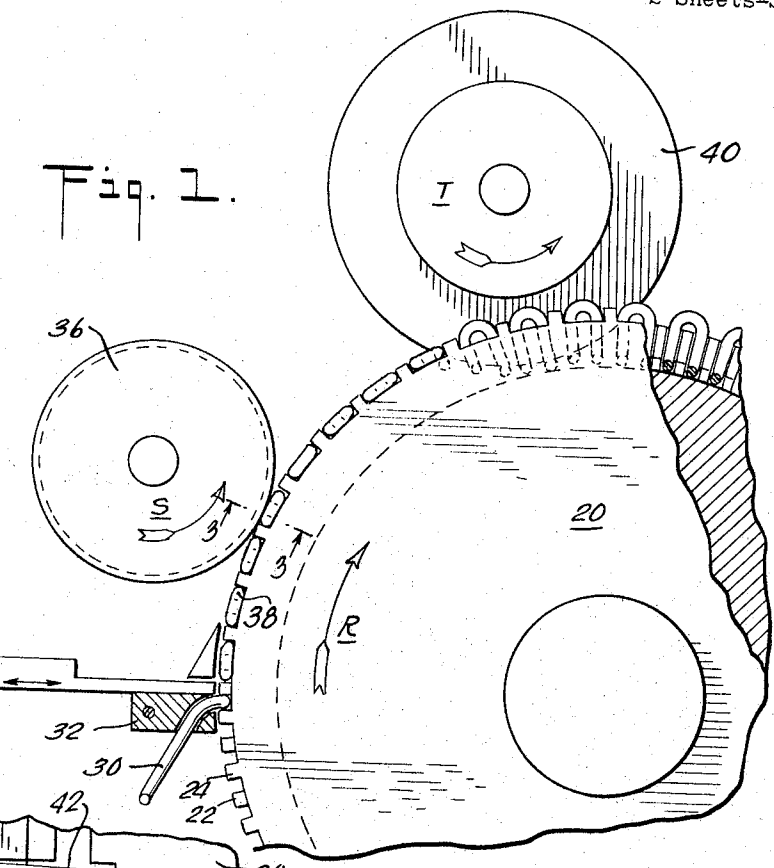
Aug. 22, 1967 W. V. CHERY 3,336,640

SLIDE FASTENER

Filed April 19, 1965 2 Sheets-Sheet 1

Fig. 1.



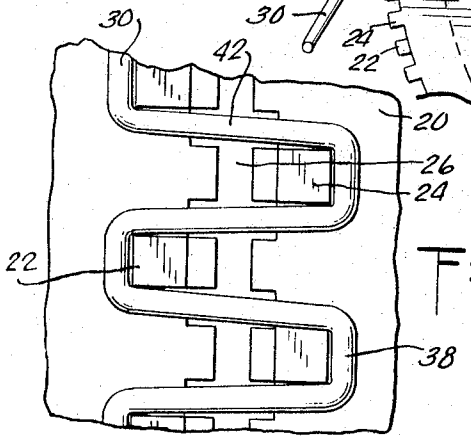


Fig. 2.

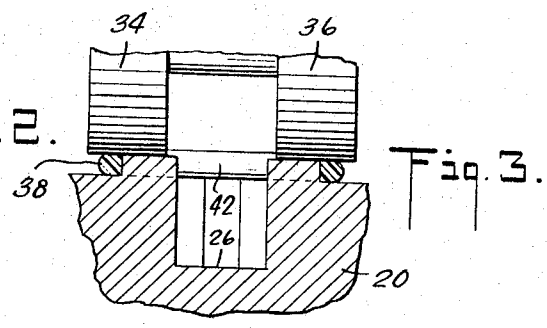


Fig. 3.

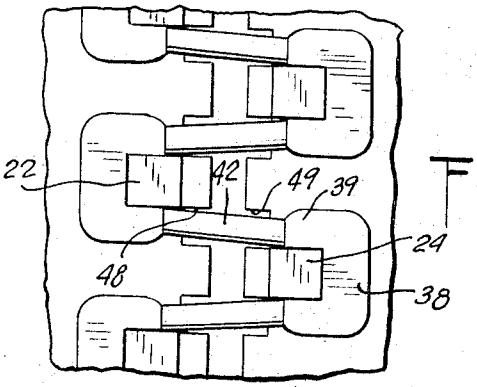


Fig. 4.

