Nov. 17, 1964 S. W. LINDSTEDT 3,156,955

SLIDING SHOE FOR A CLOSURE MEMBER

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Fig. 1

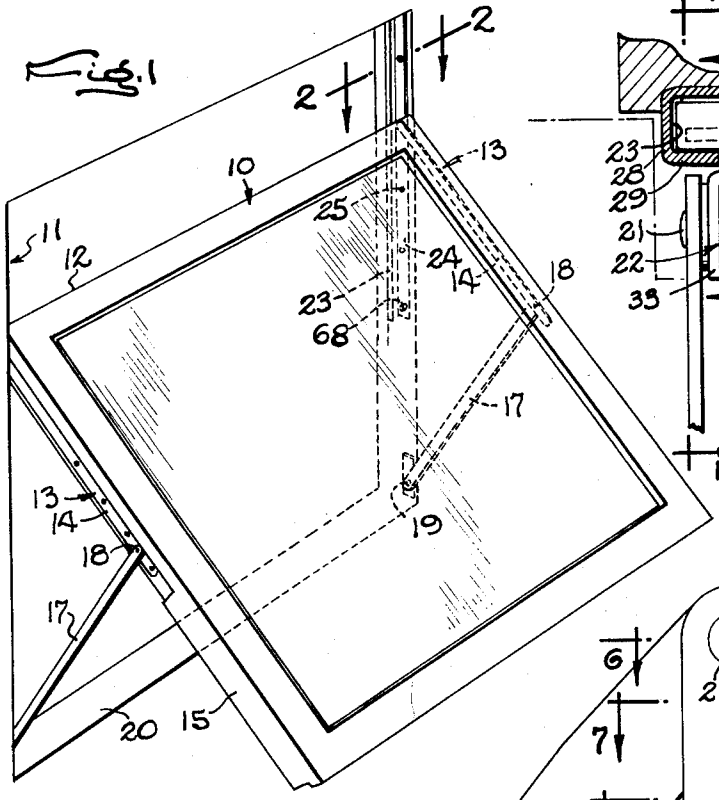


Fig. 2

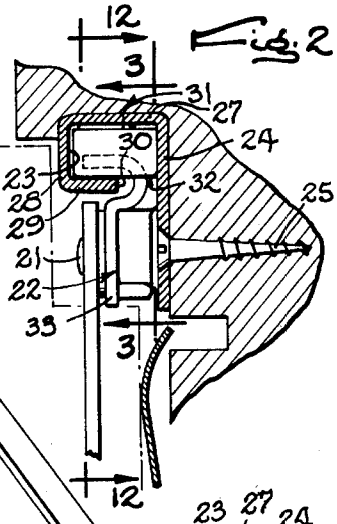


Fig. 3

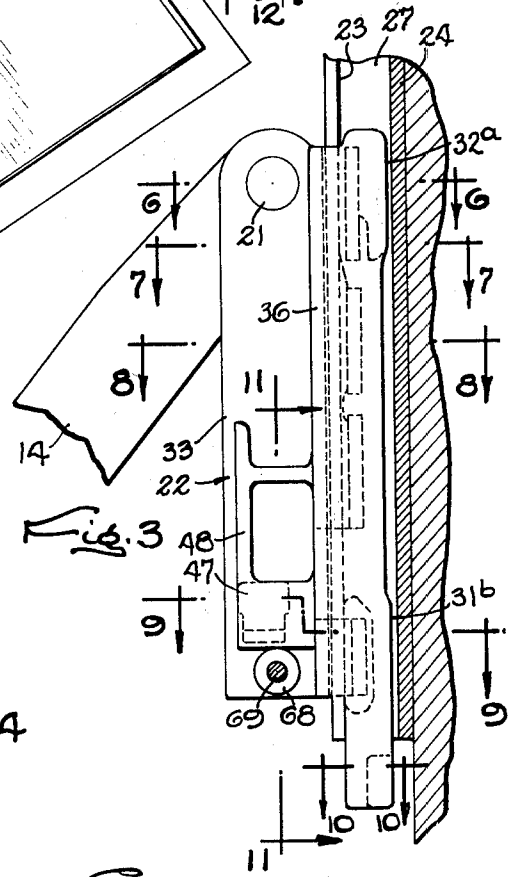
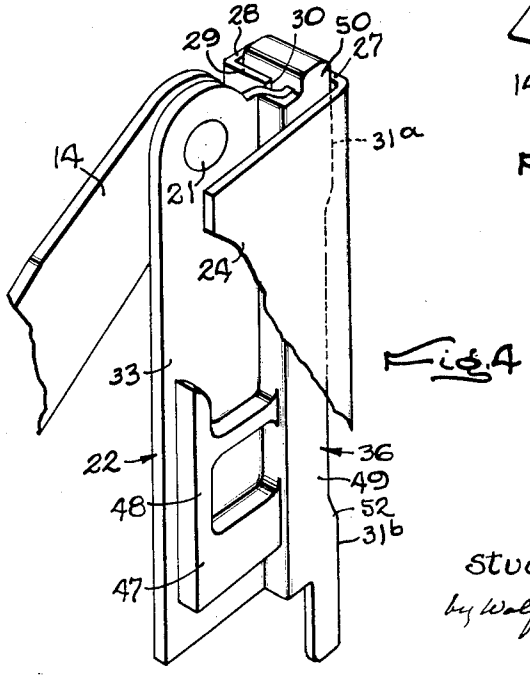


