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- 1 -

SLIDING CLASP FASTENER

This invention relates to a sliding clasp fastener and more particularly to improvements in coupling elements used therein.

Sliding clasp fasteners or zippers find
5 extensive application on garments, shoes, bags and other daily commodities as well as on industrial materials and products.

It has been a common practice to apply certain lubricating materials such as paraffin to the coupling
10 elements of the fastener as and when the same fails to function smoothly in use. This was done by coating or otherwise depositing such lubricating material on the exposed outer surface of the fastener elements. The lubricating material thus applied was susceptible to
15 separation from the elements under the influence of external physical forces exerted when cleaning, or by the chemical action of cleaning solvents in cleansers, or by repeated impinging contact of the coupling heads of mating elements during opening and closing of the

fastener. As a result, the fastener would malfunction or even become inoperative.

It is believed possible by means of the invention to

provide a sliding clasp fastener
5 having a continuous row of plastic monofilamentary coupling elements which can retain the proper and smooth functioning over extended periods of use or even after it has undone repeated cleaning.

According to the present invention, there is
10 provided a sliding clasp fastener comprising a pair of opposed support tapes, rows of coupling elements having a continuous spiral or meander formation provided with coupling heads and made from a plastic monofilament, and a slider member adapted to take said rows of
15 elements into and out of sliding engagement with each other, said monofilament having a multiplicity of indents extending longitudinally thereof, and a lubricative agent in at least some of said indents.

20 The invention will be described by way of example with reference to the accompanying drawings, wherein:-

Figures 1A, 1B and 1C are fragmentary views each schematically illustrating forms of filamentary fastener elements provided in accordance with the
25 invention;

- 3 -

Figures 2A through 2D are cross-sectional views on enlarged scale each schematically illustrating the formation of indents filled with lubricative material in the surface of the fastener element;

5 Figure 3 is a plan view of mating rows of fastener elements coupled together by and in a slider member;

Figure 4 is a schematic view on enlarged scale illustrating the encircled portion E of the fastener
10 element shown in Figure 3, and

Figure 5 is a cross-sectional view of the mating fastener elements coupled together in the slider member.

Referring first to Figure 5, there is shown a
15 typical form of a sliding clasp fastener 10 which comprises a pair of opposed fastener support tapes 11, 12 carrying rows of coupling elements 13, 14 attached to the respective tapes as by stitchings 15 and taken into and out of mutual engagement by a slider member
20 16.

The coupling elements 13, 14 to which the present invention is directed are formed from a plastic filamentary material such as polyamide and polyester resins into a continuous spiral or meander formation,
25 the illustrated embodiment being in spiral form as better shown in Figure 3.

The plastic filament designated at 17 and better

shown in Figure 1 is provided in its peripheral surface with a multiplicity of minute indents 18, the term "indent" comprehensively representing a concave contour such as a groove or a recess, which indents are filled with a suitable lubricative material as hereafter described. The indents 18 shown in Figure 1A are in the form of discrete lines of varied lengths; the indents 18' in Figure 1B are in the form of dots, and the indents 18" in Figure 1C are in the form of continuous lines. Importantly, the indents 18, 18' and 18" regardless of their different configurations are oriented and distributed longitudinally or in the direction of the length of the filament 17 for purposes hereafter to be described.

15 The indents 18, 18' and 18" are invisibly small, their widths and depths being of the order of 0.1 to 10s microns which may be determined such that elasticity and other functional requirements of the sliding clasp fastener are retained.

20 The indents 18, 18' and 18" may be formed by extruding a starting filament from a nozzle provided in its internal periphery with ridges and grooves designed to impart the particular indents to the peripheral surface of the filament 17. The indents may be also
25 formed by passing the filament 17 in contact with a coarse surface having fine particles thereon, or by blasting a stream of air mixed with particulate

- 5 -

material over and longitudinally of the filament 17. Alternatively, the indents 18, 18' and 18" may be formed when spinning a starting filament with due consideration as regards draw ratio, temperature and
5 other conditions as may be envisaged by one skilled in the art.

The lubricative agent to be used in the invention and designated at 19 in Figure 2 may be any material which is resistant or immune to chemical
10 attack by cleansers or their solvents used in cleaning the fastener. Such eligible materials are polyethylene, polysiloxane, polytetrafluoroethylene, polypropylene and the like.

