March 15, 1960 G. DOELTER ET AL 2,928,156

SLIDE FASTENER

Filed June 19, 1957 4 Sheets-Sheet 1

FIG. 1.

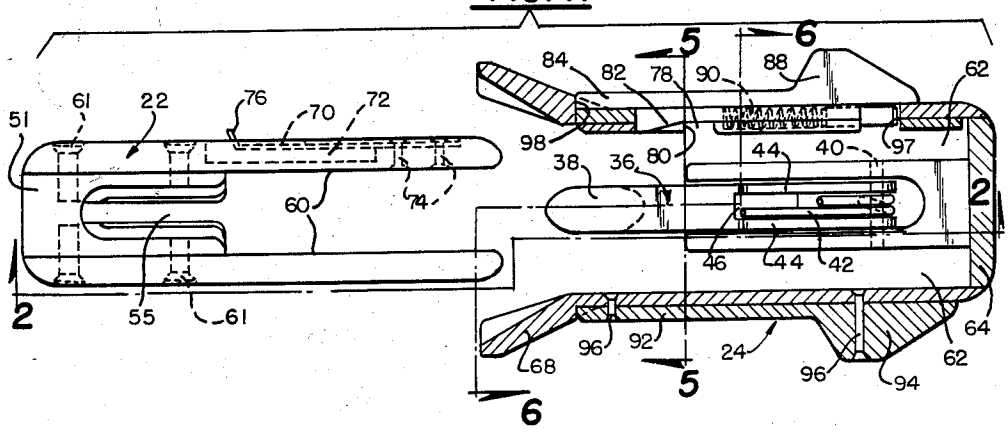


FIG. 2.

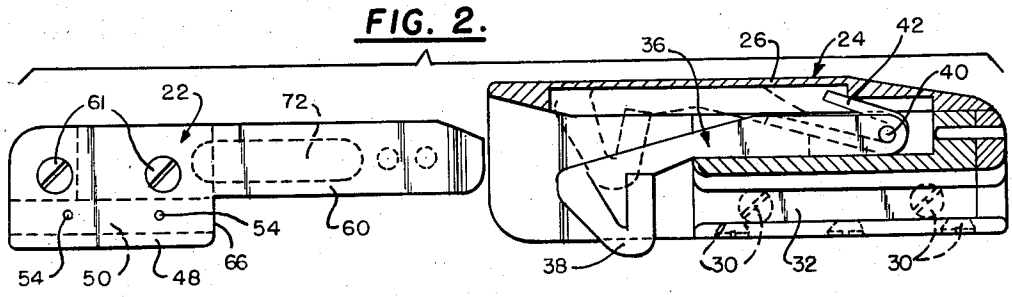


FIG. 3.

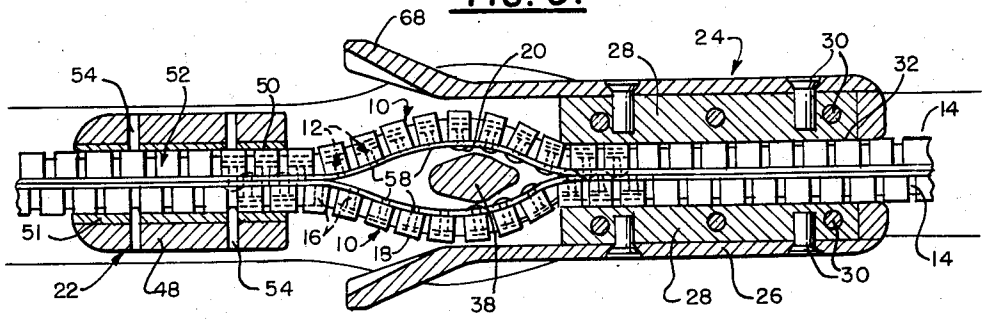
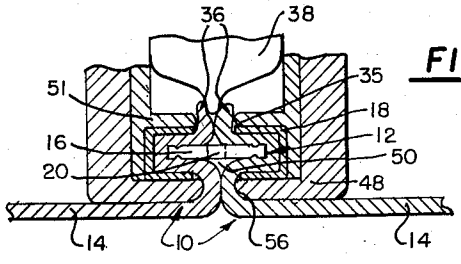


FIG. 4.



INVENTORS

Gandolph Doelter

Adolf Weissmann

BY Hall & Houghton

ATTORNEY

March 15, 1960 G. DOELTER ET AL 2,928,156

SLIDE FASTENER

Filed June 19, 1957 4 Sheets-Sheet 2

FIG. 5.

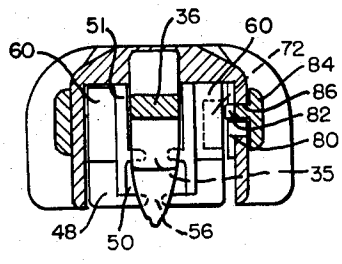


FIG. 6.

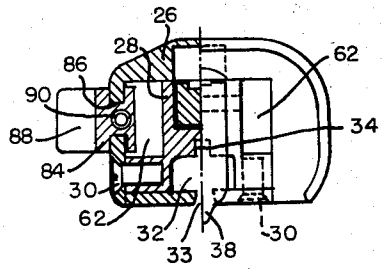


FIG. 7.

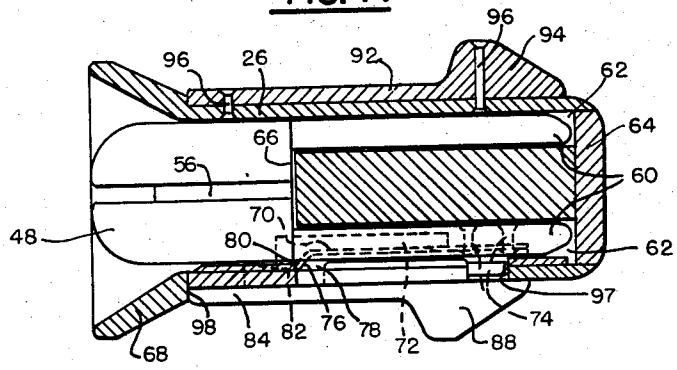


FIG. 8.

