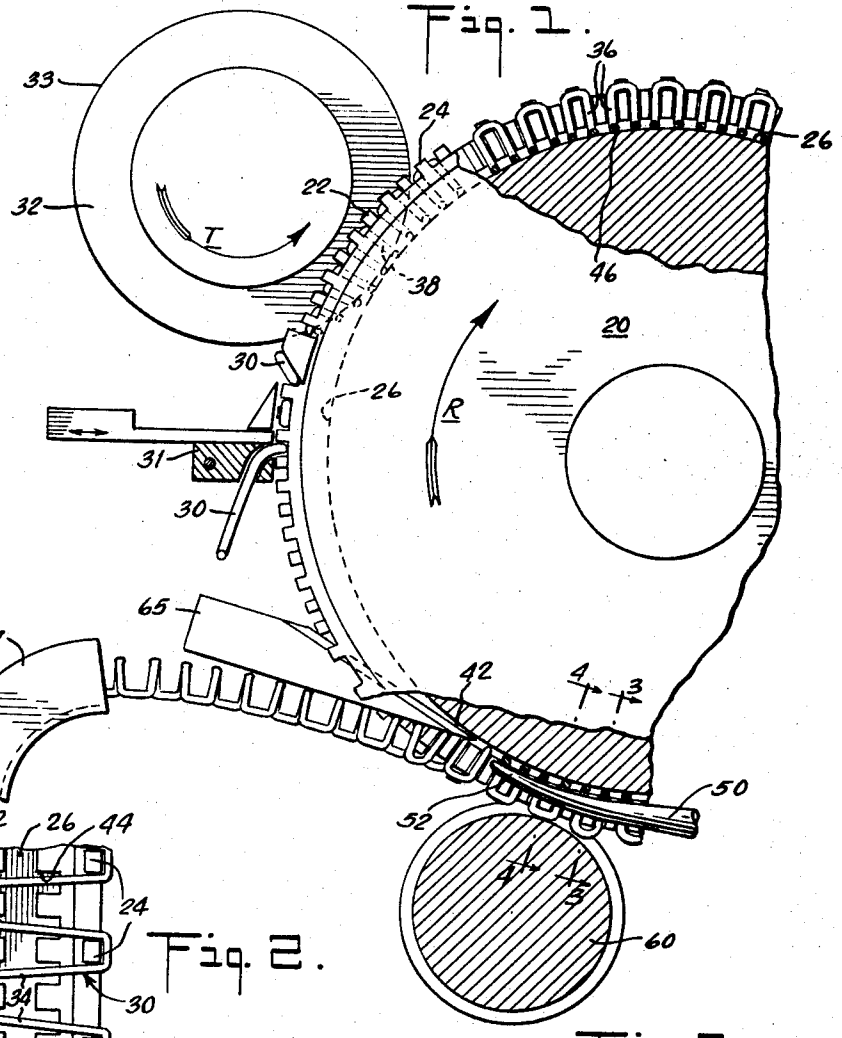
Nov. 26, 1968 A. A. SIM 3,412,438

SLIDE FASTENER

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Fig. 1.



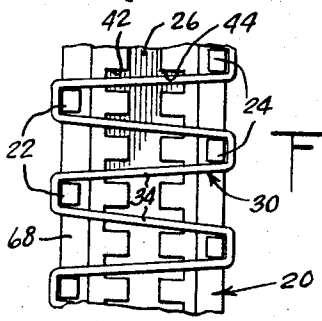


Fig. 2.

Fig. 5.

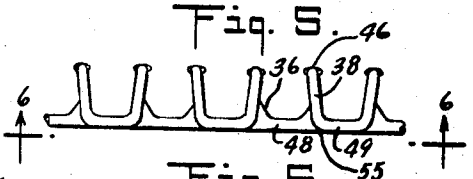


Fig. 3.

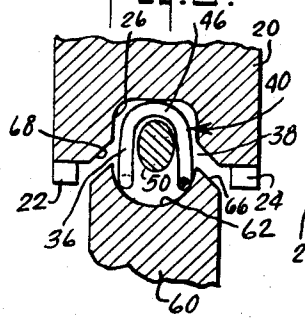


Fig. 4.