INVENTOR.
WALTER V. CHERY
BY R. E. Meech
ATTORNEY

Aug. 22, 1967 W. V. CHERY 3,336,640

SLIDE FASTENER

Filed April 19, 1965 2 Sheets-Sheet 2

Fig. 5.

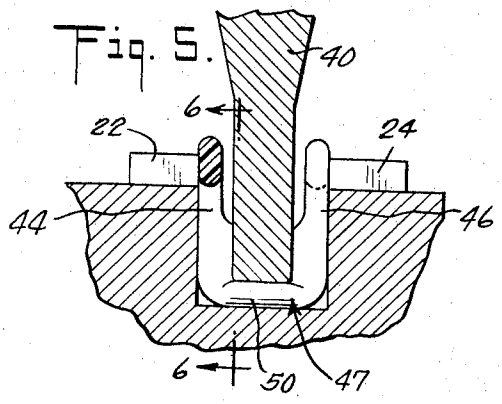


Fig. 6.

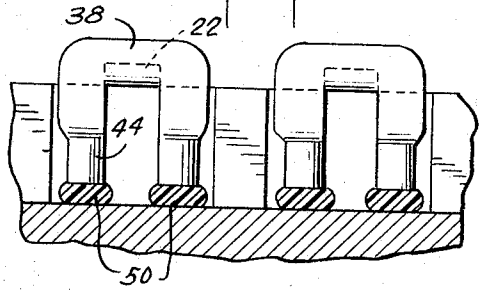


Fig. 7.

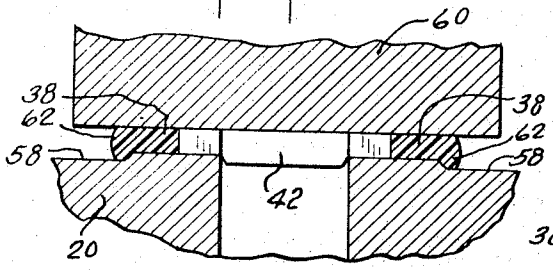


Fig. 8.

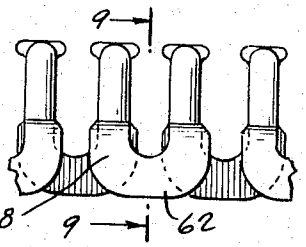


Fig. 9.

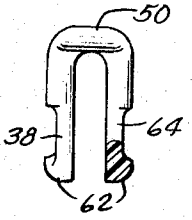


Fig. 10.

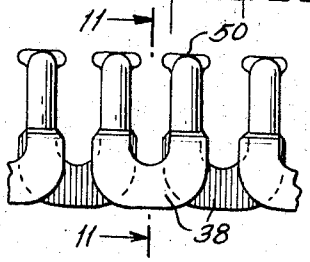


Fig. 11.

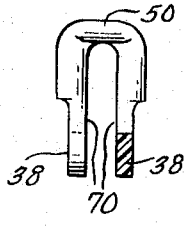


Fig. 12.

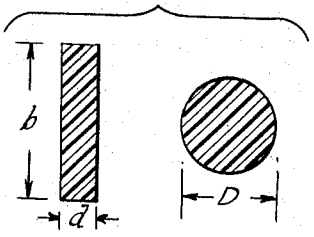
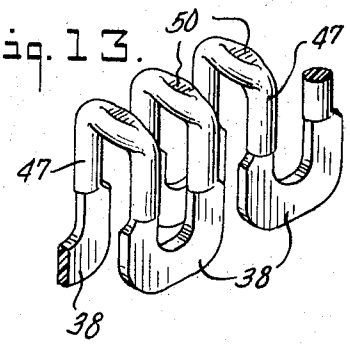


Fig. 13.



