Nov. 3, 1942. N. WAHL 2,300,443

SEPARABLE FASTENER

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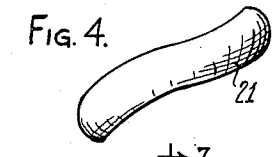


Fig. 4.

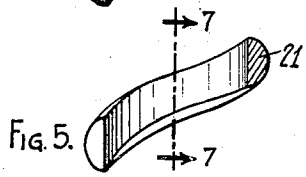


Fig. 5.

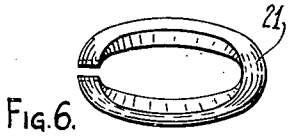


Fig. 6.

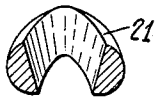


Fig. 7.

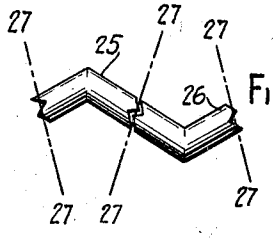


Fig. 8.



Fig. 12.

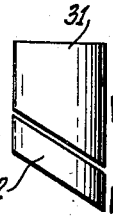


Fig. 13.

Fig. 14.



Fig. 15.

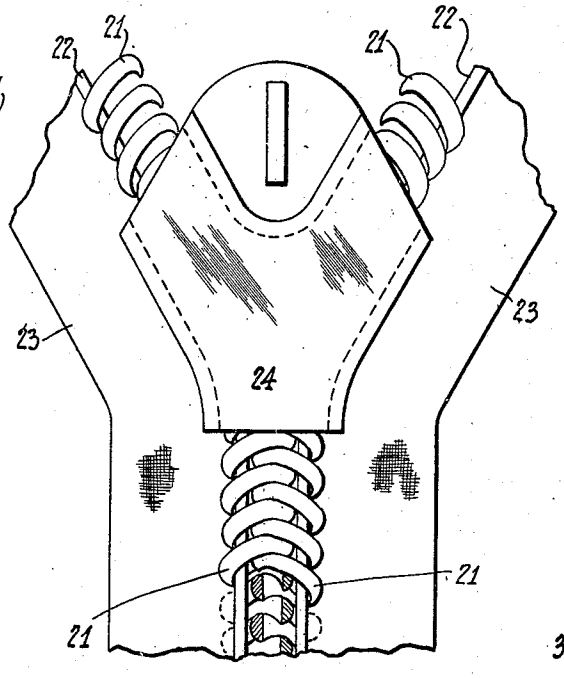


Fig. 1.

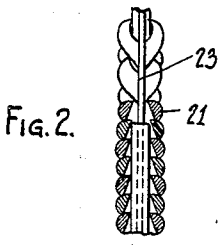


Fig. 2.

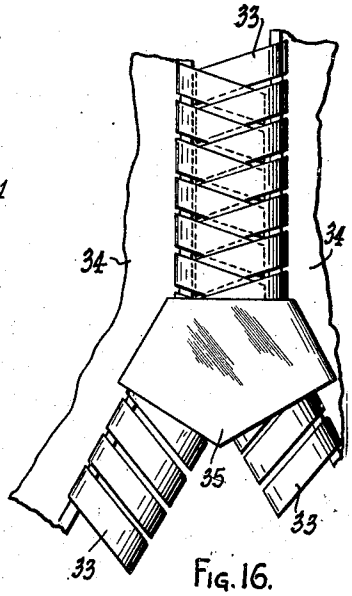


Fig. 16.

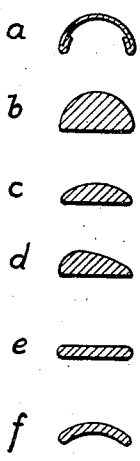


Fig. 3.

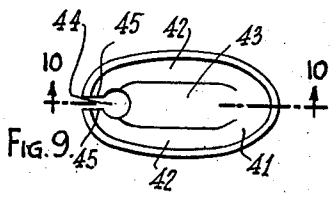


Fig. 9.

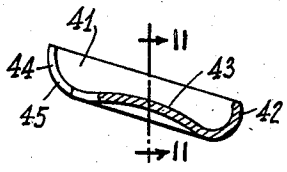


Fig. 10.

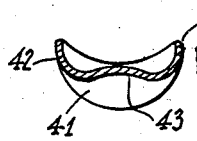


Fig. 11.