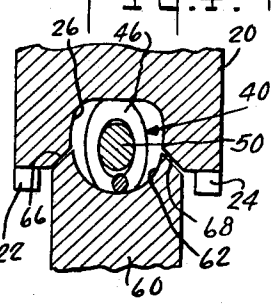
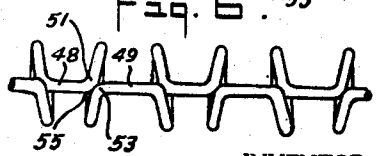


Fig. 6.



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Fig. 7.

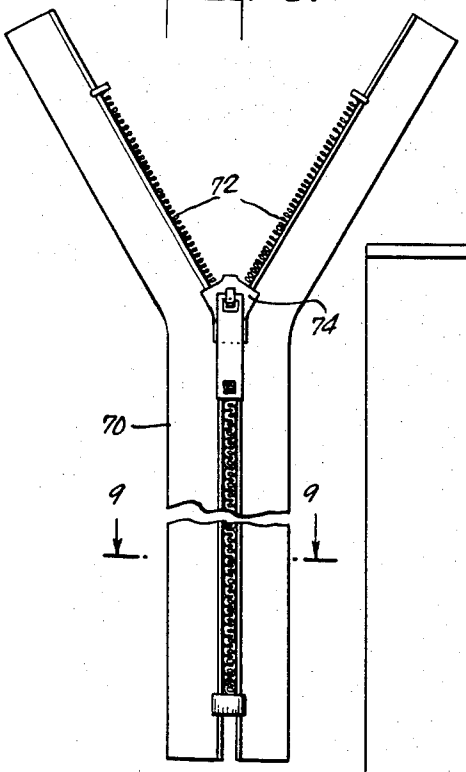
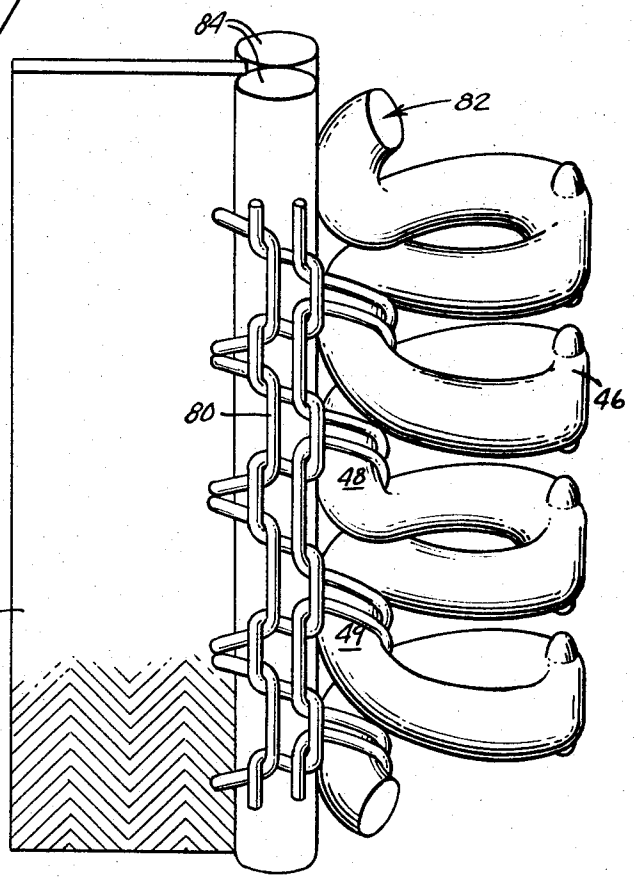


Fig. 8.



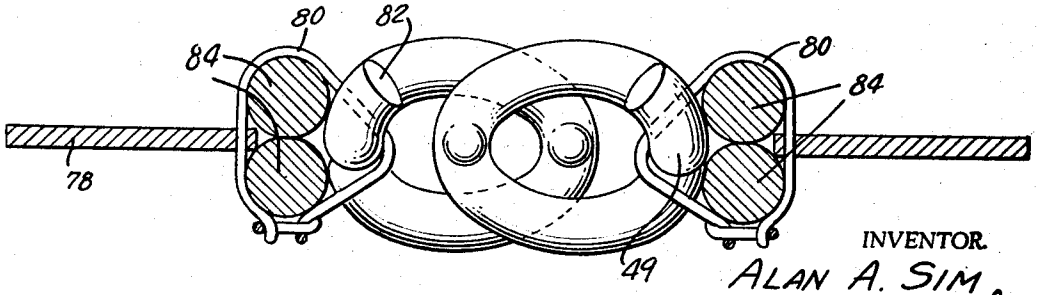


Fig. 9.

