Aug. 12, 1952 H. WENDE 2,606,351

SLIDE FASTENER SLIDER HAVING PRESSURE EXTENSIONS

Filed Feb. 10, 1949 2 SHEETS—SHEET 1

Fig. 1.

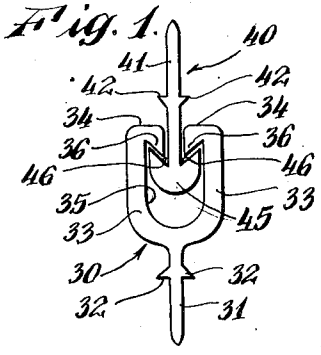
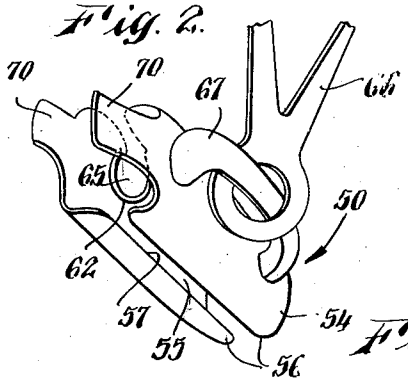


Fig. 2.



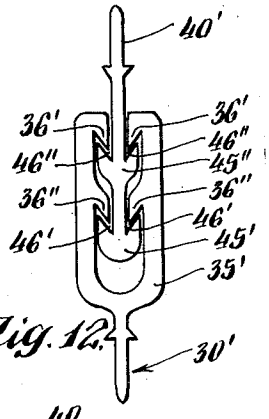


Fig. 12.

Fig. 4.

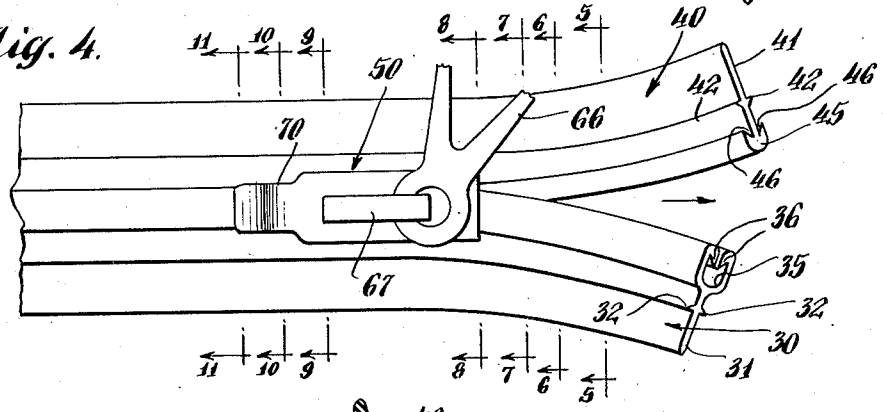
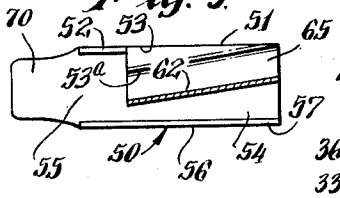


Fig. 3.



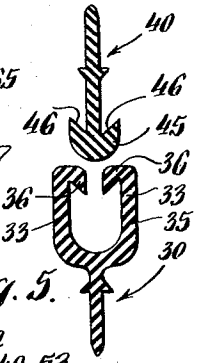


Fig. 5.

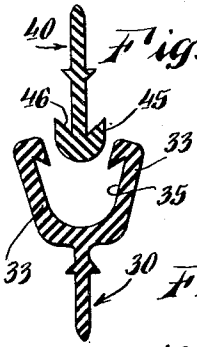


Fig. 6.

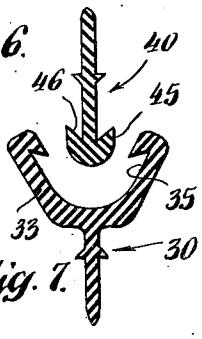


Fig. 7.