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SEPARABLE FASTENER

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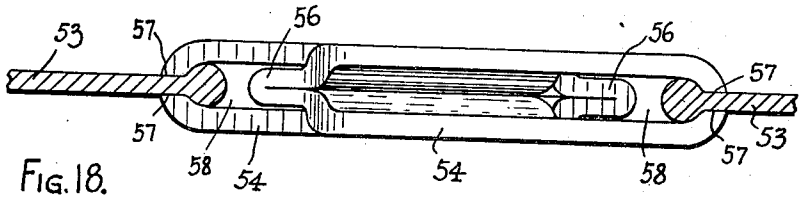


FIG. 18.

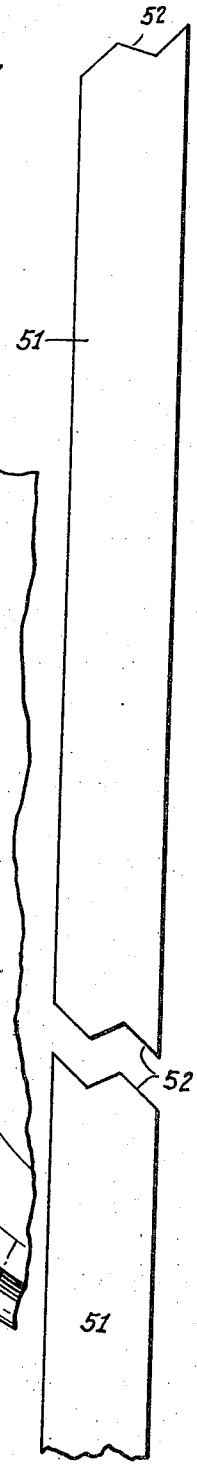


FIG. 17.