Fig. 4



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Fig. 5

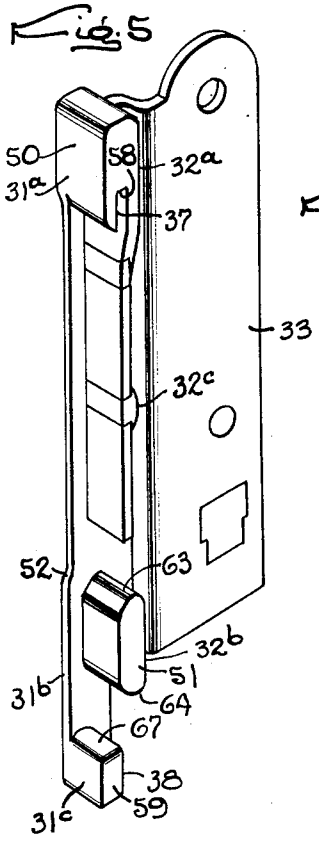


Fig. 6

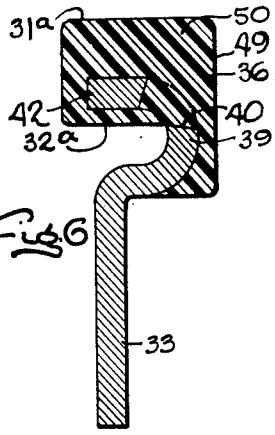


Fig. 7

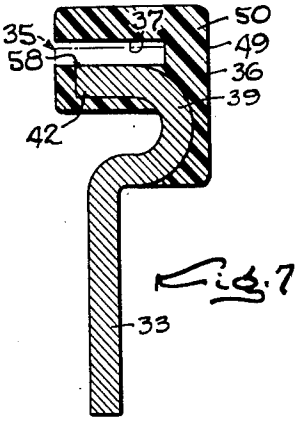


Fig. 8

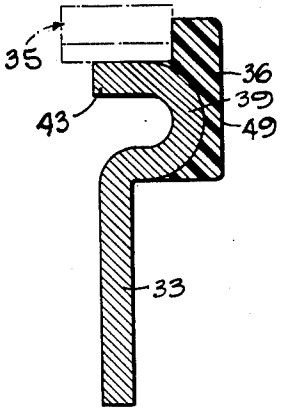


Fig. 9

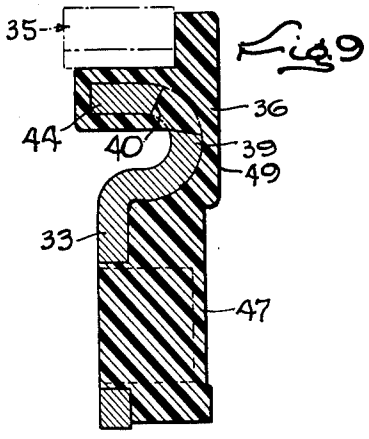


Fig. 10

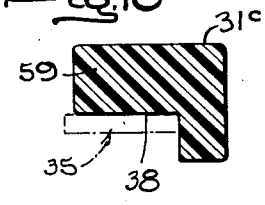
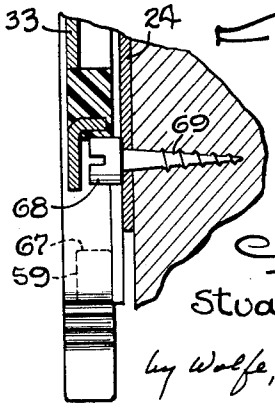