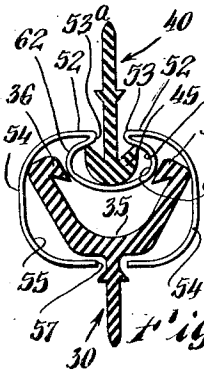


Fig. 8.



Fig. 9.

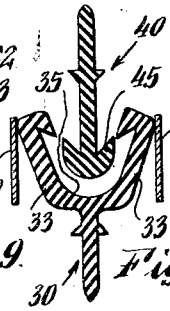


Fig. 10.

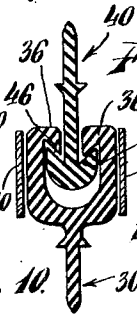


Fig. 11.

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Aug. 12, 1952 H. WENDE 2,606,351

SLIDE FASTENER SLIDER HAVING PRESSURE EXTENSIONS

Filed Feb. 10, 1949 2 SHEETS—SHEET 2

Fig. 13

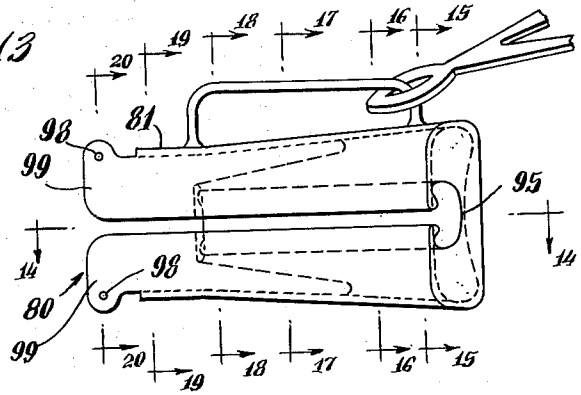


Fig. 21.

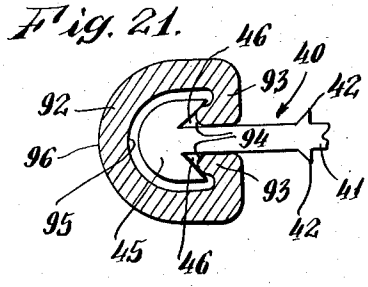


Fig. 14.

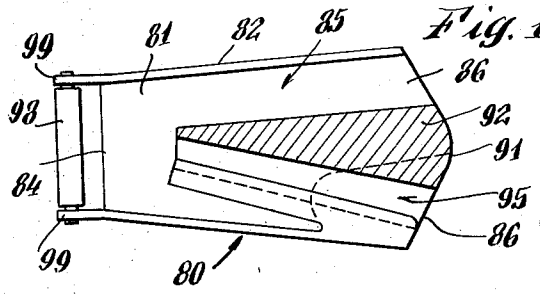


Fig. 15.

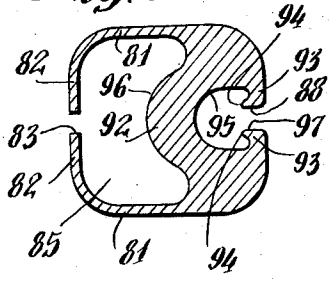


Fig. 16.

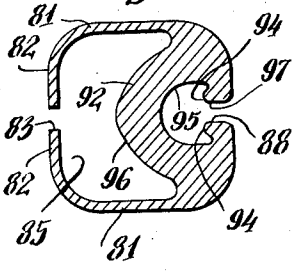


Fig. 17.

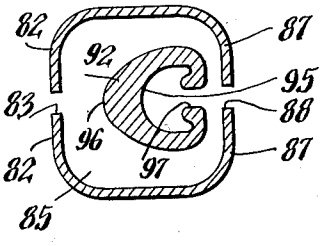


Fig. 18.

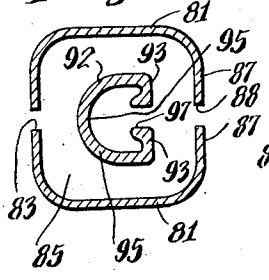


Fig. 19.