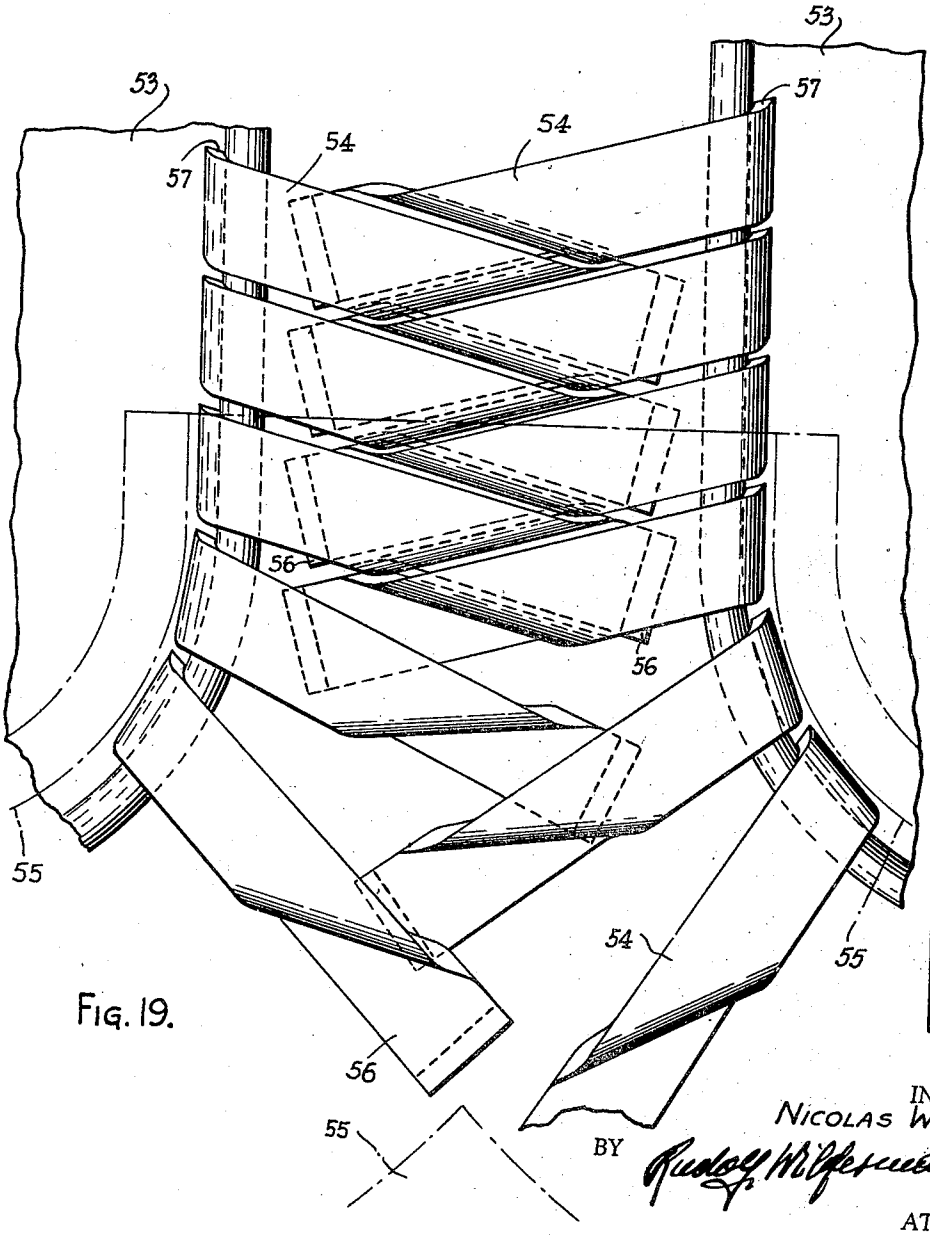


FIG. 19.

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UNITED STATES PATENT OFFICE

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SEPARABLE FASTENER

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Application May 15, 1940, Serial No. 335,365

7 Claims. (Cl. 24—205)

This invention concerns a separable fastener, i. e. a fastener serving to couple or uncouple goods along a line, and comprising rows of links on the goods, e. g. on tapes, and sliders for controlling the engagement between the links of such rows.

In the link of a separable fastener we may distinguish the following parts:

(1) A root at and by which a link is fastened and fulcrumed at its base upon or near the edge of the material to be coupled thereby.

(2) The arm or arms, which extend out from the root over the edge of the tape.

(3) The hook, which is arranged at the other end of the link and connected by the arm or arms to the root. It projects from the side of the link for engaging laterally upon a link of the opposite row.

(4) The eye, i. e. a cavity serving to receive the hook of a link of the opposite row.

In order to function properly, it is desirable to shape the links in perfect uniformity and with precision. This applies in particular to the projecting hook, and a separable fastener has therefore quite a mechanical appearance, which will frequently not harmonize with the goods to which the separable fastener is attached, e. g. a soft fabric.

It is an object of this invention to avoid this mechanical appearance of the links of a separable fastener. More particularly the sharp definition of parts making up a link and, above all, of the projecting hook is to be overcome.

In a particular embodiment of this invention the said object goes so far, that a separable fastener is to assume the appearance of common tie means, e. g. to the effect of a weave or braid.

This leads to the further object of extreme simplicity of the link, in actuality as well as in appearance, and, for the sake of harmony of effect symmetry of the opposing rows of link is also useful.

According to a further object of this invention the weight and bulk of the link of a separable fastener are to be reduced. The links of a separable fastener ordinarily have a wider cross-section of most of their parts in a direction normal to the extent of the separable fastener, than in the direction of the fastener itself. Bearing in mind, that a separable fastener is normally to join and close together goods in their plane and that a particular thickness of the material in a direction normal to the goods is not necessary and even undesirable, I also want to overcome thickness in that direction by the instant invention.

Just as much as a heavy cross-section in a direction normal to the goods and separable fastener is not desirable, bulk of the separable fastener in that direction is also not useful. This invention allows the separable fastener to be flattened, almost at libitum, so that it fits, more or less, into the plane of the goods joined thereby.

Sharp and square corners are another undesirable feature of the ordinary separable fastener. The instant invention is to provide for round corners and for pleasing and aesthetic links of the whole.

Other objects of this invention will be better understood from the following description thereof, which is made by way of setting forth a few embodiments in detail. But it is to be interpreted in illustration of the invention only, and not as a limitation thereof.

According to the principle underlying this invention, the sharp distinction between parts, such as arms, hooks and eyes described above, is eradicated, and they are merged into a simpler and more practical and useful form. Generally speaking this is brought about by using the whole link as a hook as well as an eye, the links of each row of links being engaged, as loops, over as well as in the loops of the other row. Such loops, when interengaged in separable fastener fashion may be disposed at an incline, and yield the effect of a braid.

In a preferred embodiment of this invention the links are rings, and may in their appearance even be compared with a finger ring having a flat inner and convex outer surface in connection with some of the preferred embodiments. However, for various purposes, such ring is twisted and pressed out of round, so as to permit another, similar ring to be angularly inserted and to nestle therein.

