and one flange 237. An actuating lever 242 is

pivoted by a pin **245** to a fitting **250** which is secured to the closure frame **221** and which has as an integral part thereof the keeper **227**. One end of the lever carries a flanged cover **241** for normally closing an opening **222** in the frame structure.

Clockwise movement of the lever to the position shown in full lines in Figure 10, wherein the cover closes the opening **222** and wherein end portion **243** of the lever is spaced from the latch **235**, is urged by a torsion spring **256** which has end portions **257** and **258** respectively engaging the fittings **250** and lever end **243**. To release the latch the cover is moved inwardly, and upon travel of the lever **242** to a position wherein end **243** engages the cam, further movement will result in the latter swinging clockwise against the resistance of spring **246** to the position shown in broken lines in which it will be noted that a protuberance **247** of the latch contacts the web **238** of the latch bracket preventing further clockwise motion of the cam. Continued inward movement of the cover **241**, reflected in substantially outward movement of lever end **243** will move the latch and the closure **220** as a unit outwardly to a position wherein the closure may be grasped and moved to fully opened position. In again closing the door **220** the latch **235** will ride over the keeper **227** to the latch position shown in full lines in the drawings, it being noted that the protuberance **247** will, by contacting the seat portion **240** of the latch carrying member, limit counter-clockwise movement of the latch when the door is open to make such overriding action possible.

It will be understood that the terms "inwardly," "outwardly" and the like, are used herein only in a relative sense to facilitate definition and not to limit the invention or its application to closures of various types.

It will be understood further that the several modifications herein specifically shown and described are merely illustrative of the inventive principles involved which may be embodied in other latch structures coming within the scope of the appended claims.

I claim:

1. In a latch mechanism, a member having spaced extensions and a keeper extending therebetween in spaced relation to said member, a second member provided with spaced flanges having recesses constituting a seat for said keeper and fingers to enter between said extensions, a cam latch for engaging a face of said keeper substantially opposed to the seat and a pivot pin for the latch extending between and carried by said flanges, a pin assembly extending between and carried by said flanges, said pin assembly including a torsion spring having engagement with the keeper for urging the latter from said seat, spring means for urging the latch in one direction into engagement with the keeper for camming the latter into seated relation in said recesses, and the said latch having a part engageable with said pin assembly to limit movement of the latch in the opposite direction.

2. In a latch mechanism, a member having a keeper and supporting means therefor, a second member provided with spaced flanges having recesses to seat the keeper and having fingers at one side of said recess for guiding cooperation

with said supporting means, a pivot pin extending between and carried by said flanges, a latch and a lever supported for pivotal movement by said pin, and a pair of torsion springs carried by said pin between said flanges, one spring acting between the second member and the latch for urging pivotal movement of the latter in a direction to retain the keeper seated in said recesses, the other spring acting independently of the first spring between the second member and the lever for urging pivotal movement of the latter in the same direction, and said lever being adapted to engage the latch after initial pivotal movement in the opposite direction for moving the latter from engagement with the keeper during subsequent movement.

3. In a latch mechanism a member having a keeper, a second member provided with spaced flanges having recesses to seat the keeper, a pivot pin extending between and carried by said flanges, a latch and a lever supported for pivotal movement by said pin, and a pair of torsion springs carried by said pin between said flanges, one spring acting between the second member and the latch for urging pivotal movement of the latter in a direction to retain the keeper seated in said recesses, the other spring acting independently of the first spring between the second member and the lever for urging pivotal movement of the latter in the same direction, and said lever being adapted to engage the latch after initial pivotal movement in the opposite direction for moving the latter from engagement with the keeper during subsequent movement.

4. In a latch mechanism, a keeper, a member provided with spaced flanges having recesses for seating the keeper, a pivot pin extending between and carried by said flanges, and a latch pivoted by the pin between said flanges and engageable with the keeper, a torsion spring carried by the pin between said flanges for acting between the member and the latch for urging pivotal movement of the latter in one direction to retain the keeper seated in said recesses, a pin element supported by said flanges and a torsion spring element on the pin element between said flanges, said spring element being engageable with the keeper for urging it from said recesses, and said latch having a part engageable with one of said elements to limit pivotal movement of the latch in the opposite direction.

WILLIAM M. SCARBOROUGH.

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