Fig. 11



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Fig. 12

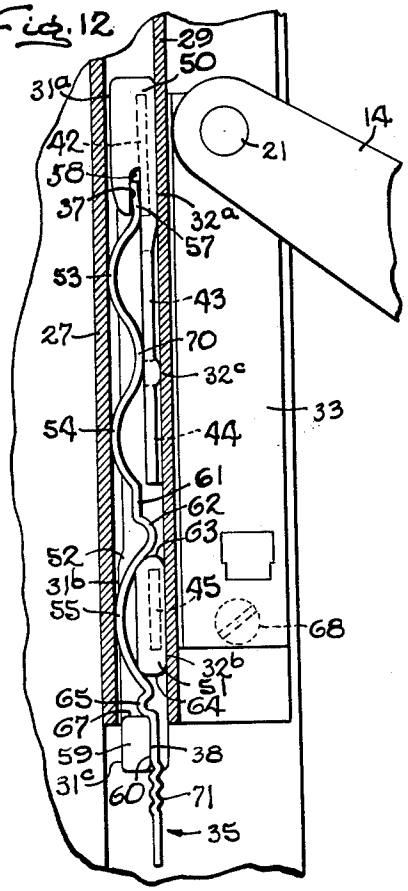


Fig. 13

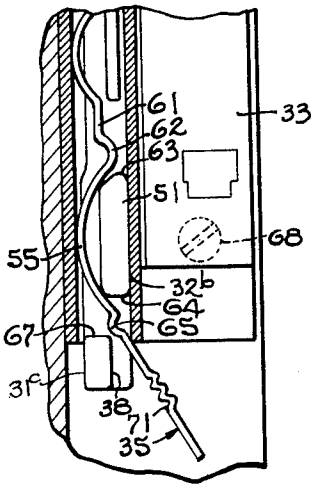


Fig. 15

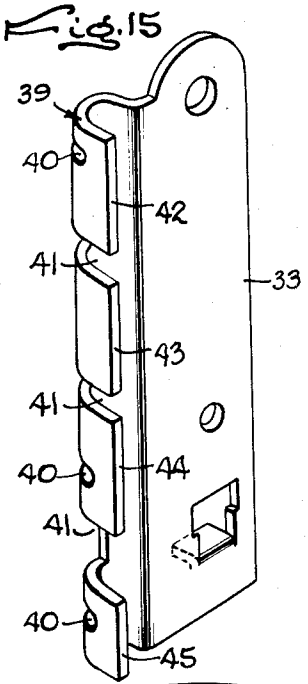
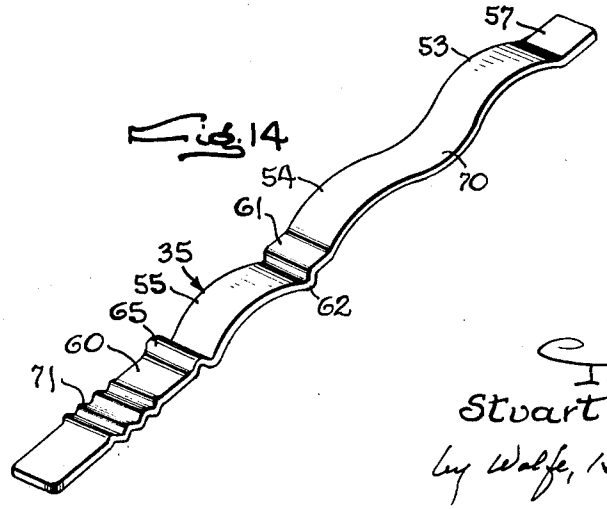


Fig. 14



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3,156,955

SLIDING SHOE FOR A CLOSURE MEMBER

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Filed Apr. 12, 1962, Ser. No. 187,053
10 Claims. (Cl. 20—42)

This invention relates to a sliding shoe for a closure member such as the sash of a so-called awning window which slides in a frame as it swings back and forth and, more particularly, to a shoe which slides along a track and forms part of a hinge for guiding the window as it is opened and closed.