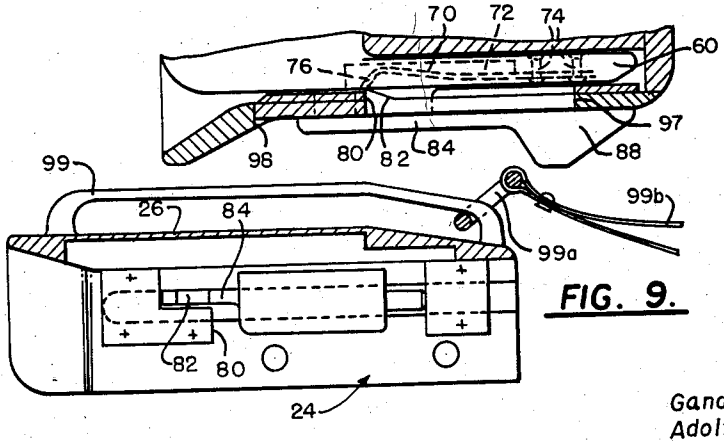


FIG. 9.

INVENTORS
Gandolph Doelter
Adolf Weissman

BY Hall & Houghton

ATTORNEY

March 15, 1960 G. DOELTER ET AL 2,928,156

SLIDE FASTENER

Filed June 19, 1957 4 Sheets-Sheet 3

FIG. 10.

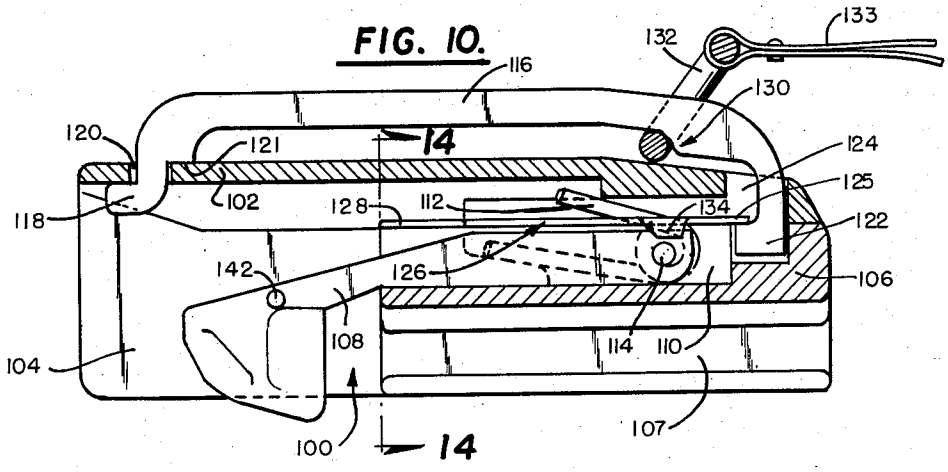


FIG. 12.

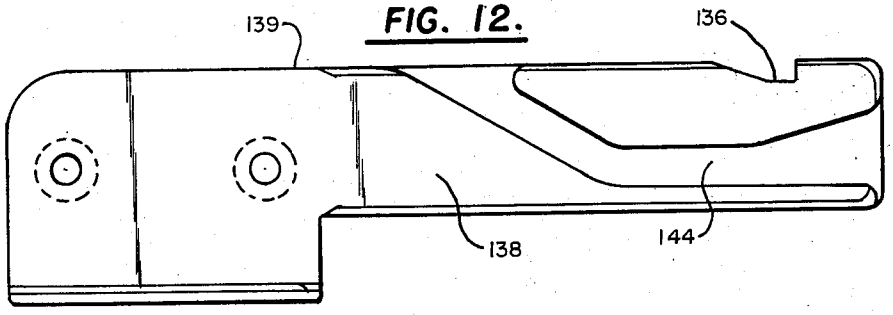


FIG. 13.

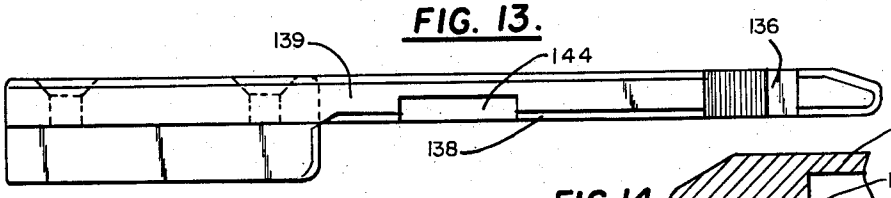


FIG. 14.

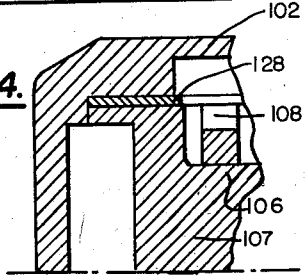
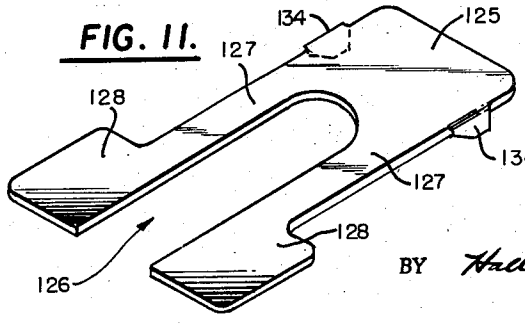


FIG. 11.