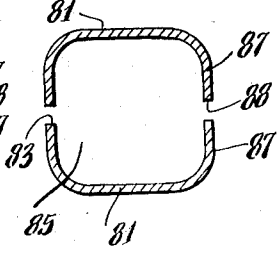
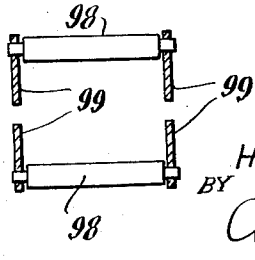


Fig. 20.



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UNITED STATES PATENT OFFICE

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SLIDE FASTENER SLIDER HAVING PRESSURE EXTENSIONS

Hermann Wende, Zurich-Zollikon, Switzerland, assignor to Bernard E. Smith, New York, N. Y.

Application February 10, 1949, Serial No. 75,725
In Switzerland February 9, 1948

6 Claims. (Cl. 24—201)

1

This invention relates to separable slide fasteners and more particularly to improved sliders for effecting opening and closing of separable slide fasteners of the type including a pair of elongated flexible elements one having an enlargement extending along its free edge and the other having a socket extending along its free edge arranged to embracingly receive and interlockingly engage such enlargement to close the fastener.

The invention is more specifically directed to such flexible fasteners in which one element comprises an elongated, substantially flat stringer, of rubber or other flexible material, having one or more enlargements along or parallel to its free edge with the side edges of the enlargements being reversely directed to define grooves therealong on either side of the stringer. The other element is preferably of the same material, and comprises a stringer enlarged along its free edge to provide one or more outwardly opening sockets along or parallel to such edge. These sockets receive and embrace the enlargements on such first mentioned element, and each socket has one or more pairs of inwardly directed ears or ribs on its inner surfaces arranged to lock into the grooves in the enlargements of the first mentioned member.

The fastener elements of such devices are engaged and disengaged by means of a slider movable forwardly and rearwardly along their free edges. These sliders have first or outer channel means embracing the socket and second or inner channel means embracing the enlargement. The second channel means is arranged to open the socket and draw the enlargement thereinto, while the socket channel means effects closure of the socket onto the enlargement to interlock the fastener elements. When the slider is moved rearwardly in an opening direction, the second channel means draws the enlargement out of the socket, which latter is released sufficiently by the first channel means to allow it to be opened by the enlargement channel means.

In order to insure proper functioning of the slider, it has heretofore been considered necessary to form the channel means to have close conforming fits with the enlargement and with the socket. This exact fitting of the slider on the fastener elements has several disadvantages in practice.

For example, in the case of fasteners of large dimensions, an exactly fitting slider effects pronounced abrasion of the fastener elements, due to the extensive areas of contact, causing rapid

2

wear destroying the utility of the fastener. Also, with small dimension fasteners, it is very difficult to form the slider to the proper shape and dimensions. These sliders are commonly formed of sheet metal, and a minimum thickness or gauge of metal is needed to insure proper rigidity of the slider. Forming this metal to the proper, conforming shape is difficult, expensive and, in some cases, impossible.

These disadvantages may be avoided by forming the slider so that it does not have a close, conforming, and exact fit with the fastener elements, thereby eliminating or reducing the abrasive effect for large sliders and facilitating the formation of small sliders. However, this introduces another undesired effect in that, if the slider does not exactly conform to the shape of the fastener elements, reliance must be had on the natural resiliency of the elements to complete their interlocking embrace after the slider has brought the elements into position for such embrace. Consequently, the final closure of the elements occurs at a point some distance beyond the slider. Between this point and the slider, the elements are not completely interlocked and may separate under transverse stresses.

To obviate this disadvantage while retaining the advantages of a slider which does not have an exact fit with the socket and enlargement, the present invention provides a slider having extensions arranged to press the socket walls, rearwardly beyond the slider channels, into firm interlocking engagement with the enlargement. These extensions, by preventing expansion of the socket immediately beyond the slider, enable the fastener to resist such transverse opening stresses until the elements are completely interlocked. At such time, of course, transverse stresses are unable to open the fastener, due to the firm interlocking of the fastener elements.