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3,412,438

SLIDE FASTENER

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4 Claims. (Cl. 24—205.13)

ABSTRACT OF THE DISCLOSURE

A stringer for a slide fastener wherein a continuous filament is constructed to include a series of head portions interconnected by a series of heel portions. The heel portions are located in substantially axial alignment with each other with the respective ends of each heel portion in abutting relationship with the next adjacent heel portions, whereby the head portions are spaced evenly apart and said heel portions provide a substantially unitary axially extending filament member for supporting said stringer when it is mounted to a tape.

The present invention relates to slide fasteners, and more particularly, to a slide fastener stringer and method of making the same.

It is well known in the art that a stringer for a slide fastener can be manufactured from a continuous filament bent in a manner to form a plurality of substantially U-shaped scoops which are located in alignment with each other. Adjacent U-shaped scoops of the stringer are interconnected, in a uniform repetitious pattern, by longitudinal heel portions which extend in a direction substantially transverse to the scoop portions. The stringer is then fastened to a tape with each scoop portion lying in a plane substantially transverse to the plane of the tape and with the corresponding legs on the same side of each U-shaped scoop lying in a common plane which is substantially parallel to the plane of the tape.

A stringer having such a construction is generally formed from a relatively thin filamentary material so as to provide U-shaped scoop members which are flexible and easily interengaged with an identical, opposing cooperable stringer to form an operable slide fastener.

However, because adjacent scoop members are interconnected by a relatively thin, unsupported, heel portion which is the only part of the stringer secured to the tape, the required precise spacing between adjacent scoop members can be readily varied due to bending and torsional forces that may be exerted on the stringer and which variation acts in a manner tending to separate the completed slide fastener when it is in its closed position.

This invention is directed to a slide fastener stringer and method of forming the same from thin filamentary material in which the scoop members are flexible and the heel portions are located substantially in axial alignment with each other resulting in the stringer having precise spacing between successive adjacent scoop members and a substantially continuous elongated member for securing the stringer to the tape.

It is an object of the present invention to provide a stringer for a slide fastener wherein the spacing between successive scoop members is maintained substantially constant.

Another object of this invention is to provide a novel method of forming a stringer for a slide fastener in which the heel portions interconnecting successive scoop members are located substantially in longitudinal alignment with each other.

Still another object of this invention is to provide a stringer for a slide fastener in which the heel portions are in abutting relationship and extend along a substantially common axis.

A further object of this invention is to provide a substantially elongated unitary member formed from the heel portions of a stringer for the purpose of securing the stringer to a tape.

Other objects and a fuller understanding of the invention can be had by referring to the following description and claims taken in conjunction with the accompanying drawings in which:

FIG. 1 is a partially sectioned side view of a machine for forming one type of filamentary slide fastener stringer;

FIG. 2 is a fragmentary view of the periphery of the forming wheel of the machine shown in FIG. 1, illustrating the positioning and forming of the filament thereon;

FIGS. 3 and 4 are enlarged cross sectional views taken along lines 3—3 and 4—4, respectively, of FIG. 1;

FIG. 5 is an enlarged side elevational view of the slide fastener stringer formed on the machine of FIG. 1;

FIG. 6 is a view of the stringer taken along the lines 6—6 of FIG. 5;

FIG. 7 is a fragmentary plan view of a completed slide fastener incorporating the stringers of the present invention;

FIG. 8 is a greatly enlarged perspective view illustrating the securing of the stringer of the present invention to the edge of the tape; and,

FIG. 9 is a greatly enlarged view of the interlocked stringers of the slide fastener and taken along the line 9—9 of FIG. 7.

Referring more particularly to the drawings, it will be seen that one type of slide fastener stringer can be initially formed from a continuous strand of filamentary material wound in an appropriate manner on a suitable machine, which includes a rotating forming wheel **20** driven in a direction R. The periphery of forming wheel **20** is provided with two rows of integral radially projecting teeth **22** and **24**, which teeth are spaced from each other in an axial direction. An annular groove **26** formed on the periphery of wheel **20** is located in the space intermediate the two rows of teeth **22** and **24**. The teeth in each row are spaced equally from each other about the circumference of wheel **20**, with the teeth in one row offset in relation to the teeth in the other row in the circumferential direction.