When such windows are to be opened manually simply by pushing outwardly on the free edge of the sash, it is desirable to provide a relatively high amount of frictional resistance between the shoe and the track so that the sash will be held fractionally in a selected position in the frame. In some instances, however, an operator is provided to open and close the window and hold it in selected partially open positions. Under these circumstances, high friction is not required and, further, is undesirable because it increases the effort required to open and close the window.

Accordingly, the primary object of the present invention is to provide a novel shoe of the above character which is adaptable quickly and easily for use with or without an operator and which, at the same time, is simple and inexpensive in construction.

A more detailed object is to form the shoe with spaced bearings for guiding the shoe along the track with a free sliding action, and to mount a spring on the shoe in a novel manner such that the spring urges one bearing into frictional engagement with the track and is removable from the shoe to reduce the friction.

The invention also resides in the novel form and mounting of the spring normally to hold the same on the shoe while permitting its removal therefrom without disassembling the hinge.

Other objects and advantages of the invention will become apparent from the following detailed description taken in connection with the accompanying drawings, in which

FIGURE 1 is a fragmentary perspective view of an awning window including a hinge embodying the novel features of the present invention.

FIG. 2 is an enlarged fragmentary sectional view taken along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary sectional view taken along the line 3—3 of FIG. 2.

FIG. 4 is a fragmentary perspective view of a portion of the hinge shown in FIG. 3.

FIG. 5 is a perspective view of the shoe.

FIG. 6 is a fragmentary sectional view taken along the line 6—6 of FIG. 3.

FIG. 7 is a fragmentary sectional view taken along the line 7—7 of FIG. 3.

FIG. 8 is a fragmentary sectional view taken along the line 8—8 of FIG. 3.

FIG. 9 is a fragmentary sectional view taken along the line 9—9 of FIG. 3.

FIG. 10 is a fragmentary sectional view taken along the line 10—10 of FIG. 3.

FIG. 11 is a fragmentary sectional view taken along the line 11—11 of FIG. 3.

FIG. 12 is a fragmentary sectional view taken along the line 12—12 of FIG. 2.

FIG. 13 is a view similar to the lower portion of FIG. 12 with the parts in a different condition.

FIG. 14 is a perspective view of the spring.

FIG. 15 is a perspective view of part of the shoe.

While the invention is applicable to closure members

of various types, it is shown in the drawings for purposes of illustration in conjunction with a so-called awning window (FIG. 1) in which a sash 10 slides vertically in a frame 11 and simultaneously swings about a horizontal axis extending along the upper edge 12 of the sash. Connecting the sash to the frame for such movement is a hinge 13 including a sash link 14 extending along and fastened to the side edge 15 of the sash, and a second link 17 pivotally connected at one end to the sash link intermediate the upper and lower edges of the sash by a pin 18 (FIG. 1). The other end of the second link is pivoted at 19 on the frame adjacent the sill 20.

Fulcrumed on the upper end of the sash link 14 by means of a pin 21 is a shoe 22 which slides along a vertical track 23 mounted on the side of the frame to guide the upper edge 12 for sliding upwardly and downwardly in the frame. Preferably, a hinge of this type is mounted on each side of the sash.

Each of the tracks 23 comprises an elongated channel extending along one edge of an elongated bar 24 mounted on the side of the frame by suitable fasteners such as screws 25 (FIGS. 1 and 2), the channel being formed by a rail 27 integral with the bar and projecting laterally from the edge of the bar, an integral flange 28 extending across the bar from the outer edge of the rail 27, and a second rail 29 carried by the flange and extending toward the first rail 27 with the free edge 30 of the second rail spaced from the bar as shown in FIGS. 2 and 4, the opposed surfaces of the two rails being parallel.

The shoes are formed with first and second bearings 31 and 32 (FIG. 2) laterally spaced apart and each facing one of the rails 27, 29 to bear against the latter and guide the shoes along the tracks. A flat plate 33 carried by the shoe with one side of the plate projecting out of the channel through the space between the rail edge 30 and the bar 24 carries the pin 21 for pivoting the shoe on the sash link 14.