In one embodiment of the invention, such extensions comprise transversely flat, longitudinally curved tongues extending from the walls or flanges of the outer channel. These tongues converge rearwardly and press the opposite walls of the socket into engagement with the enlargement. In another embodiment, extensions of the outer channel rotatably carry a pair of transversely extending rollers, and these rollers are parallel to the socket walls and spaced sufficiently close to each other to press the socket walls into their interlocking engagement with the enlargement.

Sliders for use with such flexible separable fasteners are usually formed of sheet metal. Due

to the complex shaping involved, fairly extensive manual operations are required to form the slider, and, if automatic or semi-automatic machinery is employed, it is complicated in design and expensive to construct. Furthermore, it is difficult, particularly in the case of small sliders, to properly form the requisite angles and curvatures in the metal.

With this in mind, the invention further contemplates the formation of such sliders by extrusion, punching, or plastic techniques. With such techniques, large numbers of sliders can be rapidly produced at low cost, the exact desired form can be produced with precision, and there is no necessity to compromise on operating characteristics because of design difficulties. Additionally, the slider may be made from materials which are not suitable for formation from sheet stock, thus widening the range of materials available for sliders so that selection may be made on esthetic, economic or other grounds. For example, special alloys or plastic compositions can be used as the slider material.

This application is a continuation-in-part of my copending application Serial No. 738,832, filed April 2, 1947, for Fastening Device for Garments, Shoes, Tents, and the Like, said copending application being filed under the International Convention and being based upon Swiss application No. 84,081, filed July 15, 1943, in Switzerland.

It is, accordingly, among the objects of this invention to provide improved sliders for separable, flexible fasteners.

Another object is to provide a slider causing greatly reduced abrasion on the fastener elements while still insuring firm interlocking thereof.

Still another object is to provide a slider having means cooperable with the flexible fastener elements to insure their resistance to transverse, slider opening stresses.

A further object is to provide a slider of the above type which may be formed by extrusion punching, or plastic techniques.

These, and other novel features, objects and advantages of the invention will be apparent from the following description and the accompanying drawings. In the drawings:

Fig. 1 is an end elevational view of a separable slide fastener of the type to which the present invention is directed.

Fig. 2 is a perspective view of one form of slider according to the present invention.

Fig. 3 is a horizontal longitudinal sectional view of the slider.

Fig. 4 is a plan view of a separable slide fastener, of the type shown in Fig. 1, having the slider of Fig. 2 incorporated therewith.

Figs. 5 through 11 are transverse sectional views of the slider taken on the correspondingly numbered lines of Fig. 4.

Fig. 12 is an end elevational view of a modified form of fastener to which the invention principles are applicable.

Fig. 13 is a side elevational view of another form of slider according to the invention.

Figs. 14 through 20 are transverse sectional views of the slider of Fig. 13, taken on the correspondingly numbered lines of that figure.

Fig. 21 is a view of the central portion of Fig. 18, on a large scale, showing a fastener element therein.

Referring first to the embodiment of the invention shown in Figs. 1 through 11, the separable fastener to which the invention is applicable is shown in Figs. 1 and 4 as comprising

a pair of elongated fastener elements **30** and **40**, formed of suitably flexible, preferably waterproof material, such as natural or synthetic rubber, plastic composition material or the like.

Specifically, fastener element **30** may comprise a substantially flat stringer portion **31** having a socket **35** extending along its free edge. Stringer **31** may have demarcation ribs **32** extending along either side and acting as location lines for securing the stringer to the fabric of the article to which the fastener is to be applied. Socket **35** has spaced parallel walls **33** with inturned free edges **34** shaped to form inwardly directed, substantially triangular ribs **36, 36**. However, ribs **36** may have other cross-sectional shapes as circumstances may dictate.