The material of such ring or any other embodiment of this invention is to have a cross-section, which is wider in the direction of the axis of the ring, than in the direction normal to such axis. In other words, the material should be oblong in the direction of the fastener. Such cross-section may then be the same throughout the extent of the links, loops or rings.

By way of contrast with most of the ordinary separable fasteners the links do not have to be absolutely rigid, although they may be so. As loops the links may have a certain resiliance and yieldability, more particularly in a direction normal to the extent of the separable fasteners, so

that there is a certain pliability and suppleness, which is not ordinarily encountered in separable fasteners. Since links of a separable fastener of this invention may be rigid or may be resilient and even pliable, an exceptional number of materials may be adapted for them, such as metal, plastic, stone, wood, etc. In a coarser, ornamental form these separable fasteners may be for instance executed in leather. On the other hand a separable fastener of this invention is particularly suited, on account of the simplicity of its links, for execution in a very small size.

Other features of this invention will be best explained and understood in connection with the illustration of the accompanying drawings, in which:

Fig. 1 shows a partly sectioned top view of an embodiment of a separable fastener of this invention when applied to goods.

Fig. 2 is a corresponding detail side view of the interlocked part, shown in Fig. 1, the lower portion of the view showing a central cross-section.

Fig. 3 suggests at *a*, *b*, *c*, *d*, *e* and *f* a few profiles of cross-sections of the material of the link, as there are shown: at *a*, an arched flat wire with beaded edges; at *b*, a half round wire; at *c*, a wire of plano-convex cross section; at *d*, a "stream-lined" wire, e. g. a bisected ellipse or oval; at *e*, a level flat wire; and at *f*, an arched flat wire.

Fig. 4 is the side view of one of the links of the embodiment of Fig. 1.

Fig. 5 is a corresponding view in a longitudinal central cross-section.

Fig. 6 is a corresponding top view.

Fig. 7 is a corresponding transverse cross-section, the view being taken in the direction and at a plane indicated by arrows and a dot-dash line and marked by numerals **7** in Fig. 5.

Fig. 8 shows two such links in a developed view, illustrating at the same time how blanks may be cut from a continuous strip of material.

Fig. 9 is the top view of a modified link of this invention stamped, for instance, out of sheet material.

Fig. 10 is a corresponding cross-sectioned side view taken along line **10—10** and looking in the direction of the arrows.

Fig. 11 is a corresponding cross-sectioned end view taken along line **11—11** of Fig. 10 and looking in the direction of the arrows.

Figs. 12–16 illustrate the derivation of an embodiment of this invention from a tube.

Fig. 12 is the end view of a tube.

Fig. 13 is a side view thereof, a blank for a link of an embodiment of this invention having been cut off the lower end of the tube.

Fig. 14 shows a side view of such a blank.

Fig. 15 shows a top view of such a blank, after it has been spread at one end in one direction for purposes of this invention.

Fig. 16 shows the top view of an embodiment of this invention thus arrived at, when applied to goods.

Fig. 17 shows the developed view of two other blanks, one of which is only shown in part, aligned with each other, as they are cut from a flat wire.

Fig. 18 shows an end view of goods to which a fastener comprising links made up from the blanks of Fig. 17 is applied.

Fig. 19 shows a corresponding top view.

Similar numerals refer to similar parts throughout the various views.

Links for this invention may be sewed, clamped, struck, cast, molded or otherwise attached to the goods or tapes, in accordance with any preferred method known in the art. There may for instance be teeth on the registering ends of the wires or loops, as indicated in Fig. 8, these ends being struck in opposition with each other onto a tape, so that then the rows of links engage over the reinforced edge **22** of the goods **23** the rows being coupled and uncoupled by a suitable slider **24** of known construction.

A wire having as cross-section a segment of a circle, e. g. the half-round profile *b* of Fig. 3, has advantages from an aesthetic as well as practical point of view. The wire may be preliminarily given a zig-zag shape extending in the plane of the flat side thereof, as indicated in connection with the blanks **25** and **26**, which are shown in a position in which they have been cut from such a wire. The blanks do not have to run to a sharp point at their center, except that such a shape is conducive to creating the impression of a full braid, when the links are coupled.