As shown in FIGS. 1 and 2, a plastic filamentary material **30**, having substantially wire-like qualities, is guided to the periphery of the rotating forming wheel **20** and wound thereon by a reciprocating slider **31**, such that adjacent loops of filamentary material **30** are wound around the offset teeth **22** and **24**. The filamentary material **30** extending between teeth **22** and **24** is generally located on a bias relative to groove **26**. Filamentary material formed in this manner is commonly referred to as ladder type stringer.

Once filamentary material **30** is formed and located on the periphery of forming wheel **20**, the rotation of wheel **20** in the direction R moves filamentary material **30** past a forming disk **32**, which is freely rotatably mounted on an axis parallel to the axis of rotation of forming wheel **20**. Disk **32** moves in a direction T in response to the movement R of wheel **20**. The peripheral edge **33** of forming disc **32** engages the transverse portions **34** of that portion of the ladder-shape filamentary material **30** lying between teeth **22** and **24** and over groove **26**, and presses these transverse portions into annular groove **26** on forming wheel **20**. Thus, each of the transverse portions **34** are bent into a substantially U-shaped configuration such that the respective legs **36** and **38** of the U-shaped scoop portions **40** become respectively located in the radially directed indentations **42** and **44**, formed in the side walls of groove **26**. The enlarged head

elements 46 of scoop portions 40 are located at the bottom of groove 26 with the legs 36 and 38 on either side thereof projecting radially outwardly from the center of wheel 20. Adjacent pairs of legs 36 and 38 of adacent U-shaped scoop portions 40 are interconnected by their respective heel portions 48 and 49. Where legs 36 or 38 are interconnected by their respective heel portions 48 or 49, legs 36 and 38 taper toward each other as they extend from their respective head portions 40 to their respective heel portions 48 or 49. Forming wheel 20 is heated by any suitable means (not shown) for the purpose of raising the temperature of the filamentary material 30 to a given value for maintaining the material in a malleable condition. The filamentary material 30, which has now been deformed in a uniform repetitious pattern into a plurality of successive U-shaped scoop portions 40, is now carried by wheel 20 through an arc of approximately 270° before it is removed from the wheel.

As best shown in FIGS. 1, 3 and 4, an elongated curved and tapered mandrel 50, having a substantially rounded cross section throughout its length, is rigidly supported at one end in any suitable manner (not shown), such that the tip portion 52 of mandrel 50 extends into groove 26 of forming wheel 20. As the interconnected U-shaped scoop portions 40 move about forming wheel 20, scoop portions 40 are moved into a position where legs 36 and 38 will straddle mandrel 50. A wrapping wheel 60 having an annular groove 62 located about its peripheral surface, is mounted on an axis substantially parallel to the axis of rotation of forming wheel 20. Groove 62 has a substantially semi-circular configuration, in cross section, the surface of which is adapted to cooperate with the downwardly depending legs 36 and 38 of each U-shaped scoop portion 40 and mandrel 50. As more particularly shown in FIGS. 3, and 4, wheel 60 has tapered edge walls 66 which cooperate with the slanted recessed side walls 68, on forming wheel 20 along each side of groove 26, so that the side walls of groove 62 will engage legs 36 and 38. As forming wheel 20 continues to rotate, a given segment of wheel 60 tends to move into engagement with the surfaces of side walls 68 on forming wheel 20 and tend to wrap the lower portions of legs 36 and 38 and their respective interconnecting heel portions 48 and 49 about mandrel 50. While a single wheel 60 is illustrated in the drawings, it should be understood that either a plurality of wheels or an elongated contoured shoe member placed adjacent the periphery of the wheel, can also be used to progressively deform one or both sides of the formed filamentary material as it moves past given points about wheel 20.

The difference between the numerical value of the radius of mandrel 50 and the radius of groove 62 is approximately the thickness of filamentary material 30. Once legs 36 and 38 are wrapped about mandrel 50, heel portions 48 and 49 interconnecting the legs of adjacent U-shaped portions 40, which were previously in staggered spaced relationship relative to each other are now nestled within groove 62 and placed in axial alignment with each other, as is best shown in FIGS. 5 and 6.