Element **40** likewise has a stringer portion **41** with locating ribs **42** on either side thereof. Along its free edge, element **40** has an enlargement **45** having a thickness substantially equal to the spacing of the inner surfaces of socket walls **33, 33**. The rearward surface of enlargement **45** is formed with rearwardly opening grooves **46, 46** on either side of stringer **41**, and these grooves have the same cross-sectional shape and area as ribs **36, 36**. When fastener elements **30, 40** are fully interengaged to close the fastener, enlargement **45** is embraced by socket **35** and ribs **36** interlock in grooves **46**, thus preventing opening of the fastener under transverse stresses.

Engagement and disengagement of elements **30** and **40** is effected by movement of a slider **50** forwardly and rearwardly along socket **35** and enlargement **45**. This slider is shown in perspective in Fig. 2, in horizontal section in Fig. 3 and in place in Fig. 4. Slider **50** is essentially comprised of a sheet metal member bent and shaped to form what might be termed a double shell of cylindrical external form, and includes outer and inner channels **55** and **65**, respectively, arranged to receive socket **35** and enlargement **45**, respectively. Channel **55** is generally C-shaped, and channel **65** has a simple channel configuration. Channels **35** and **45** are diagonally related and oppositely facing, so as to draw the socket and enlargement toward each other when the slider **50** is moved in one direction, and separate them when the slider is moved in the opposite direction.

The C-shaped, outer, or "socket" channel **55** has a base **51** comprising sections **52, 52**, separated by a slot **53** arranged to receive the stringer **41** of element **40**. The side walls **54, 54** of channel **55** have inturned or reentrant flanges **56, 56** defining a slot **57** arranged to receive stringer **31** of element **30**. Referring to Figs. 8 and 9, it will be noted that channel **55** has only a loosely embracing fit with socket **35**.

The inner or "enlargement" channel **65** is formed integrally with outer channel **55**, although it terminates short of the rearward or closing end of channel **55**. Thus, the side walls **62** of channel **65** are continuations of base sections **52** of channel **55**, being united by base **61** of the inner channel and being bent inwardly toward each other where they approach the base of the outer channel to form confining or reentrant flanges defining an inner, restricted, slot opening **53***a*. Channel **65** is substantially frustoconical and is angularly disposed with respect to the outer channel (Fig. 3) so that its base **61** and reentrant flanges both approach flanges **56** of outer channel **55** toward the closing end of slider **50**. The inner channel **65** thus fits around

enlargement 45 and draws it further into outer channel 55 as slider 50 is moved forwardly in a closing direction. Conversely, the enlargement 45 is drawn outwardly of channel 65 as the slider 50 is moved rearwardly in an opening direction. Movement of slider 50 is effected by a tab 66 sliding on a loop 67 formed on or secured to one side wall 54 of outer channel 55.

The operation of slider 50 in interlocking separable elements 30, 40 to close the fastener may be best understood by reference to Figs. 5 through 11. In Fig. 5, the relative position of elements 30 and 40 is shown at a point beyond the fastener opening end of slider 50. Elements 30 and 40 are completely separated, and walls 33, 33 of socket 35 are substantially parallel to each other.

Nearer slider 50, socket 35 is opened slightly due to the action of inner channel 65 in entering between and separating walls 33 within slider 50, as shown in Fig. 6, such separation being accommodated by the wide separation of flanges 54, 54 of outer channel 55. Also, inner channel 65 has begun to draw enlargement 45 into socket 35. Immediately in front of the opening end of slider 50, as shown in Fig. 7, socket 35 has been opened wider by channel 65 and enlargement 45 has been drawn further into the opened socket 35.

Conditions at the entrance to slider 50 are shown in Fig. 8. At this point, channel 65 has forced the walls of socket 35 outwardly against the flanges 54 of channel 55. The inner channel has likewise drawn enlargement 45 further into socket 35. Just short of the rearward end of inner channel 65, as shown in Fig. 9, enlargement 45 has been drawn fully into socket 35, whose width is greater than the width of the enlargement. Due to the rearwardly decreasing width of channel 65, walls 33 of the socket have begun to approach each other to close on enlargement 45.