The blanks, like **25** and **26**, may be cut at generally parallel planes, so that the resultant ring, when these cut ends are brought together will have a cylindrical inner surface. This would yield links in which the opposite halves are true helices. If the material is a plastic which is adapted for setting at heat, stringers upon which such cylindrical links comprising half helices are mounted may be intermeshed in a coupled position, and will then yield, when the links are reset under heat while pressure is applied from opposite sides to the overlapping rows of links—a shape like that of link **21** more particularly shown in Figs. 4, 5 and 6. We notice that the opposite inner sides of each link are not parallel any more, but extend substantially conically Such a conical shape may also be arrived at, by not cutting opposite ends of blanks **25** and **26** in parallelism with each other, but by cutting them at a suitable incline, such as indicated by dot-dash lines **27**.

In arranging the endless loops of wires as links upon the edge of goods or tapes, it is a general prerequisite of this invention that the distance between links is less than the width thereof in this direction, more particularly their width where they hook upon the links of the other stringer in overlapping engagement. Generally speaking, the engagement between the rows of links is more secure, when the links are spaced closer. Because in that case the separable fastener, or the goods upon which it is mounted, may stretch and be elongated to quite some extent, before the rows of links cease gripping positively upon each other. The positive grip will only cease when the links are moved apart to a distance greater than their width at the point of coupling.

While the cross-section of the material of links of this invention should be, generally, oblong, there are no specific other limitations, except that a best performance is obtained, when the underside of the wire is flat or concave. Thus any of the various forms *b*—*f* of cross-section at random shown in Fig. 3 may be used, or suitable profiles may be built up, e. g. from sheet material, like the profile *a*, the edge of which has been beaded for purposes of reinforcement; profiles *e* and *f* suggest the use of plain sheet material for simple embodiments. The profile *e* results for instance, when without any particular additional shaping, the links are produced by

slicing a tube. Thus blank 32 is cut from a tubing 31, which is for instance oval in cross-section. Such tubular blanks may be bound by suitable tying, stitching or molding into the tape, or they may be slid upon a head at one side for purposes of attachment. Or, in the latter instance, a tube rolled from a sheet and open on one side may be used. A more suitable shape for overlapping engagement may be given to the blanks by pressure applied after they have been aligned upon the stringers and coupled; but a preferred shape, in which they are wider upon one side than the other such as indicated in connection with the blank 33 of Fig. 15, may also be arrived at by a suitable spreading operation before the tubular sections are strung. Links of this type are shown to be assembled upon goods 34 and to be coupled by slider 35 in Fig. 16.

Instead of being cut from a material extending in zig-zag formation, as it was illustrated in Fig. 8, loops for an embodiment of this invention may also be cut from a straight wire.

Thus the blanks for the loops or links may be cut from a flat wire as it is suggested by the direction of the blanks 51 of Fig. 17. In this case the bend at the apex of the link will extend substantially normal to the sides of such a link, whereas there was an incline at this point in connection with the embodiments first illustrated herein.

The ends 52 of blanks 51 are again shown to be cut at an angle, which substantially corresponds to the incline at which the links are to extend in respect to the tape or the edge of the goods 53. The slider by which links 54 of this embodiment are to be controlled is of standard form and it is indicated at 55 in dot-dash outlines.

The embodiment of Figs. 18 and 19 serves also to illustrate that a detachable fastener of this invention may be executed so flat that it extends substantially in the plane of the goods to be connected thereby. The ends or apices 56 of the links or loops 54 are pressed flat at an angle, the flattened portion extends into the slot 58 of the overlapping link of the opposite row.

By virtue of the manner in which links of this modification are derived from a flat wire, the flattened apices 56 as well as the roots 57 of the links are slightly laterally offset from the links. This offsetness is however not a prerequisite for a link falling within the scope of this invention, but may be avoided and the sides of the links may be completely flat, as it would for instance result from further shaping, e. g. in connection with links made in a plastic material.

The loops do not have to extend through each other, such "extending through" being shown in connection with the embodiment of Figs. 18 and 19, though even there it may be avoided. Therefore they may be closed upon one side for purposes of reinforcement or otherwise, at least where they are clear of the goods they are attached to. If, for instance, a loop of a wire having the profile *f* of Fig. 3 is closed in such manner, the links assume the shallow-dish-like appearance of the embodiment 41 of Figs. 9, 10 and 11. The loop material 42 surrounds the bottom 43. A key slot 44 in the material of link 41 permits such link to be positioned on the selvage bead of a piece of goods or the link may there be clamped onto goods which are to be provided with a separable fastener.

Such an embodiment of this instant invention is described and claimed in my companion application Serial No. 417,938 of November 5, 1941, entitled "Separable fastener," said application being a continuation in part of the instant application.