With this arrangement, the window may be opened by pushing outwardly on the lower edge of the sash which thus swings outwardly about the horizontal axis defined by the pins 21. During such swinging, the sash also swings counterclockwise (FIG. 1) about a horizontal axis defined by the pins 18 joining the links 14 and 17. Thus, the upper edge 12 and the shoes 22 slide downwardly along the tracks as the sash swings outwardly thereby opening the window at both the top and the bottom.

When the window is to be opened and closed simply by swinging the sash by hand, it is desirable to provide frictional resistance to sliding of the shoes along the tracks so that the sash will remain in a selected partially open position in the frame. In some instances, however, a mechanical operator (not shown) is used with a window of this type to swing the sash back and forth. Such operators, which are well known in the art, hold the sash in selected partially open positions in the frame as well as in the fully open and closed positions. Thus, frictional resistance is unnecessary and, in fact, is undesirable because it increases the effort required to open and close the window.

Accordingly, the present invention contemplates the provision of a novel shoe 22 for use in a hinge 13 of this type which shoe is adaptable quickly and easily for use with or without an operator, that is, to provide sufficient frictional resistance to hold the sash in place where an operator is not used and, after a simple modification, provide a greatly reduced amount of friction so that the hinge is better suited for use with an operator. For these purposes, the bearing surfaces 31 and 32 are spaced to provide a guided free-sliding action of the shoe, and a spring 35 is removably mounted in a novel manner on the shoe to act between the shoe and one of the rails 27, 29 and urge the shoe into frictional engagement with the

other rail thereby to provide the desired high friction. To reduce the friction, the spring simply is removed from the shoe whereupon the latter slides freely along the track.

To achieve these ends, the lateral spacing between the bearings 31 and 32 is made less than the spacing of the opposed surfaces of the rails 27 and 29 for the free-sliding action of the bearings within the channel, and a backing is formed on the shoe and spaced behind the bearing 31. The spring 35 comprises an elongated strip bowed intermediate its ends with portions at the opposite ends of the bow engaging the backing and the bow projecting outwardly beyond the bearing 31 to engage the rail 27 and press the shoe toward the rail 29. Two abutments 37 and 38 rigid with the shoe and engaging the outer side of the spring adjacent the opposite ends thereof normally hold the spring against the backing for movement with the shoe. The spring may be deformed around the abutments, however, and withdrawn endwise from the shoe.

In the present instance, the side edge of the plate 33 within the channel is formed with a lip 39 (FIG. 15) of U-shaped cross-section (see FIGS. 6 through 9 and 15) on which the bearings 31 and 32 are formed by molding a body 36 composed of suitable plastic such as Zytel onto the lip 39. The latter is apertured at 40 (FIG. 15) and slotted at 41 so that the plastic flows into the spaces in the lip and is joined securely thereto. As shown most clearly in FIG. 15, the slots 41 divide the free edge portion of the lip into a plurality of fingers 42, 43, 44 and 45 disposed in a plane normal to the plate. A block 47 (see FIGS. 4 and 9) of plastic integrally joined to the body is molded on the underside of the plate 33 and formed with a ridge 48 disposed adjacent the bar when the shoe is mounted in the channel.

The body 36 includes an elongated base 49 extending along the curved portion of the lip 39 with one flat side sliding along the bar within the channel. At the upper end of this base is a block 50 of generally rectangular cross-section molded on the finger 42 and having parallel side surfaces 31^a and 32^a constituting parts of the bearings 31 and 32 respectively. Adjacent the other end of the base, a lug 51 is molded on the finger 44 with a flat side surface 32^b disposed in the plane of the surface 32^a to constitute another part of the bearing 32 and, on the other side of the base, a shoulder 52 (FIG. 4) is formed with a side surface 31^b disposed in the plane of the surface 31^a to complete the bearing 31. Thus, each bearing includes at least two surfaces spaced apart longitudinally of the shoe to guide the latter in the channel. The spacing between the surfaces 31^a and 32^a and the surfaces 31^b and 32^b is less than the spacing between the rails 27 and 29 as shown in FIGS. 2, 3 and 12.