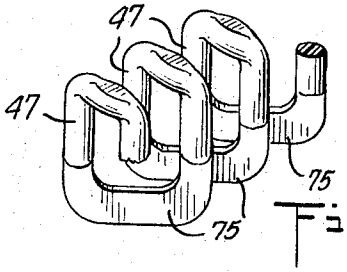


Fig. 14.

INVENTOR.
WALTER V. CHERY
BY R. E. Mecl
ATTORNEY

United States Patent Office 3,336,640 Patented Aug. 22, 1967

3,336,640

SLIDE FASTENER

Walter V. Chery, Meadville, Pa., assignor to Talon, Inc., a corporation of Pennsylvania

Filed Apr. 19, 1965, Ser. No. 449,105
12 Claims. (Cl. 24—205.13)

ABSTRACT OF THE DISCLOSURE

A stringer for a slide fastener and method of forming the same wherein a continuous filament having a given cross sectional configuration is constructed to include a series of head portions interconnected by a series of heel portions. The filament of the heel portions is deformed by the step of compressing the same in the method of manufacturing the stringer to have a substantially rectangular configuration with the height dimension being greater than the width dimension and lying in a plane which is substantially transverse to the common plane of the head portions.

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

It is generally known in the art that a stringer for a slide fastener can be formed from a continuous filament which is initially bent to provide a plurality of substantially parallel U-shaped scoop elements located in alignment with each other and with each scoop element lying in a plane substantially transverse to the plane of the tape to which the stringer is to be fastened. The corresponding legs on the same side of each U-shaped scoop element lie substantially in a comon plane. The U-shaped scoop elements of the stringer are interconnected in a uniform repetitious pattern by longitudinal heel portions which extend betwen adjacent scoop elements, and which heel portions extend in a direction substantially parallel to the plane of the tape to which the stringer is to be attached.

A stringer constructed to provide a plurality of conventional elements, as well as the method of manufacturing the same, requires a filamentary material having a relatively thin cross section. The use of thin filamentary material for a pair of slide fastener stringers results in a slide fastener of poor quality, because the elements formed from the filamentary material are flexible and can easily be mismeshed when the stringers of the slide fastener are in their interengaged condition.

It is an object of the present invention to provide a substantially rigid stringer for a slide fastener which is formed from a thin, flexible filamentary material.

Another object of the present invention is to provide a novel method of forming a substantially rigid stringer for a slide fastener from a relatively thin filamentary material.

A further object of the present invention is to provide a novel method of forming a substantially rigid stringer for a slide fastener which uses the least amount of filamentary material.

Still another object of this invention is to provide a slide fastener stringer which tends to resist bending and torsional forces applied thereto for the purpose of maintaining the interlocking scoop members substantially in uniform spaced relationship relative to each other.

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;

FIG. 3 is a cross section taken along the line 3—3 of FIG. 1 illustrating the means for deforming a portion of the filament on the periphery of the forming wheel;

FIG. 4 is a fragmentary view of the filament on the forming wheel after it has been deformed;

FIG. 5 is a cross sectional view of the filamentary material deformed by the forming disc;

FIG. 6 is a partial cross sectional side view of the filament on the forming wheel after it has been deformed by the forming disc;

FIG. 7 is another modification of the deformation of the filament on the periphery of the forming wheel;

FIG. 8 is a side view of the deformed filamentary material shown in FIG. 7 after it is removed from the forming wheel;

FIG. 9 is a partial cross sectional view of the deformed filamentary material taken along the line 9—9 of FIG. 8;

FIG. 10 is a side view of another modification of the deformed filamentary material;

FIG. 11 is a partial cross sectional view of the deformed filamentary material taken along the line 11—11 of FIG. 10;

FIG. 12 illustrates two cross sectional configurations of filamentary material having the same area;

FIG. 13 is a perspective view of a fragment of slide fastener stringer of the present invention; and,

FIG. 14 is a perspective view of a fragment of a second embodiment of a slide fastener stringer of the present invention.