INVENTORS

Gandolph Doelter

Adolf Weissman

BY Hall & Houghton

ATTORNEY

March 15, 1960 G. DOELTER ET AL 2,928,156

SLIDE FASTENER

Filed June 19, 1957 4 Sheets-Sheet 4

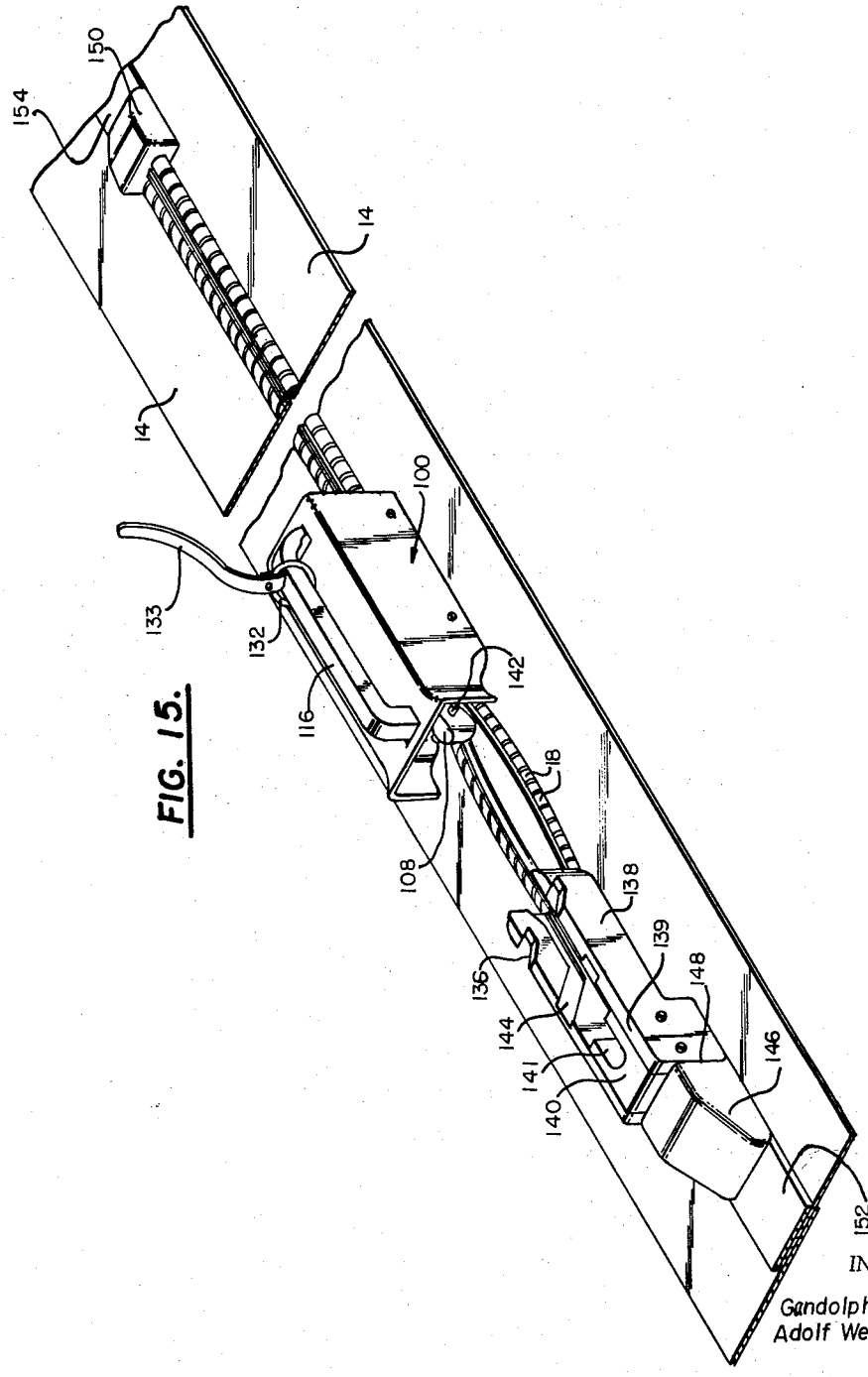


FIG. 15.

INVENTORS
Gandolph Doelter
Adolf Weissman

BY Hall & Houghton

ATTORNEY

United States Patent Office 2,928,156 Patented Mar. 15, 1960

2,928,156

SLIDE FASTENER

Gandolph Doelter, London, England, and Adolf Weissman, New York, N.Y., assignors to The New Zipper Corporation, Panama, a corporation of Panama

Application June 19, 1957, Serial No. 666,719

27 Claims. (Cl. 24—205.1)

This invention relates to a gas-tight slide fastener and to the construction of a slider therefor. More particularly, this invention relates to a slide fastener that is sealed against water, gas, and dust by the mutual pressure of a pair of stringers that are joined to form a single chain through the cooperation of a series of fastening elements, which form a part of each stringer, and a slider movable along the elements. The invention is particularly useful in connection with stringers constructed in the manner set forth in Mulka Patent No. 2,775,012, issued Dec. 25, 1956, to which reference may be made for a more detailed description of the stringer construction, but the invention has broader applicability and is not limited to the constructtion set forth in that patent.

The aforementioned Mulka patent described a slide fastener that is sealed against gas, dust and water by the mutual pressure of a pair of stringers, each of which has a series of fastening elements that are held in part of an S-shaped fold formed in a suitably treated strip or tape of flexible gas impervious fabric material. The fastening elements associated with the respective tapes thus form two opposed rows of elements, the elements of each row being shaped and arranged to engage and interlock with the opposed elements of the other row and thereby bring the opposed faces of the flexible tapes into abutting face-to-face relationship when the stringers are joined by the slider to form a closed fastener chain. In this manner the flexible tape material is compressed to form a sealed joint.

With the construction described so far, difficulties have been encountered in connection with the sealing of the finally closed end of the fastener chain, that is, the end toward which the slider is moved when the fastener is being closed. Although attempts have been made to solve this problem, prior to the present invention the solutions suggested have required skillful manipulation of the slider with both hands and have not proved satisfactory.