Herein, the spring 35 is formed with three bows 53, 54 and 55 spaced apart longitudinally of the spring. The spring is disposed between the fingers and the rail 27 to abut on one side against the fingers or against the plastic molded on the fingers, and each bow projects outwardly beyond the bearing 31 on the other side far enough to engage the rail 27 and be flattened between the rail and the backing formed by the fingers thereby to urge the shoe toward the other rail 29. To hold the spring on the shoe as the latter slides in the channel, the upper end 57 of the spring is anchored in a seat comprising a downwardly opening slot 58 in the block 50 having walls disposed on opposite sides of the spring to hold the latter against lateral movement away from the shoe, the outer wall of the slot forming the abutment 37. A lug 59 is molded on the lower end of the body to abut on one side against the lower end portion 60 of the spring and holds the latter against the backing. Thus, the inner side of the lug 59 constitutes the abutment 38. The outer side 31^c of the lug is disposed in the plane of the surfaces 31^a and 31^b to form part of the bearing 31.

Just below the slot, the first bow 53 curves outwardly past the plane of the bearing 31 to engage the rail 27, and then curves back inwardly to engage the second finger 43. Then, the second bow 54 curves outwardly from the finger 43 toward the rail 27 and back inwardly toward the finger 44. Instead of contacting the latter, the spring is flattened at 61 and then bends sharply inwardly at 62 to overlie the upper end 63 of the lug 51. The lower bow 55 curves outwardly around the upper end of the lug and then inwardly to abut against the lower end 64 of the lug which thus constitutes part of the backing for the spring.

Initially, the upper and lower end portions 57 and 60 of the spring 35 are disposed at an angle with each other, for example, an angle of fifteen degrees, so that bending of the upper end of the spring into the plane of the notch 58 stresses the spring to hold the lower end against the abutment 38. The outer side of the lug 51 is set outwardly from the plane of the abutment 38 to increase the tension on the spring between the lug and the abutment thereby to insure that the bow 55 is held tightly against the opposite ends of the lug 51. A U-shaped bend 65 is formed in the spring just above the lug 59 to overlie the upper end 67 thereof and provide a positive stop against downward sliding of the spring relative to the shoe. Because of the stressing of the spring during assembly, the bend 65 and the lug end 67 are held securely in interlocking relation.

It will be seen that endwise sliding of the spring 35 upwardly relative to the shoe is limited by the length of the slot 58 and the spacing of the upper end of the bow 53 from the lower end of the block 50, and endwise sliding in either direction is resisted by abutting engagement between the lower bow 55 and the ends 63 and 64 of the lug 51. To accommodate the slight elongation of the spring which results from the flattening of the bows between the rail 27 and the backing as the shoe is inserted in the channel, the upper end of the spring is slidable endwise back and forth in the slot through a limited range.

With the spring mounted in this manner, the bows are flattened between the rail 27 and the backing to press the shoe toward the rail 29 when the shoe is inserted in the channel. Thus, the spring engages the rail 27 on the outer side of the shoe, herein at three points, and the bearing surfaces 32^a and 32^b frictionally engage the rail 29 on the inner side of the shoe. An additional bearing surface 32^c is formed on the inner side of the shoe intermediate the ends of the latter by a bead molded in the space between the fingers 43 and 44 to project inwardly therefrom and lie in the plane of the surfaces 32^a and 32^b. It will be seen that the frictional resistance of the spring and the bearing 32 will be sufficient to hold the shoe securely in any selected position along the track and thereby maintain the sash in any selected position in the frame. The flat side of the base 49 slides along the bar 24 and the opposite sides of the lugs 50, 51 and 59 slide along the flange 28 to complete the guiding of the shoe in the track.

When an operator is included during the initial installation of a window, the spring 35 is omitted so that the shoe 22 slides freely in the channel. Where the initial installation has been made for operation without an operator and a spring has been included, the spring is removed if an operator is added later. To facilitate the changeover from one condition to the other, the spring formed as described above is removable from the shoe and the channel without the necessity of completely disassembling the hinge 13.

For this purpose, the lower end of the channel is left open so that the shoe 22 may be slid into the position shown in FIGS. 3, 11, 12 and 13 in which the lower end of the shoe and the lower end of the spring project beyond the ends of the rails 27, 29. A stop 68 herein comprising the head of a screw 69 (FIG. 11) driven into the frame through the bar 24 is disposed in the path of the block 47 to abut against the latter and prevent accidental sliding of the shoe completely out of the channel.