As enlargement 45 leaves the end of channel 65, walls 33 of socket 35 continue to close on the enlargement. However, in order to avoid the abrasive effect of large areas of contact between outer channel 55 and the socket walls, the channel 55 does not engage the socket walls. Up to this point, closure is effected by the resiliency of walls 33 of socket 35, but complete closure does not occur until a point beyond outer channel 55 is reached. Consequently, without special provision to prevent it, the fastener could be opened beyond the slider, by transverse stresses, before the natural flexibility of the socket 35 has completed the interlocking of elements 30 and 40, with ribs 36 seating in grooves 46.

The invention provides means for closing walls 33 onto enlargement 45 immediately beyond channel 55 so that transverse stresses cannot disengage the fastener elements. In the embodiment of Figs. 1 through 11, such means comprises a pair of tongues 70, 70 formed as integral extensions of side walls 54 of channel 55.

Referring to Figs. 2, 10 and 11, tongues 70 are transversely flat and approach each other outwardly of channel 55 until their spacing is equal to the normal width of socket 35 in its closed position. To achieve this effect, tongues 70 are longitudinally curved toward each other until their inner surfaces are disposed substantially closer together than the side walls 54, 54 of outer channel 55. Thus, tongues 70 begin to force walls 33 inwardly immediately after emergence of socket 35 from channel 55, and bring the walls 33 of the socket against enlargement 45 at the ends of tongues 70, as shown in Fig. 11. The tongues 70 thus restrain walls 33 against separation immediately beyond the main body of slider 50, whereby transverse stresses are ineffective to open the fastener before the elements 30 and 40 are fully interlocked. A reverse movement of parts occurs on forward opening movement of slider 50.

The slider 50 may be fabricated of sheet metal or other sheet material without requiring exact correspondence of its channels to the shape of the socket and enlargement. It should be noted that contact of channel 55 is reduced substantially to the line contacts between the outer free edges of walls 33, while channel 65 has line contact only with the reversely directed edges of enlargement 45 and, for a short distance only, line contact with the curved outer surface of the enlargement. Thus friction is greatly reduced, with reliance being placed on tongues 70 to insure gradual, forced closing of socket 35 onto enlargement 45. These tongues may, of course, take a different form and extend from parts of slider 50 other than flanges 54 of channel 55.

Fig. 12 shows a modified form of fastener comprising an element 30' having a wider socket 35' provided with laterally spaced, parallel pairs of ribs 36' and 36''. Socket 35' is arranged to interlock with enlargements 45' and 45'' on fastener element 40'. The enlargements have laterally spaced pairs of parallel grooves 46' and 46'' conforming to the ribs of socket 35'. In this case, the slider would have a larger outer channel and a double inner channel.

Figs. 13 through 20 illustrate another embodiment of the slider capable of formation by extrusion, punching or plastic techniques, and having rollers in place of the tongues 70 of slider 50. The slider 80 includes an outer or socket channel 85 and an inner or enlargement channel 95, with the outer channel having relatively thin walls and the inner channel having thicker wall portions and being shaped in the form of a nozzle.

Thus, the outer channel 85 comprises essentially two side walls 81 having reentrant flanges formed by inturned edges 82 spaced to form a slot 83 to receive the stringer 31 of element 30. Side walls 81 are substantially polygonal in shape, each having a rearward edge 84 perpendicular to the direction of travel of the slider and forward edges 86, 86 merging into the projecting nose 91 of inner channel 95, as may be best seen in Fig. 14. Side walls 81 are integral with webs 87, 87 conjointly forming the base of channel 85 and separated by a slot 88 to receive stringer 41 of fastener element 40. Adjacent the "opening" or forward end of slider 80, webs 87 as well as side walls 81 merge into and are preferably integral with the walls of channel 95. It should be noted that channel 85 decreases in cross-section from the "opening" or forward end to the "closing" or rearward end of slider 80, and is connected to channel 95 only adjacent the "opening" or forward end.