The lubricative agent 19 may be dissolved or
15 dispersed in a suitable solvent which can be applied uniformly over the filament 17, and is well penetrative and volatile to permit quick drying. In the case of a low molecular weight polyethylene lubricative agent 19, substantially homogeneous fine
20 particles of this material are dissolved or dispersed in the solvent, applied to the peripheral surface of the filament 17, dried to strip off the solvent and heated at a temperature above the melt point of ethylene to allow firm embedding of the lubricative
25 agent 19 in the indents 18, (18', 18"). This process can be shortened by treating the filament 17 directly with liquefied polyethylene.

The application of the lubricative agent 19 to the filament 17; that is to fill and embed the agent 19 in the indents 18, (18', 18'') in the filament 17, as schematically illustrated in Figures 2A - 2D, is accomplished by means of roll coating, spraying or immersing in a solution or dispersion of lubricative agent 19. This can be done during extrusion of the filament 17, after the filament 17 has been formed into coupling elements 13, 14, or after a complete product fastener has been made, whichever is more convenient.

The type of lubricative agent 19 to be used depends upon the type of filament 17 which is most commonly polyamide and polyester resins. In the case of polyamide filament, the most suitable lubricative agent is polyethylene because it is less water-absorptive and can therefore minimize water-absorption of the filament per se so as to retain the properties and dimensional stability of the coupling elements 14, 14.

Referring now to Figure 3, there is shown on enlarged scale a fragmentary portion of the fastener 10 in which opposed rows of coupling elements 13, 14 are received in the slider member 16. The coupling heads 13' and 14' of the mating elements 13 and 14 are brought into and out of sliding engagement with one another in the direction of the arrows. Since the coupling heads 13', 14' are formed at the portions of

- 7 -

the elements 13, 14 which are turned into adjacent convolutions as better shown in Figure 5, it is to be noted that the indents 18 in the elements 13, (14) at the region of their coupling heads 13' (14') are oriented to extend perpendicularly with respect to the plane of the fastener 10 or the plane of Figure 4 showing the encircled portion E of Figure 3 on more enlarged scale, or transversely of the width of the fastener 10. Movement of the slider member 16 in one direction or the other causes the coupling heads 13', 14' to come into sliding contact with each other, the contact taking place in a direction paralld to the plane of Figure 4 with the result that the forces of sliding contact are directed to urge the lubricative agent 19 rather into than out of the indents 18. This ensures prolonged retention of the lubricative agent 19 on the coupling elements 13, 14 which leads to maintenance of lubricity and smooth coupling and uncoupling operation of the fastener 10. The indents 18, 18' and 18" are all so minute that elasticity desired of the filament 17 can be also retained.

(18)



CLAIMS:-

1. A sliding clasp fastener comprising a pair of
opposed support tapes, rows of coupling elements having
a continuous spiral or meander formation provided with
5 coupling heads and made from a plastic monofilament,
and a slider member adapted to take said rows of
elements into and out of sliding engagement with each
other, said monofilament having a multiplicity of
indents extending longitudinally thereof, and a
10 lubricative agent in at least some of said
indents.

2. A sliding clasp fastener as claimed in Claim
1 wherein said indents are in the form of discrete
lines of varied lengths oriented in the direction of
15 the length of the monofilament.

3. A sliding clasp fastener as claimed in Claim
1 wherein said indents are in the form of dots oriented
and distributed in the direction of the length of the
monofilament.

20 4. A sliding clasp fastener as claimed in Claim
1 wherein said indents are in the form of continuous
lines extending longitudinally of the monofilament.

5. A sliding clasp fastener as claimed in any
preceding claim wherein said lubricative agent is a material
25 resistant to cleaning solvents or cleansers and
selected from the group of polyethylene, polysiloxane,
polytetrafluoroethylene and polypropylene.



19

- 9 -

6. A sliding clasp fastener as claimed in Claim 1 wherein said indents at the coupling heads of the elements are oriented to extend perpendicularly with respect to the plane of the fastener.

- 5 7. A sliding clasp fastener substantially as described with reference to and as illustrated in the accompanying drawings.
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