Accordingly, it is a principal object of the present invention to provide a unique slide fastener, a slide fastener which does not require skill or concentration by the user to operate the same and which requires the use of only one hand and is almost automatic in its action.

Another object of the invention is to provide a slide fastener which may readily be made gas and fluid tight from end to end.

Yet another object of the invention is to provide a slide fastener incorporating a positive safety lock to prevent accidental or unintentional opening of the fastener when it has been fully closed.

Still another object of the invention is to provide a slide fastener of the foregoing type in which the lock is engaged automatically and is released by a single movement in the opening direction of the slider.

A further object of the invention is to provide a unique slider for a slide fastener.

An additional object of the invention is to provide a unique top stop for a slide fastener.

A still further object of the invention is to provide a slide fastener which incorporates a slider and top stop having a unique working relationship.

A more specific object of the invention is to provide a slide fastener of the foregoing type in which the top stop cooperates with the slider to control the insertion and withdrawal of a stripper lever with respect to the rows of fastening elements.

Another object of the invention is to provide a slide fastener of the foregoing type in which the proper engagement of the slider and top stop is ensured without careful manipulation by the user.

These and other objects of the invention will become more readily apparent from a consideration of the following detailed description of exemplary embodiments of the invention when taken in conjunction with the accompanying drawings which illustrate such embodiments and wherein:

Figure 1 is a top plan view partly in section of the slider and top stop of the invention;

Figure 2 is a sectional view taken along line 2—2 of Figure 1 in the direction of the arrows;

Figure 3 is a horizontal sectional view illustrating the cooperation of the slider, top stop, and stringers;

Figure 4 is an enlarged transverse sectional view illustrating the cooperation of the stripper lever, top stop, and stringers;

Figure 5 is a transvere sectional view taken along line 5—5 of Figure 1 in the direction of the arrows;

Figure 6 is a transverse partly sectional view of the slider taken along line 6—6 of Figure 1 in the direction of the arrows;

Figure 7 is a bottom view, partly in section, illustrating the engagement of the slider and top stop and the locking of these elements together;

Figure 8 is a partial view similar to Figure 7 and illustrating the operation required to unlock the elements of that figure;

Figure 9 is a longitudinal sectional view of a part of the slider;

Figure 10 is a longitudinal sectional view of a modified form of slider;

Figure 11 is a perspective view of a part of the modified slider;

Figure 12 is a side elevation view of a part of a modified top stop for use in conjunction with the modified slider;

Figure 13 is a plan view of the part illustrated in Figure 12;

Figure 14 is a transverse sectional view of a detail of the modified slider; and

Figure 15 is a perspective view of a slide fastener incorporating the modified slider and top stop and illustrating additional details of the stringer construction.

Briefly yet comprehensively stated, the invention comprises a pair of stringers each having a row of fastening elements held within a fold of a flexible tape, a slider movable along the stringers to control the engagement and disengagement of the fastening elements, and a top stop at the finally closed end of the stringers which clamps the fastening elements of that end into permanent engagement and which receives the slider when the fastener is fully closed. The slider is provided with a stripper lever which pivots into the path of a channel formed in the slider body and through which the fastening elements pass as the slider is moved along the stringers. The stripper is effective to ensure the engagement or disengagement of the fastening elements and by virtue of the novel construction to be described is lifted from between the stringers

as the slider approaches the top stop. To promote the reinsertion of the stripper between the stringers as the fastener is opened, the fastening elements adjacent the top stop are mutilated to prevent their interlocking in the normal manner, sealing of the fastener at this point being accomplished by simple pressure upon the stringers by the slider body. A unique relationship between the slider and the top stop ensures the proper engagement of these parts and the proper operation of the stripper without requiring concentration or skillful manipulation on the part of the user. Moveover, a novel lock of extreme operational simplicity (which may assume several forms) is provided to prevent accidental or unintentional opening of the fastener when the slider and the top stop have been engaged and the fastener is fully closed. The invention resides in the foregoing combination and in the combinations and subcombinations described below.

The slide fastener of the invention in the form shown comprises a pair of stringers **10** (Figs. 3 and 4), each having a row of fastening elements **12** held within a fold of a flexible tape **14**. The tape may be folded into an S-shape as shown in Fig. 4 and may be formed of a waterproof material, such as rubber or plastic, or be suitably treated to make it gas and/or water impervious. Each fastening element may have a stud body **16** embedded within the fold of the associated tape and permanently fixed to the tape by a C-clamp **18** which embraces the material of the fold about the corresponding stud. Except as set forth below, each fastening element also has a head **20** which protrudes from the fold of the associated tape and which has an angulated outer surface and a flat inner surface arranged to interlock with the corresponding surface of the adjacent fastening elements of the opposed tape. The fastening elements at the initially closed end of the fastener may be clamped into permanent engagement by conventional means or as later described in connection with Figure 15. In accordance with the invention, the fastening elements at the finally closed end of the fastener are held in permanent engagement by a top stop **22** (Fig. 3) to be described in more detail hereinafter.

A slider **24** is arranged to move along the stringers between the initially and finally closed ends and has an outer shell **26** which supports the slider body proper **28** as by a plurality of machine screws **30**. As shown in Figures 2, 3, and 6 the slider body is provided with a longitudinal groove which forms a channel **32** for the passage of the rows of fastening elements therethrough. Entrance to the channel is provided by a longitudinal slot **33** through which tapes **14** pass. The channel has a spur groove **34** (Fig. 6) which receives the terminal edges **36** (shown in Fig. 4) of the opposed stringer tapes **14**.