With the lower ends of the shoe and the spring projecting below the channel, the upper side **67** of the lug **59** is adjacent the open end of the channel and the bend **65** may be swung out of interlocking relation with the lug simply by swinging the end of the spring laterally to the right and away from the lug as shown in FIG. 13. Then, a downward force is applied to the spring to withdraw it from the shoe and the channel. This force results in outward bending of the spring at the upper end of the bow **55** where the latter bears against the upper end **63** of the lug **51** which preferably is beveled as shown in the drawings to guide the spring outwardly as it moves downwardly. After the bend **62** clears the lug, the spring slides endwise out of the channel, the portion **70** between the bows **53** and **54** also being deformed outwardly in passing over the lug **51**. The lower end of the spring preferably is knurled at **71** to facilitate gripping thereof by a suitable tool such as pliers. After the spring has been removed, the bearings **31** and **32** guide the shoe for free back and forth sliding in the channel.

From the foregoing, it will be evident that a hinge **13** including a simple and inexpensive shoe **22** of the type described above provides either the relatively high frictional resistance desirable in one application or the substantially friction-free, guided sliding preferred in the other, and may be adapted for one condition or the other quickly and easily simply by removing the spring **35** from the shoe in the manner described.

I claim as my invention:

1. For use with a closure member slidable in a frame, the combination of, an elongated track open at one end and adapted to be mounted on said frame, said track having parallel rails opposing each other, an elongated shoe adapted to be connected to the closure member and disposed between said rails to slide endwise along said track, said shoe having first and second bearing surfaces laterally spaced apart and each facing one of said rails to guide the shoe along the track, the spacing between said surfaces being less than the spacing between said rails to permit free sliding of said shoe along said track, a backing on said shoe spaced behind said first bearing surface, an elongated spring disposed between said backing and one of said rails and having a plurality of bows along its length with said bows projecting outwardly beyond said first bearing surface and frictionally engaging said one rail, said bows being stressed between said backing and said one rail to urge said second bearing surface into frictional engagement with the other rail, a first lug formed on said shoe adjacent one end of said spring to engage the outer side of the spring at a point spaced from said one end to hold the latter against said backing, said shoe being formed with a slot adjacent to the other end of the spring opening toward said first lug to receive and hold said other end, a bend in said spring extending outwardly to overlie and abut against said first lug on the side thereof closest to said slot, a second lug on said shoe engaging the inner side of one of said bows at points adjacent the ends of the bow, said spring being stressed between said lugs to urge said one end toward said first lug and said one bow toward said second lug thereby to interlock said bend with the first lug and said one bow with the second lug, said shoe being slidable in one direction along said track into a predetermined position in which one end of the spring projects outwardly through said open track end and said first lug is adjacent the open end, and a stop on said track engageable with said shoe when the latter is in said predetermined position thereby to prevent sliding of said shoe further through the open end, said spring being removable from the shoe in said predetermined position in response first to lateral bending of said one end inwardly to swing said bend away from said first lug and then to an endwise force on said one end sufficient to deform said one bow and pull the latter past said second lug.

2. For use with a closure member slidable in a frame, the combination of, an elongated track adapted to be mounted on said frame and having parallel rails opposing each other, said track being open at one end, an elongated shoe adapted to be connected to the closure member and disposed between said rails to slide endwise along said track, said shoe providing first and second bearing surfaces laterally spaced apart and each facing one of said rails, the spacing between said surfaces being less than the spacing between said rails to permit free sliding of the shoe along said track, a backing on said shoe spaced behind said first bearing surface, an elongated spring bowed intermediate its ends with portions at opposite ends of the bow engaging said backing, said bow projecting outwardly beyond said first bearing surface whereby the bow and said second bearing surface frictionally engage said rails, a seat formed on said shoe adjacent one end of said spring and providing two abutments, one on the outer side of said spring for holding the latter against said backing and the other for engaging said spring and preventing endwise sliding thereof in one direction, a lug on said shoe adjacent the other end of said spring engaging the outer side of the spring to urge the latter toward said backing, a bend in said spring projecting outwardly to overlie said lug on the side thereof closest to said seat, said bend abutting against said lug normally to prevent endwise sliding of the spring relative to the shoe in the other direction, said shoe being slidable along said track into a predetermined position in which said lug is adjacent said open track end and said other end of the spring projects out of the track whereby the spring is removable from said shoe first by bending said other end inwardly to swing said bend away from said lug and then by exerting an endwise force on said spring.