As best shown in FIGS. 1, 5 and 6, the alternately placed heel portions of the ladder type stringer are removed by a wedge shaped stripper 65 in a manner such that the formed stringer is directed towards an open throated chute 67 leading to a supply bin or tape attachment station. Prior to entering chute 67, the stringer can be subjected to a blast of cooling air (not shown) to make sure that the filamentary material has assumed its permanent configuration and is no longer in a malleable state. However, this is not always necessary as the material readily cools in the ambient atmosphere and once formed on mandrel 50 can be immediately removed therefrom and maintained in its formed configuration.

As more particularly shown in FIGS. 5 and 6, heel portions 48 and 49 interconnecting adjacent U-shaped scoop portions 40 are located substantially in alignment with each other when viewed in both the horizontal and vertical axis. In bending heel portions 48 and 49 into axial alignment with each other, when the filamentary material 30 is in a malleable state, it is intended that the remote ends 51 and 53 of the respective heel portions 48 and 49 will abut against each other. In so doing, the respective remote ends 51 and 53 of each pair of heel portions 48 and 49 will generally be moved into engagement in such a manner as to deform each other, which deformation could in most instances be likened to a ball and socket joint, resulting in a cooperating flexible joint 55 between adjacent heel portions 48 and 49 placed in alignment. Likewise successive pairs of heel portions will be similarly deformed resulting in successive flexible joints 55. This arrangement, when cooled, provides a flexible connection between adjacent U-shaped scoop portions 40, which connection is not readily separated, while simultaneously providing scoop portions which can be moved through a given arc. In addition, heel portions placed in axial alignment with each other in this manner provide substantially constant spacing between adjacent U-shaped scoop portions 40 with the axially extending heel portions providing a convenient means for securing the completed series of elements to a slide fastener.

A finished slide fastener 70 is shown in FIG. 7 and includes a pair of stringers 72 which are located adjacent to each other and which can be interengaged with each other by means of a slider 74 to maintain the slide fastener in a closed position.

Referring to FIGS. 8 and 9, there is illustrated a slide fastener stringer of the filament type constructed in accordance with the method and apparatus disclosed hereinabove, which stringer can be readily attached along the edge of a slide fastener tape 78. The heel portions 48 and 49 provide a substantially rigid securing member for the threads 80, such that stringer 82 can be sewn along the edge of cords 84 of tape 78. In addition, heel portions 48 and 49, when placed in alignment with each other, provide a convenient securing member which readily lends itself to being woven integrally with the tape on a loom. Heel portions 48 and 49 will take the place of a warp thread such that the weft threads of a tape can be placed over and under the filamentary material in a manner well known in the weaving art.

While the above description has been directed to a ladder type of stringer for a slide fastener, it should be particularly noted that substantially the same steps can be taken with a "coil type" of stringer to achieve the same results. A coil type of stringer is composed of substantially U-shaped scoop portions interconnected by heel portions which heel portions generally lie in an axis which is generally askew to plane of the tape. Thus, in forming this type of coil, it is merely a matter of design to place the heel portions in alignment with each other as is done with a ladder type coil.

The invention has been described in detail with particular reference to an embodiment thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention as described hereinabove and as defined in the appended claims.

I claim:

1. In a stringer for a slide fastener comprising:

an elongated continuous filament uniformly deformed at regularly spaced intervals for providing a plurality of substantially U-shaped scoop members located in a row along a longitudinal axis and in alignment with each other, each scoop member including a head portion which lies in a plane common to all of said head portions and a leg member located on each of the opposite ends of each of said head portions, said leg members located on the same corresponding end of said head portions being disposed in a common plane;

an alternating series of heel portions formed integrally

of said continuous filament and in a reptitious pattern, each heel portion interconnecting a leg on one side of a given scoop member with a leg on said same one side of an immediately adjacent scoop member with the remote ends of said heel portions in abutting relationship; and,

means on each remote end of each of said heel portions for flexibly joining adjacent heel portions together to provide a substantially unitary axially extending filament member for supporting said scoop portions when said stringer is mounted to said tape.

2. A stringer for a slide fastener according to claim 1 wherein said means on each remote end of each of said heel portions includes members carried by said heel portions which cooperate for flexibly joining together adjacent heel portions.

3. A stringer for a slide fastener according to claim 2 wherein said members flexibly joining adjacent heel portions include a projecting member on one heel portion and a recessed member on an adjacent heel portion for receiving said projecting member.

4. A stringer for a slide fastener according to claim 3 wherein said members on adjacent heel portions include a substantially ball and socket cooperating member.

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