Housed within a recess formed in the slider shell and body is a stripper lever **36** (Figs. 1 and 2). This lever has a tapered nose or head **38** and is pivotable at one end about a pin **40** between upper and lower positions in which the head **38** is moved respectively out of and into the path of channel **32**. The stripper lever is biased into the latter position by a hairpin spring **42** that is coiled about the pivot pin **40** and which has its ends engaging the shell **26** and the stripper lever **36**, respectively. As shown, the stripper lever may have a pair of legs **44** which rotate about the pivot pin **40** and between which the hair spring **42** is mounted, one end of the hair spring engaging an inclined surface **46** between the legs **44**.

During the major portion of the travel of the slider along the stringers, the stripper head **38** is inserted between the two stringers at the point where they leave the slider channel (as shown in Fig. 3) and effects separation of the fastening elements of the opposed rows when the slider is moved in the opening direction and interlocking of the fastening elements when the slider is moved in the closing direction, the lateral surfaces of the stripper head being properly angulated to provide the required angle of engagement and disengagement for the opposed fastening elements.

When the slider is moved to the finally closed end of the slide fastener so as to engage the top stop in a manner to be described, the stripper must be withdrawn from between the stringers before the stringers merge into a closed chain inside the top stop **22** if the fastener is to be closed and sealed from end to end. Moreover, if the stripper is to be effective to open the fastener as the slider is moved away from the top stop, the stripper must be positively inserted between the stringers when the slider is so moved. The lifting of the stripper lever from between the stringers is accomplished by engagement of the tapered nose of the stripper lever with the junction of the permanently closed fastening elements at the top stop. The top stop has a body **48** (Figs. 2 and 3) which has a channel **50** for receiving the permanently closed end **52** of the slider fastener. The top stop is firmly clamped over this end of the fastener and is held thereto by anchoring pins **54**. The upper extremity of the stop body is provided with a bevelled slot **55** as shown in Figure 1, the slot receiving the nose **38** of the stripper lever when the slider moves on to the top stop and the stripper lever is lifted from between the stringers at the point where the stringers enter the top stop channel as a closed chain. The bevelled configuration of slot **55** aids in lifting the stripper lever. The tapered nose of the stripper then passes through this slot and is held between the upper edges **36** of the stringer tapes (as shown in Figure 4) by its hairpin spring **42**. It will be noted that the core **51** which defines the channel **50** in the top stop (as shown in Figs. 4 and 5) has a slot **35** through which the edges **36** protrude for this purpose. The top stop body **48** is also provided with a slot **56** through which the stringer tapes **14** pass into the top stop channel.

In order that the stripper lever may be readily inserted between the rows of fastening elements when the slider is moved away from the top stop, the fastening elements **12** adjacent the entrance to the top stop channel **50** are decapitated or mutilated as indicated at **58** (Fig. 3) to prevent the interlocking of the fastening elements over the length of fastener so treated. When the slider is moved away from the top stop, the nose of the stripper lever is urged between the decapitated fastening elements under the bias of its hairpin spring, and the proper insertion of the stripper between the stringers is ensured by the fact that the nose of the stripper lever lies between the terminal edges **36** of the stringer tapes when the lever passes through the slot of the top stop as previously described. By virtue of this construction the stripper lever will always be inserted between the stringers when the slider is moved away from the top stop, notwithstanding the fact that the stripper lever is lifted from between the rows of fastening elements when the slider is moved to its finally closed position.

Although the mutilation of the fastening elements adjacent the top stop channel prevents the interlocking of these elements, positive sealing of the fastener at this portion of its length is ensured by the face to face pressure of the tape material that is exerted by the engagement of the slider channel with the C-shaped clips embracing the decapitated fastening elements. It is immaterial whether the sealing contact between the opposing tape faces is produced by interlocking of the fastening elements or by the application of lateral pressure on the C-shaped clips.

In both the inserting and lifting of the stripper lever as described, the force of the hairpin spring **42** acting between the slider body and the stripper lever might tend to tilt the slider body with respect to the plane of the fastener chain and the top stop to which the chain is firmly connected. This would in turn tend to prevent the depression of the stripper into the joint of the stringers when the fastener is opened or to interfere with the proper alignment of the slider and top stop when the fastener is about to be closed and subsequently when the stripper rests raised between the terminal edges of

the tapes in the slot of the top stop. To prevent any such rocking tendency of the slider, a positive guide is provided between the slider body and top stop. Such a guide must positively align the slider and the top stop just before and also during the lifting or inserting movement of the stripper lever as well as when the nose of the stripper lever rests within the slot of the top stop. To accomplish the foregoing purpose of guiding and aligning, the top stop is provided with a pair of arms **60** which are received within corresponding recesses **62** formed in the slider body above and to each side of the slider channel **32** (see Figs. 1, 2, 6 and 7). Arms **60** may be formed integrally with the body **48** of the top stop, which is preferably formed in two parts that are joined, as by screws **61**, to the core **51**. As shown in Figures 6 and 7 the configuration of the top stop and slider body is such that the arms **60** are surrounded by the slider shell and body on all sides, the slider body fitting between the arms as shown in Figure 7 and having an end plate **64** which closes the recesses **62** at the ends of the arms. When the arms **60** are fully received within the slider recesses **62**, the top stop body **48** abuts the body of the slider at **66**. The slider and top stop are so dimensioned that the arms **60** have a sliding fit within their recesses.

The proper seating of the top stop arms within the corresponding recesses of the slider would normally require a careful and properly directed approach of the slider toward the top stop during the final closing movement. This would necessitate undesirable attention on the part of the user. To avoid this complication, the portion of the slider body leading into the two recesses **62** is flared as indicated at **68** in Figures 1 and 7 to provide an easy lead into the recesses for the two guiding arms **60** of the top stop. By virtue of this construction, the slider can be pushed over the top stop with little attention to exact alignment and becomes operable even in complete darkness, since an angle of misalignment of about 20 degrees to either side of the top stop axis is corrected by the flared entry.