The embodiments of Figs. 9–11 will normally be rigid. But generally it will be found, that this invention permits the use of links of considerable flexibility, which is conducive to suppleness of the applied product; that is most desirable, yet rarely found in separable fasteners.

The incline and width of the links in the direction of the separable fastener may be adjusted within a wide range. Neither one should be too large, however, since that may require too wide an angle of bifurcation of the slider.

Having thus described my invention by way of various embodiments, yet I do not wish to be limited thereby, except as the state of the art and the appended claims may require, for it is obvious that various modifications and changes may be made in the form of embodiment of my invention, without departing from the spirit and scope thereof.

What I claim is:

1. In a slide fastener, locking members consisting of similar loops of a filament, which filament is of greater width than thickness, the greater cross-sectional dimension of the filament being tilted with respect to the axis of a loop on opposite sides of the latter so that the loop as a whole is concavo-convex.

2. In a slide fastener, locking members consisting of similar elongated loops of a filament having a substantially uniform non-circular cross-section throughout its length, the greater diameter of the filament being tilted with respect to the axis of a loop on opposite sides of the latter so that the loop as a whole is concavo-convex.

3. In a slide fastener, locking members consisting of similar elongated incomplete rings of a filament, which filament is curvilinear and is of a substantially uniform non-circular cross-section throughout its length, the ends of the filament in each ring being engaged opposite to each other upon a fabric, and the greater diameter of the filament being tilted with respect to the axis of the ring at opposite sides of the latter so that the ring as a whole is concavo-convex.

4. A slide fastener comprising as its locking members two rows of elongated flexible loops of a pliable filament, which filament is curvilinear and is of a substantially uniform non-circular cross-section throughout its length, the loops being attached along the edges of the goods to be joined by the fastener with the greater diameter of the filament substantially parallel to the edge of the goods at the points of attachment, the loops in each row extending substantially parallel to one another from the goods at an angle with respect to the edge of the goods and the adjacent loops being spaced apart by a distance less than the width of the filament, the greater diameter of the filament being tilted with respect to the edge of the goods at opposite sides of each loop so that the loop as a whole is concavo-convex, and the loops in each row being staggered with respect to those in the other row so that when the fastener is closed a given loop of one row extends at an angle between and nests within the adjacent complementary loops of the other row with contact between the complementary loops at the sides of the latter.

5. In a slide fastener, locking members consisting of a plurality of similar substantially closed individual elongated flexible loops of a

pliable filament, which filament is curvilinear and is of substantially uniform non-circular cross-section throughout its length, the loops being attached along the edges of the goods to be joined by the fastener with the greater diameter of the filament substantially parallel to the edge of the goods at the points of attachment, the loops in each row extending substantially parallel to one another from the goods at an angle with respect to the edge of the goods and the adjacent loops being spaced apart by a distance less than the width of the filament, the greater diameter of the filament being tilted with respect to the edge of the goods at opposite sides of each loop so that the loop as a whole is concavo-convex, and the loops of each row being staggered with respect to those in the other row so that when the fastener is closed a given loop of one row extends at an angle between and nests within the adjacent complementary loops of the other row with contact between the complementary loops at the sides of the latter.

6. A slide fastener comprising as its locking members two rows of elongated loops of a filament having greater width than thickness, which loops are attached along the respective edges of the goods to be joined by the fastener in such manner that each loop extends from the goods to which it is attached at an acute angle with respect to the edge of the goods and is spaced apart from the adjacent loops in the same row by a distance less than the width of the filament, each loop being of smaller diameter toward its outer end remote from the point of attachment to the goods than toward the inner end of the loop which is attached to the goods, this difference in diameters of the outer and inner portions of the loop being provided by a diagonal off-set in the filament on each of the opposite sides of the elongated loop near the midsection of the latter, the complementary loops being staggered with respect to one another so that when the fastener is closed a given loop extends from the point of attachment to the goods between adjacent loops in the other row and its outer end projects within the inner open portion of a complementary loop of the other row while the outer end of one of said complementary loops of the other row projects within the inner open portion of the first of said loops, thus providing lengthwise to the fastener two lines of projection of the complementary loops within one another so that the loops are positively interlocked against separation by a transverse pull.

7. In a slide fastener, locking members consisting of similar loops of a filament which filament is of greater width than thickness and is provided with a bead lengthwise upon each edge thereof, the greater cross-sectional linear dimension of the filament being tilted with respect to the axis of a loop on opposite sides of the latter so that the loop as a whole is concavo-convex.

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