Referring more particularly to the drawings, it will be seen that filamentary material can be initially formed for one type of stringer on a machine which includes a rotating forming wheel **20** driven in the direction R and whose periphery is provided with two rows of radially projecting teeth, **22** and **24**, preferably formed integrally with forming wheel **20**. The rows of teeth **22** and **24** on forming wheel **20** are spaced from each other in an axial direction, with an annular groove **26** on the periphery of wheel **20** located between the two rows of teeth, **22** and **24**. The teeth in each row are spaced equally from each other about the circumference with the teeth of one row offset in relation to the teeth in the other row in the circumferential direction.

A plastic filamentary material **30**, having wire-like qualities, is guided to the periphery of the rotating forming wheel **20** and wound into a zig-zag configuration thereon by a reciprocating slider **32**, such that adjacent loops of filamentary material **30** are wound around the offset teeth, **22** and **24**, of the two rows on the forming wheel. This construction, best shown in FIG. 2, is commonly referred to as a ladder-type of stringer.

As shown in FIGS. 1 and 3, after filamentary material **30** is wound on the periphery of forming wheel **20**, the rotation of wheel **20** in the direction R moves filamentary material **20** past a pair of axially spaced pressure rollers **34** and **36**. The peripheral surfaces of rollers **34** and **36** frictionally engage the top surfaces of looped heel portions **38** wound around teeth **22** and **24** to cause rotation of the rollers in the direction S, as shown in FIG. 1. Since the thickness of filamentary material **30** is greater than the projecting height of teeth **22** and **24**, rollers **34** and **36** will exert pressure upon filamentary material **30** at the looped heel portions **38** as well as area **39** of the adjacent transverse portion **42**, and to compress and flatten the material in this area into the widened configuration substantially as shown in FIG. 4. Because the cross sectional configuration of filamentary material **30** is changed, without a change in the cross

sectional area, the filamentary material, in effect, is changed from a circular cross sectional configuration to a rectangular cross sectional configuration, as is better shown in FIG. 12. It is the general intent of the present invention, in its broadest concept, that only the material of the looped heel portions **38** is to be flattened by rollers **34** and **36**. In the actual manufacture of the stringer, however, a small area **39** may be intentionally flattened without any appreciable change in the function.

The next step in the manufacture of the slide fastener stringer is to move the ladder type filamentary material **30** on wheel **20** past a forming disc **40** which is turnably mounted for rotation in the direction T about an axis parallel to the axis of rotation of forming wheel **20**. The forming disc **40** engages the transverse portions **42** of the ladder-shape filamentary material **30** and presses these transverse portions into the annular groove **26** formed between the rows of teeth **22** and **24** on forming wheel **20**. Thus, each of the transverse portions **42** are formed into a substantially U-shaped configuration in which the respective legs **44** and **46** of the U-shaped scoop portions **47** become respectively located in the radially directed indentations **48** and **49** formed in the side walls of groove **26**, with enlarged head elements **50** located at the bottom thereof.

Once transverse portions **42** are bent to form the U-shaped scoops **47**, the ladder-like filamentary material **30** moves off the periphery of forming wheel **20** and is seated within groove **26** thereof in a manner substantially as is shown in FIG. 6 until setting by heat is completed. The filamentary material can then be removed from the forming wheel **20** and it will have a continuous stringer configuration substantially similar to that shown in FIG. 13; wherein the U-shaped scoop portions **47** have enlarged head elements **50** at their central portions and the heel portions **38** are flattened into a rectangular cross sectional configuration with the width thereof being substantially less than the height and with the height dimension lying in a plane substantially parallel to the plane of the legs of the U-shaped portions **47**.

As shown in FIGS. 7 through 9, the transverse portions **42** can be formed on forming wheel **20** whose peripheral surface has been changed to provide annular recesses **58** spaced outwardly from annular groove **26**. Thus, when the heel portions **38** and transverse portions **42** are passed under a single roller **60** having a flat peripheral surface, the outermost ends of heel portions **38** include enlarged portions **62**. When filamentary material **30** is passed under forming disc **40** to form the U-shaped scoop members, the legs thereof will extend upwardly, and when the stringer is removed from the forming wheel and inverted, the stringer will appear as shown in FIGS. 8 and 9. In this embodiment the heel portions of the finished slide fastener stringer are substantially rectangular in cross section with the outer surfaces thereof recessed as at **64** from the normal outer surface of the head elements **50** to form the enlarged portions **62** at the lowermost portions thereof. When the stringer is sewn to a tape, not shown, the sewing threads will be received within the recessed area **64**; and, thus, will be protected from being rubbed upon by the wings of a slider (not shown), when the slider is moved along the tape. In addition, the outer flanges of the slider will ride on enlarged portions **62** of the stringer, and will be supported thereby such that the flanges of the slider will not scuff and wear the tape.