In order to maintain the integrity of the seal provided by the slide fastener of the invention, it is important that the slider remain in engagement with the top stop and that accidental or unintentional movement of the slider so as to open the fastener be prevented. Pursuant to this purpose, a lock is provided for maintaining the slider and top stop in engagement. In a first form, the lock comprises a leaf spring **70** (Figs. 1, 7, and 8) that is received within a recess **72** formed in one of the guide arms **60** of the top stop and that is fixed near one end to the said arm as by rivets **74**. The free end of the leaf spring **70** is bent outwardly and constitutes a detent **76** that extends beyond the outer surface of the supporting guide arm. The sidewall of the slider adjacent the leaf spring is provided with a recess **78** to receive the detent **76**, one wall of recess **78** forming an abutment **80** against which the detent **76** may rest when the slider rests over the top stop. The detent engages the abutment **80** along a lower portion of the detent edge, but the abutment is shorter than the detent edge so that the upper portion of the detent edge is exposed for cooperation with the ramp or incline **82** of a slide **84** that is reciprocatively mounted within a slot **86** in the sidewall of the slider shell (see Figs. 5 and 9). Slide **84** has an outwardly extending lug **88** to be engaged by the fingers of the user and is biased by a small coil spring **90** (Fig. 1) to a position in which the lug **88** is farthest from the end plate **64** of the slider and in which the ramp or incline **82** is disengaged from the edge of the detent **76** (Fig. 7). When slide **84** is moved in the opening direction of the fastener (i.e., the direction in which slider **24** moves to open the fastener), ramp **82** engages the edge of detent **76** and forces the detent out of the recess **78** in the slider, away from abutment **80** and back into the recess **72** in the top stop arm (Fig. 8). Motion of the slide is limited at the ends of its travel by stop surfaces **97** and **98**, respectively.

The opposite side extremity of the slider is provided with a false slide **92** having a lug **94** corresponding generally to the lug **88** previously described. This "slide" is fixed to the slider as by rivets **96**. It will be noted that the lug **94** is closer to the end plate **64** of the slider than is lug **88** when the movable slide **84** is in its normal relaxed position. This arrangement of lugs **88** and **94** and the fact that the unlocking movement of slide **84** is in the same direction as the opening movement of the slider **24** greatly facilitates the operation of the invention. When the fingers of the user grasp the slider to pull or push the slider from the top stop and open the fastener, the fingers first engage the lug **88** of the movable slide **84** because of the fact that this lug is closest to the finally closed end of the fastener. Slight pressure of a finger against lug **88** causes the slide **84** to move along the slider against the slight bias of the return spring **90** and engages the ramp **82** with the detent **76** so as to move the detent out of its recess in the slider. This action unlocks the slider from the top stop, and when the lug **88** approaches the limit of its unlocking movement, the fingers of the user engage lug **94** as well and thus readily exert the force necessary to draw the slider off of the top stop. It is thus apparent that the slider is unlocked and disengaged from the top stop in a single continuous movement.

In the closing movement of the slider, the fingers of the user first engage the lug **94** which is closest to the initially closed end of the fastener, but engagement with the lug **88** would not be detrimental to the operation of the fastener, because the force exerted on this lug would merely be transmitted to the stop surface **98** in the slider shell. When the slider has been moved into final engagement with the top stop, the detent **76** enters the recess **78** in the slider and firmly locks the slider to the top stop. This locking action is automatic and requires no attention from the user. Moreover, the metal to metal contact betwen the detent **76** and the abutment **80** produces an audible click that is a positive indication of the proper operation of the lock.

In some applications of the invention it may be desirable to provide a conventional pull tab for moving the slider in the closing direction and also for moving the slider in the opening direction after the lock has been released. This may be accomplished by simply providing a bridge piece **99** rigidly attached to the upper side of the slider shell **26**, as shown in Figure 9, and a ring **99*a*** movable along the bridge piece by a pull tab **99*b***, which may be formed of fabric.

Figure 10 illustrates a modified form of slider which incorporates a modified form of slider lock. The slider generally designated **100** has a slider shell **102** with a flared end **104**. The slider has a body **106** which defines a channel **107** for the passage of the stringer tapes. A stripper lever **108** pivotable about a pin **114** is held within a recess **110** in the slider body and is urged by a hairpin spring **112** to a downward position in the path of channel **107**. The slider described so far is substantially identical to the previously described embodiment of the invention. However, in place of the locking mechanism of the previously described embodiment (the real and dummy slides, L-shaped leaf spring, etc.) the following locking mechanism is provided. On the top of the outer shell **102**, a bridge piece lever **116** is mounted. This piece has one end **118** of generally S-shaped configuration held loosely within an opening **120** in the shell of the slider. It will be noted that this end is hooked under the adjacent portion of the shell and has an abutment just outside opening **120** at **121** to support the end on the shell. The opposite end **122** of the bridge piece passes through an aperture **124** in the shell at the corresponding end of the slider and has an extension that is hooked under the bight or end **125** of a U-shaped flat spring **126**. The spring is better seen in Figure 11

wherein the legs 127 of the spring are seen to have flat extremities 128. These extremities are clamped between the shell and body of the slider as indicated in Figure 14, whereby one end of the U-shaped spring is fixed within the slider. The stripper lever 108 is free to pivot between the legs of the U-shaped spring. Beyond the end portions 128 the spring is free for limited vertical movement within the slider shell.

Bridge piece 116 has a cam step 130 adapted for engagement with the inner circumference of a tab ring 132 through which the bridge piece is threaded. When the tab ring is pulled, as by a pull tab 133, toward the end 122 of the bridge piece, it engages the cam step and raises end 122 of the bridge piece, the other end, 118, pivoting in opening 120. Since end 122 is hooked under the bight 125 of the flat spring, the spring is lifted, flexing about its fixed end portions 128.