The inner channel 95 is formed as a substantially frusto-conical member 92, having its base adjacent the "opening" or forward end of slider 50. Channel 95 has substantially the shape of enlargement 45 of element 40, but is somewhat larger than enlargement 45. Channel 95 has its base and side walls formed by the thicker portion of member 92, and the side walls terminate in inturned webs or reentrant flanges 93, spaced to form a slot opening 97 aligned with slot 88 to

receive stringer 41 of element 40, and having rearwardly extending bulbous edges 94. These edges are arranged to have substantially line contact in the grooves 46 of enlargement 45, as best seen in Fig. 21. Referring to Fig. 14, it will be noted that slot 97 approaches the slot 83 defined by flanges 82 of the outer channel from the "opening" toward the "closing" end of slider 80, and that member 92 decreases in thickness in the same direction. Figs. 15 through 18 illustrate these features, and it will be noted that slots 88 and 97 merge at the connection of channels 85 and 95 at the "opening" end of the slider.

Channel 95 terminates short of the rearward end of channel 85, as seen in Figs. 13, 14 and 19, so that the fastener elements are guided only by the outer channel 85 as they pass from the "closing" end of the slider 80. Channel 85 loosely embraces element 30, and as the slider 80 is drawn in a closing direction, the rounded back surface 96 of channel 95 enters socket 35 and spreads its walls so that enlargement 45 may be drawn by the reentrant flanges 93 into the socket as channel 95 approaches the rearward end of the slider. The flexible walls of socket 35 tend to close on enlargement 45 as the latter emerges from channel 95.

However, in accordance with the invention, channel 85 does not function to close socket 35, in order to avoid abrasion of the surfaces of the socket, and only such resilience of the socket is relied on to effect partial closure of the fastener. As explained, such closure is not sufficiently complete, immediately beyond the outer channel 85, to afford adequate resistance to transverse separation stresses. To provide for firm closing of socket 35 immediately beyond the slider, the tongues 70 of slider 50 could be utilized, as could also an equivalent arrangement.

In the case of slider 80, such equivalent arrangement is shown as a pair of parallel rollers 98 rotatably mounted in extensions 99 of outer channel 85 and arranged to engage the outer surfaces of socket 35. Rollers 98 extend inwardly of side walls 81, as may be seen from a comparison of Figs. 19 and 20, and thus roll along the walls of socket 35 pressing them into firm interlocking engagement with enlargement 45 to resist transverse opening stresses on the fastener.

It will thus be noted that the sliders 50 and 80 are characterized by not having a close, exact fit with elements 30 and 40 and thus not having an abrading effect thereon. Also, as the tolerances are accordingly not so close, the sliders may be more easily formed. Slider 80 has the further advantage of being arranged for formation by punching, extrusion, or plastic techniques, facilitating mass production and increasing the range of usable materials. To resist the transverse opening stresses which might open the fastener during its final closing movement beyond the slider, extensions in the form of tongues, rollers, or the like are provided to insure rapid and positive closing of the fastener. It should be understood that the terms "opening" end and "forward" end, as used in relation to the slider, refer to the end of the slider from which the fastener emerges or extends in an open condition and that the opposite end of the slider is designated the "closing" end or "rearward" end.

While specific embodiments of the invention have been shown and described in detail to illustrate the application of the principles thereof, it should be understood that the invention may be otherwise embodied without departing from such principles.

What I claim is:

1. For use with a slide fastener of the type including a first flexible fastener element comprising a substantially flat, elongated stringer having an enlargement extending along a free edge thereof and a second flexible fastener element comprising a substantially flat, elongated stringer having a socket extending along a free edge thereof, said socket opening toward and arranged to embracingly receive said enlargement, a slider movable forwardly along said elements in a closing direction to effect insertion of said enlargement into said socket to close the fastener and movable rearwardly to effect removal of said enlargement from said socket to open the fastener, said slider comprising means defining an outer C-shaped channel arranged to surround said socket with a clearing fit and having reentrant flanges defining a first slot for receiving the stringer of said second fastener element, the portion of said means defining the base of said outer channel having a second slot therein for receiving the stringer of said first fastener element; said means also having integrally connected portions defining an inner channel for receiving said enlargement, said inner channel having reentrant portions defining a restricted opening facing toward said second slot, said first slot and said restricted opening converging rearwardly to draw said enlargement into and out of said socket as the slider is moved respectively in closing and opening directions, the rearward end of the inner channel terminating short of the rearward end of the outer channel; said means defining said channels having extensions projecting beyond the rearward end of the outer channel adjacent opposite sides thereof, said extensions having surfaces disposed inwardly with respect to the side walls of said outer channel with a substantially closer spacing than said side walls for firmly engaging the outer side walls of the socket of said second fastener element beyond the rearward end of the outer channel and forcing them toward each other in firm engagement with the enlargement of said first fastener element as the slider is moved forwardly in a closing direction.

2. A slider according to claim 1 in which said extensions projecting beyond the rearward end of the outer channel are transversely flat continuations of the side walls of the outer channel and converge rearwardly toward each other to form said inwardly disposed surfaces for engaging the outer side walls of the socket of said second fastener element.

3. A slider according to claim 1 in which said extensions projecting beyond the rearward end of the outer channel have a pair of rollers mounted thereon with their axes parallel to the side walls of the outer channel, said rollers being disposed adjacent opposite sides of said outer channel and being spaced substantially closer together than the side walls of said outer channel to form said inwardly disposed surfaces for engaging the outer side walls of the socket of said second fastener element.

4. For use with a slide fastener of the type including a first flexible fastener element comprising a substantially flat, elongated stringer having an enlargement extending along a free edge thereof, said enlargement having reversely directed side edges forming grooves on opposite sides of the stringer, and a second flexible fastener element comprising a substantially flat,

elongated stringer having a socket extending along a free edge thereof, said socket opening toward and arranged to embracingly receive said enlargement and having inwardly directed ribs adapted to interlock in the grooves of said enlargement for securing the enlargement in the socket, a slider movable forwardly along said elements in a closing direction to effect insertion of said enlargement into said socket to close the fastener and movable rearwardly to effect removal of said enlargement from said socket to open the fastener, said slider comprising means defining an outer C-shaped channel arranged to surround said socket with a clearing fit and having reentrant flanges defining a first slot for receiving the stringer of said fastener element, the portion of said means defining the base of said outer channel having a second slot therein for receiving the stringer of said first fastener element; said means also having integrally connected portions defining an inner channel for receiving said enlargement, said inner channel having reentrant portions defining a restricted opening facing toward said second slot, said first slot and said restricted opening converging rearwardly to draw said enlargement into and out of said socket as the slider is moved respectively in closing and opening directions, the rearward end of the inner channel terminating short of the rearward end of the outer channel; said means defining said channels having extensions projecting beyond the rearward end of the outer channel adjacent opposite sides thereof, said extensions having surfaces disposed inwardly with respect to the side walls of said outer channel with a substantially closer spacing than said side walls for firmly engaging the outer side walls of the socket of said second fastener element beyond the rearward end of the outer channel and forcing them toward each other in firm engagement with the enlargement of said first fastener element, with said inwardly directed ribs of the

socket interlocked with said grooves defined by the side edges of the enlargement, as the slider is moved forwardly in a closing direction.

5. A slider according to claim 4 in which said extensions projecting beyond the rearward end of the outer channel are transversely flat continuations of the side walls of the outer channel and converge rearwardly toward each other to form said inwardly disposed surfaces for engaging the outer side walls of the socket of said second fastener element.

6. A slider according to claim 4 in which said extensions projecting beyond the rearward end of the outer channel have a pair of rollers mounted thereon with their axes parallel to the side walls of the outer channel, said rollers being disposed adjacent opposite sides of said outer channel and being spaced substantially closer together than the side walls of said outer channel to form said inwardly disposed surfaces for engaging the outer side walls of the socket of said second fastener element.

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