Still another embodiment is shown in FIGS. 10 and 11 wherein the heel portions **38** are formed to have a substantially rectangular configuration with the innermost surface **70** of each heel portion lying in a plane which is substantially the same plane as the innermost surface of the U-shaped scoop portions **47**. Thus, when this type of stringer is sewn to a tape, the inner surfaces of the opposed legs will lie flush with the opposed surfaces of the tape to firmly anchor the stringer thereto.

In each of the embodiments described hereinabove, particular reference was made to a ladder type of stringer as is illustrated in FIG. 13. Each embodiment is constructed of a substantially round filament with the heel portions thereof deformed and flattened into a substantially rectangular configuration, as shown in FIG. 12. By modifying the heel portions interconnecting adjacent scoops such that the normally round filament is flattened to assume a rectangular shape with the cross sectional area in each instance being the same, and the height of each heel portion substantially parallel to the legs of U-shaped portions **47**, the heel portions have a greater resistance to bending loads which tend to change the distance between head elements of adjacent scoops. If the distance between head elements of adjacent scoops is not maintained substantially constant at all times, the two meshing stringers of the finished slide fastener will have (1) a tendency to mismesh when the slider is moved to the closed position; and (2) once in the closed position, the scoops can be slightly separated to disengage the intermeshed scoops.

Because the resistance to bending loads exerted on the stringer is directly related to the moment of inertia of the cross sectional area of the filament at any given point, and because the cross sectional areas are equal, the following mathematic relationship is quickly evident:

$$\frac{I \text{ rectangle}}{I \text{ circle}} = \frac{4b^2}{3D^2}$$

where b is the height of the rectangular cross section and D is the diameter of the round filament or, expressed as a function of their thicknesses

$$\frac{I \text{ rectangle}}{I \text{ circle}} = \frac{II^2D^2}{12d^2} = \frac{5}{6}\frac{D^2}{d^2} \text{ approx.}$$

where d is the thickness of the rectangular cross section.

Thus, it will be seen that deforming the circular filament at the heel portions in a manner such that the height of the resulting rectangular cross section is greater than the diameter of the circular filament, or where the thickness of the rectangular cross section is somewhat less than the diameter of the round filament provides a stringer whose resistance to bending is greatly increased and in which the distance between U-shaped scoop portions is maintained substantially constant at all times resulting in a rigid and inflexible stringer.

Similarly, it can be shown that when the round filament is changed to a rectangular filament having the same cross sectional area, the resistance to torsion is greatly increased to further provide a substantially more stable stringer.

While the above description has been made with particular reference to a ladder type of stringer, it will be seen with reference to FIG. 14 that this invention is also applicable to other filament fasteners such as the coil or coil-ladder type wherein that heel portion **75** of the filament interconnecting adjacent U-shaped scoop elements **47** can be deformed to provide a substantially rigid and inflexible slide fastener stringer.

The invention has been described in detail with particular reference to embodiments 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 having a given cross sectional configuration uniformly deformed at regularly spaced intervals to provide a plurality of U-shaped scoop portions located substantially in alignment with each other and with each U-shaped scoop portion including a head portion lying in a common plane and legs having substantially said given cross sectional configuration disposed on each side thereof; and

a series of heel portions formed integrally of said continuous filament, each heel portion interconnecting the legs of two adjacent scoop portions in a uniform and repetitious pattern with the filament forming each heel portion deformed to have a substantially rectangular cross sectional configuration at any given point therealong, with the height dimension of each heel portion being greater than the width and extending substantially transverse to said common plane of said head portions said width of said heel portions being less than the smallest dimension of said given cross sectional configuration.

whereby said heel portions tend to maintain the legs of adjacent scoops of said stringer in substantially rigid spaced relation relative to each other.