The flat spring has projections 34, one on each leg, which extend downwardly substantially perpendicular to the plane of the spring and constitute detents. Each of these projections is arranged to engage a recess 136 in a corresponding arm 138 of the top stop, one arm being illustrated in Figures 12 and 13, and to be held by an abutment constituted by a vertical wall of the recess. The top stop may be formed generally similarly to that previously described, but the recess 136 is provided instead of the leaf spring lock 70 and associated parts of the former embodiment. The complete top stop will comprise a pair of mating arms of the type illustrated in Figures 12 and 13 that are joined to a core 140 as shown in Figure 15.

It will be apparent from the foregoing description of the modified form of the invention that the fastener may be operated by simply pulling on the tab ring in one direction or the other along the length of the stringers. From Figure 10 it can be seen that if the tab ring is pulled to the end 118 of the bridge piece, it will exert a force on the bridge piece that will be transmitted to the slider shell and body so as to move the slider along the stringers and onto the top stop. When the slider is properly in place on the top stop, the projections 134 of the flat spring 126 will enter the recesses 136 in the top stop guide arms and will securely lock the slider to the top stop. If the tab ring is then pulled to the end 122 of the bridge piece, it will engage the cam step 130 aid thereby raise the associated end of the bridge piece along with the adjacent end of the flat spring, so as to remove the projections 134 from the recesses 136 in the top stop arms. This will release the slider from the top stop, and continued pull on the tab ring will move the slider from the top stop and open the fastener. The modified form of the invention provides a slider which may be operated by the conventional pull tab but which nevertheless retains the desirable features by which the slider and top stop may be engaged and locked, or unlocked and disengaged by single continuous movements in the closing and opening directions, respectively.

The slide fastener just described also incorporates another feature, which may also be used in the initially described form of the invention if desired. The stripper lever has a transverse pin 142, which extends from opposite sides of the lever (although a pin extending from one side may suffice) as shown in Figures 10 and 15. Each of arms 138 of the top stop is provided with a groove 144 which has a flared entrance at the tip of the arm, extends toward the finally closed end of the fastener and upwardly to a flared entrance at the top of the arm. When the slider is moved onto the top stop, the ends of pin 142 enter the respective grooves 144, and the nose of the stripper lever is lifted by the camming action of the pin in the grooves, the pin moving upwardly in the grooves until it rests on the respective upper surfaces 139 of the top stop arms. Since the stripper lever is lifted in the foregoing manner, the slot 141 in the core 140 need not be bevelled as in the previously described embodiment, but is simply wide enough to allow the nose of the stripper lever to be inserted between the upwardly extending edges of the stringer tapes.

Figure 15 illustrates in greater detail the manner in which the opposite ends of the stringers may be formed. As shown, a projection 146 may be provided to secure the finally closed end of the fastener. This projection may be molded about the fastening elements at the fastener end and also bonded to the adjacent face of the top stop, as indicated at 148, to aid in holding the top stop in place. A similar projection 150 is molded about the fastening elements at the opposite end. The stringer tapes 14, when formed of rubber or similar moldable material, may be united at opposite ends as shown at 152 and 154 by molding operations in which the projections 146 and 150 are formed and made integral with the stringers.

It is apparent from the foregoing description that the invention provides a fastener having unique characteristics and definite advantages over prior fasteners. While there have been described and illustrated what are now believed to be preferred embodiments of the invention, changes may be made in such embodiments without departing from the principles and spirit of the invention, the scope of which is defined in the appended claims. Accordingly, the foregoing embodiments are to be taken as illustrative rather than restrictive of the invention, and those modifications which come within the meaning and range of equivalency of the claims are to be included therein.

We claim:

1. A slide fastener comprising a pair of opposed stringers having opposed rows of fastening elements therealong arranged for mutual engagement to join said stringers, a slider movable along said stringers and having a body embracing said rows of fastening elements to urge them into engagement, said slider having a stripper movable between the fastening elements of the respective stringers to disengage said elements, and means fixed to the finally closed end of said fastener for lifting said stripper from between the rows of fastening elements as it approaches said end of said fastener so that the fastening elements near said fastener end may be urged together without the interposition of said stripper.

2. The slide fastener of claim 1, wherein said slider has a channel therethrough for passage of said fastening elements and said stripper comprises a lever having a head portion spring biased into the path of said channel.

3. A slide fastener comprising a pair of opposed stringers having opposed rows of fastening elements therealong arranged for mutual engagement to join said stringers, a slider movable along said stringers and having a body embracing said rows of fastening elements to urge them into engagement, said slider having a stripper movable between the fastening elements of the respective stringers to disengage said elements, and means for lifting said stripper from between the rows of fastening elements as it approaches the finally closed end of said fastener so that the fastening elements near said fastener end may be urged together without the interposition of said stripper, said fastening elements comprise studs attached to said stringers, the studs near said finally closed fastener end being headless to allow the ready insertion of said stripper between said rows of fastening elements, and the studs along the major length of said stringers having interlocking heads.

4. The slide fastener of claim 3, wherein said stringers comprise flexible tapes and said studs are embedded within a fold of the associated stringer tapes, whereby said tapes may be brought into contact when said fastening elements are engaged, said slider body bringing the tape portions adjacent said headless studs into contact.

5. A slide fastener comprising a pair of opposed

stringers having opposed rows of fastening elements therealong arranged for mutual engagement to join said stringers, a slider movable along said stringers and having a body embracing said rows of fastening elements to urge them into engagement, said slider having a stripper movable between the fastening elements of the respective stringers to disengage said elements, means for lifting said stripper from between the rows of fastening elements as it approaches the finally closed end of said fastener so that the fastening elements near said fastener end may be urged together without the interposition of said stripper, and a stop at said finally closed end, said stop embracing the fastening elements of said rows adjacent said end to hold them in engagement, said lifting means comprising the last-mentioned fastening elements.