3. The combination defined in claim 2 including a stop on said track and engageable with said shoe when the latter is in said predetermined position to prevent further sliding of the shoe out of the track.

4. The combination defined in claim 2 including a second lug engaging the inner side of said bow adjacent the ends of the latter to resist endwise sliding of the spring in either direction, said bow being deformable around said second lug in response to said endwise force.

5. The combination defined in claim 4 in which said lugs are spaced and positioned to stress said spring and interlock said bend with said first lug and said bow with said second lug.

6. For use with a closure member slidable in a frame, the combination of, an elongated track adapted to be mounted on said frame and having parallel rails opposing each other, an elongated shoe adapted to be connected to the closure member and disposed between said rails to slide endwise along said track, said shoe providing first and second bearing surfaces laterally spaced apart and each facing one of said rails, the spacing between said surfaces being less than the spacing between said rails to permit free sliding of the shoe along said track, a backing on said shoe spaced behind said first bearing surface, an elongated spring bowed intermediate its ends with portions at opposite ends of the bow engaging said backing, said bow projecting outwardly beyond said first bearing surface whereby the bow and said second bearing surface frictionally engage said rails, said shoe being formed with a slot adjacent one end of said spring opening toward the spring and receiving said one end to hold the same against movement laterally of the shoe, a first lug on said shoe adjacent the other end of said spring and having one side spaced inwardly from the projecting portion of said bow and engaging the outer side of the spring to hold the latter against said backing, a bend in said spring projecting outwardly to overlie said lug on the side thereof closest to said slot, and a second lug comprising part of said backing and formed on said shoe intermediate the ends of said bow, said second lug having an outer side spaced outwardly from said one side and engaging the inner side of said bow at points spaced from

the ends thereof whereby said slot, said bend, and said lugs cooperate to resist endwise sliding of the spring along said shoe.

7. The combination as defined in claim 6 in which said spring is stressed between said lugs to urge said one end toward said first lug and insure that said bend is interlocked with the first lug.

8. For use with a closure member slidable in a frame, the combination of, an elongated track adapted to be mounted on said frame and having parallel rails opposing each other, an elongated shoe adapted to be connected to the closure member and disposed between said rails to slide endwise along said track, said shoe providing first and second bearing surfaces laterally spaced apart and each facing one of said rails, the spacing between said surfaces being less than the spacing between said rails to permit free sliding of the shoe along said track, a backing on said shoe spaced behind said first bearing surface, an elongated spring bowed intermediate its ends with portions at opposite ends of the bow engaging said backing, said bow projecting outwardly beyond said first bearing surface whereby the bow and said second bearing surface frictionally engage said rails, said shoe being formed with a slot adjacent one end of said spring opening toward the spring to receive and hold said one end against movement laterally of the shoe, a lug on said shoe adjacent the other end of the spring and having an inner side engaging the outer side of the spring, said lug and said slot cooperating to hold said spring against said backing, and a bend in said spring overlying said lug on the side thereof closest to said slot whereby the slot and said lug resist endwise sliding of the spring relative to said shoe.

9. A shoe for a sliding closure member including, in combination, an elongated body having first and second laterally spaced bearing surfaces, a backing on said body spaced behind and facing toward said first bearing surface, an elongated spring bowed intermediate its ends with portions at opposite ends of the bow engaging said backing behind the spring and the intermediate portion of the bow projecting forwardly beyond said first bearing surface for engagement with a guide rail, abutment means on said body adjacent one end of said spring for holding said one end against said backing and resisting endwise sliding of the spring toward said one end while permitting sliding of the spring in the opposite direction, and means for holding the spring releasably against endwise sliding in the opposite direction including an abutment spaced longitudinally along said spring from said abutment means and engaging the forward side of said spring beyond said bow at a point spaced from the other end of the spring with the spring passing between said abutment and said backing and projecting beyond said abutment whereby the spring may be removed from said shoe by pulling on said projecting end portion and deforming the spring to pass endwise between said abutment and said backing.

10. A shoe as defined in claim 9 further including two opposed abutments on said backing engaging the rear side of said spring intermediate the ends of said bow and facing longitudinally of said spring in opposite directions to prevent endwise sliding of said spring except upon deformation of said spring.

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