2. In a stringer for a slide fastener according to claim 1, wherein the lower portion of each of said legs adjacent their respective heel portions has a substantially rectangular cross-sectional configuration whose width is substantially equal to the width of said heel portion interconnecting legs of adjacent scoop portions.

3. In a stringer for a slide fastener comprising:

an elongated continuous filament substantially circular in cross section having a substantially zig-zag configuration to provide a plurality of U-shaped scoop portions with the respective legs having a circular cross sectional configuration disposed on each side of said U-shaped portions located in a common plane;

a series of heel portions formed integrally of said continuous filament for interconnecting the legs of two adjacent U-shaped portions, with said respective heel portions lying in said common plane of the two interconnected legs, each of said heel portions deformed to have a substantially rectangular cross sectional configuration, with the height, which is greater than the width, lying in the common plane of the interconnected legs,

whereby said heel portions tend to maintain the legs of adjacent scoops of said stringer in substantially rigid spaced relation relative to each other.

4. A stringer for a slide fastener according to claim 3, wherein the lower portions of each of said legs and each of said heel portions interconnecting said legs has a substantially rectangular cross sectional configuration and said upper portions of said legs have a cross sectional configuration substantially the same as said filament.

5. A stringer for a slide fastener according to claim 4, wherein the width of said rectangular cross sectional configuration of said lower portions of said legs and said heel portions is less than the width of said upper portions of said legs.

6. A stringer for a slide fastener according to claim 5 wherein the outer surface of the lowermost portion of each of said legs and each of said heel portions interconnecting two adjacent legs lies in the same plane that contains the outer surface of the upper portion of each of said legs.

7. A stringer for a slide fastener according to claim 5, wherein the inner surfaces of the lowermost portion of each of said legs and each of said heel portions interconnecting two adjacent legs lies in the same plane that contains the inner surface of the upper portion of each of said legs.

8. A stringer for a slide fastener according to claim 7, wherein the lowermost portion of each of said heel portions interconnecting two adjacent legs of said scoop portions are enlarged to a width which is greater than said width of the cross sectional rectangular configuration of said heel portions.

9. A stringer for a slide fastener according to claim 8, wherein said width of said lowermost portion of each of said heel portions is substantially equal to the width of said filament prior to being deformed whereby the surfaces of said lowermost portions of said legs form a recessed anchorage member for securing said stringer to said tape.

10. In a stringer for a slide fastener comprising

an elongated continuous filament substantially circular in cross section uniformly deformed at spaced intervals into a substantially helical coil configuration to provide a plurality of U-shaped scoop portions located substantially in alignment with each other, each U-shaped scoop portion including a pair of legs having a substantially circular cross section and a head portion located intermediate thereof,

a series of heel portions formed integrally of said continuous filament in a repetitious pattern for interconnecting the legs of two adjacent U-shaped portions, said heel portions extending between the leg on one side of one U-shaped portion and the leg on the opposite side of the next adjacent U-shaped portion,

each of said heel portions having a substantially rectangular cross sectional configuration, with the width, which is less than the height, lying in a plane substantially parallel to said head portion,

whereby said heel portions tend to maintain the legs of adjacent scoop portions in substantially spaced relation relative to each other.

11. A stringer for a slide fastener according to claim 10, wherein the lower portions of each of said legs and each of said heel portions interconnecting said legs has a substantially rectangular cross sectional configuration and said upper portions of said legs have a cross sectional configuration substantially the same as said filament.

12. A stringer for a slide fastener according to claim 11, wherein the width of said rectangular cross sectional configuration of said lower portions of said legs and said heel portions is less than the width of said upper portions of said legs.

References Cited

UNITED STATES PATENTS

2,296,880	9/1942	Smith.	
3,015,868	1/1962	Ruhrmann.	
3,063,120	11/1962	Steingrubner.	
3,149,387	9/1964	Ruhrmann.	
3,189,964	6/1965	Galonska	24—205.16 X

BERNARD A. GELAK, *Primary Examiner.*