6. The slide fastener of claim 5, wherein said stop has arms which telescope with said slider body to align said slider and said stop.

7. The slide fastener of claim 6, wherein the end of said slider facing said stop diverges to receive said arms therein.

8. The slide fastener of claim 5, wherein the fastening elements adjacent said stop are mutilated to prevent their interlocking, thereby to allow said stripper to enter readily between said rows of fastening elements.

9. The slide fastener of claim 5, wherein said slider and said stop have cooperating releasable locking elements to hold said slider to said stop.

10. A slide fastener comprising a pair of opposed stringers having opposed rows of fastening elements therealong arranged for mutual engagement to join said stringers, a slider movable along said stringers and having a body embracing said rows of fastening elements to urge them into engagement, and a stop connected to the finally closed end of said fastener, said stop and said slider having cooperating releasable locking elements for holding said slider to said stop, said locking elements comprising a spring biased detent secured to said stop, an abutment surface on said slider for engaging said detent, and a detent release on said slider for moving said detent away from said abutment surface.

11. The slide fastener of claim 10, wherein said spring biased detent comprises a leaf spring, said spring being mounted on an arm part of said stop which telescopes with said slider, and wherein said detent release comprises a slidable incline arranged to engage said spring and stress the same into a non-locking position.

12. The slide fastener of claim 11, wherein said slidable incline is attached to a lug movable along said slider in the direction of its motion along said stringers, said lug being resiliently biased to disengage said incline and detent spring.

13. The slide fastener of claim 12, wherein said slider has a second lug fixed thereto, said lugs extending from opposite sides of said slider and the second lug being farther from the finally closed end of said fastener than said first lug.

14. A slide fastener comprising a pair of opposed stringers having opposed rows of fastening elements therealong arranged for mutual engagement to join said stringers, a slider movable along said stringers and having a body embracing said rows of fastening elements to urge them into engagement, and a stop connected to the finally closed end of said fastener, said stop and said slider having cooperating releasable locking elements for holding said slider to said stop, said locking elements comprising a spring biased detent on said slider and an abutment for said detent on said stop, and means on said slider for disengaging said detent from said abutment, the last-mentioned means comprising a tab slidable along said slider and a lever arranged to be raised by said tab and connected to said detent to raise the same therewith.

15. The slide fastener of claim 14, wherein said lever is pivotable at one end on said slider and has a cam surface near its other end engageable by said tab to lift said lever.

16. The slide fastener of claim 15, wherein said detent is supported by a flat spring fixed near one of its ends on said slider and free for movement at its other end, said other end of said lever being hooked under said other end of said flat spring.

17. The slide fastener of claim 16, wherein said flat spring is U-shaped, and wherein said slider has a stripper lever pivotable thereon for movement between the legs of said U-shaped spring into a position between said rows of fastening elements, said stop having means for lifting said stripper lever from said position.

18. A slide fastener comprising a pair of opposed stringer tapes having opposed rows of fastening elements therealong, each of said tapes being folded into a substantially S-shaped cross-sectional configuration and having its fastening elements held within a part of its fold with head portions exposed for engagement with the opposed elements of the other tape, a stop having a body with a channel therein, said channel embracing said tapes along a portion of their length and holding them together at said portion, said channel having an opening along one side thereof into which said tapes pass and an opening along the opposite side thereof through which the terminal edge portions of said tapes protrude, a slider movable along said tapes and having a body which embraces said tapes and urges said rows of opposed fastening elements into engagement, said slider having a stripper lever pivotable thereon between a first position in which said lever has a portion between said rows of fastening elements and a second position in which said lever portion is withdrawn from between said rows, said stripper lever being resiliently biased to said first position, and means associated with said stop for moving said stripper lever to said second position and for locating said stripper lever portion between said terminal edge portions of said tapes.

19. The slide fastener of claim 18, wherein the last-mentioned means comprises a slot in said stop through which said lever portion passes.

20. The slide fastener of claim 19, wherein the tapes adjacent said stop are arranged to be free from positive fastening element engagement, whereby said lever portion may be readily inserted therebetween as it moves from said slot.

21. The slide fastener of claim 20, wherein said stop has guide arms arranged to extend into corresponding recesses formed in said slider and wherein said slider is flared at the end toward said stop to guide said arms into said recesses.

22. The slide fastener of claim 21, wherein said slider and said stop have cooperating locking elements automatically engageable upon movement of said slider onto said stop to hold the slider thereto and disengageable by a single unlocking movement in the direction of motion of said slider away from said stop.

23. A slide fastener comprising a pair of opposed stringers having opposed rows of fastening elements therealong arranged for mutual engagement to join said stringers, a slider movable along said stringers and having a body embracing said rows of fastening elements to urge them into engagement, said slider having a stripper movable between the fastening elements of the respective stringers to disengage said elements, a stop at the finally closed end of said fastener, said stop having at least one arm arranged to telescope with said slider, said arm and said stripper having associated cam elements for lifting said stripper from between the rows of fastening elements as it approaches said finally closed end.

24. The slide fastener of claim 23, wherein said cam elements comprise a groove extending away from the tip

of the arm and upwardly, and a pin fixed to the stripper and movable along said groove.

25. The slide fastener of claim 1, wherein said stringers comprise tapes of waterproof material.

26. The slide fastener of claim 25, wherein said tapes are secured together at each end and are provided with projections which encase and hold together the corresponding ends of the rows of fastening elements.

27. The slide fastener of claim 26, further including a stop for said slider bonded to one of said projections.

References Cited in the file of this patent

UNITED STATES PATENTS

2,123,512	Marinsky	July 12, 1938
2,270,782	Gilmore	Jan. 20, 1942
2,832,119	Neitlich	Apr. 29, 1958
2,873,741	Donaldson	Feb. 17, 1959

FOREIGN PATENTS

808,881	Germany	July 19, 1951
1,005,546	France	Apr. 11, 1952