

FLUID-TIGHT SLIDE FASTENERS

This invention relates to slide fasteners, more particularly to fluid-tight slide fasteners for use on ski wears, sports bags and other articles which require sealing against rain, snow, wind or dust.

- 5 Gas or liquid-tight slide fasteners are known, a typical example of which comprises a pair of fastener stringers and sealing strips applied to the respective stringers at least over one surface thereof, the sealing strip being formed from rubber, plastics film or other
- 10 elastomeric material. The sealing strips are laid over the respective stringers with their confronting edges slightly projecting beyond the central axis of symmetry defined by two coupling element rows in engagement or beyond the extremities of the longitudinal edges of the
- 15 stringer tapes along which the coupling elements are mounted. When the slide fastener is closed, the confronting edges of the sealing strips are brought deformably into abutting engagement with each other to produce a tight seal therealong, with the coupling
- 20 elements concealed completely from external view. However, when severe transverse pull or stresses are applied to such known slide fasteners, the sealing strips are susceptible to separation to create a leakage

path along their confronting edges largely due to the stringer tapes being non-stretchable or unyieldable. This tendency has become pronounced in the cases where the slide fastener is applied to ski wear or other roughly handled articles.

According to the present invention, there is provided a fluid-tight slide fastener comprising:

(a) a pair of stringer tapes each including a knit system having on its one side a plurality of alternating longitudinal wales and grooves, said knit system including substantially non-stretchable inner and outer edge regions and a transversely stretchable intermediate region;

(b) a pair of rows of continuous coiled coupling elements each secured to the other side of the respective stringer tape along the inner edge region by sewing threads extending through said wales in said inner edge region; and

(c) a pair of elastically deformable sealing strips each attached to said one side of the respective stringer tape and substantially coextending with said tape except that its inner edge projects slightly beyond the extremity of the inner longitudinal edge of said tape, for bearing deformably against the inner edge of the other sealing strip.

A believed possibility of the invention is provision of a fluid-tight slide fastener which is capable of maintaining a complete seal against external atmosphere when in use on sports wear and other roughly handled articles.

It is also believed possible by means of the invention to provide a slide fastener which is not only completely fluid-tight but also can be applied to articles firmly and positionally accurately.

The invention will be described by way of example with reference to the accompanying drawings in which like numerals denote like and corresponding parts and in which:-

Figure 1 is a rear fragmentary plan view of a slide fastener according to a preferred embodiment of the invention;

Figure 2 is an inverted transverse cross-section of Figure 1;

Figure 3 is a cross-sectional view of slide fastener of Figure 2, showing its respective halves disengaged and separated;

Figure 4 is a view similar to Figure 1 but showing the slide fastener in stressed condition;

Figure 5 is a schematic diagram of a stringer tape system used according to the invention; and

Figure 6 is a views similar to Figure 3 but showing a different form of fastener coupling element.

Referring now to the drawings and Figure 2 in particular, there is shown a slide fastener 10 having a fluid-tight construction which comprises a pair of stringer tapes 11 and 12 and a pair of rows of coiled coupling elements 13 and 14 which are secured to the respective tapes 11 and 12, respectively, by sewn seams 15 which may be of chain locked stitches. The rows of coupling elements 13 and 14 are brought into and out of mutual engagement by a slider (not shown) to close and open the fastener 10 in the well known manner.

In the embodiment shown in Figures 1 - 6 inclusive, the stringer tapes 11 and 12 are each formed by a knit system 16 exemplified in Figure 5. The knit tape system 16 consists of an outer longitudinal edge region 17, an intermediate region 18 and an inner longitudinal region 19. The inner longitudinal edge region 19, to which the coupling elements 13 and 14 are secured, is formed by chain stitch-forming warp threads L1 and tricot threads L2 together forming wales 20 alternating with grooves 21 and inlaid weft threads L3 extending over five of these

wales. The outer longitudinal edge region 19, to which an article 22 is secured, is of a system similar to the inner edge region 17 and consists of chain stitch-forming warp threads L1, tricot threads L2 and inlaid weft threads L5 extending over five wales 20. The innermost and outermost warp threads L1 are made of a reinforcing thread stronger than the rest of the warp threads so as to strengthen and thicken the extremities of the respective edge regions 17 and 19.

The intermediate region 18 consists of chain stitch-forming warp threads L1, tricot threads L2 and inland weft threads L4 extending over eleven wales 20. The weft threads L4 in this region are made of a stretchable material such as spandex for purposes hereafter to be described.

The rows of coupling elements 13 and 14 illustrated to be in the form of a continuous helical coil are secured to the respective stringer tapes 11 and 12 on their flat sides and along their inner edge regions 17 by sewn seams 15. Each element has a coupling head 13a, (14a) and upper and lower legs 13b, 13c, (14b, 14c), the lower leg having a recess 13d, (14d) for receiving sewing threads of the seam 15..

The opposite side of each stringer tape 11, (12) has alternate wales 20 and grooves 21 extending

longitudinally of the tape and is covered by a sealing strip 23 made of an elastically deformable material such as rubber, soft synthetic resin or other elastomeric material. The sealing strip 23 is substantially
5 coextensive with the tape 11, (12) but has its inner longitudinal marginal edge 23a projecting slightly beyond the extremity of the inner tape edge region 19, as shown in Figure 3, so that the projecting edge 23a bears deformably against the counterpart 23a of the
10 opposed mating strip 23 to effect a sealing action when the fastener halves are coupled together as shown in Figures 2 and 4.

When thus coupling the two stringers tapes 11 and 12 of the fastener 10, the coupling elements 13, 14 receive
15 stresses tending to move inwardly toward each other. This movement is averted by the arrangement in which the sewing threads are firmly anchored in the recesses 13d, 14d of the individual elements 13, 14 against
20 displacement thereof which would otherwise occur under the influence of transverse stresses.

The sealing strip 23 may be applied to the respective tape 11, (123) by high frequency, ultrasonic or other heating technique, in which instance the material of the sealing strip 23 is embedded in the grooves 21 of the
25 knit surface system thereby enhancing the bond between the strip 23 and the tape 11, (12).

The strip 23 may be secured also by an adhesive compound or even by stitching because the needle threads will become instantly seized and intimately compacted by the elastic action of the sealing material surrounding the threads thereby retaining fluid-tightness.

The intermediate region 18 of the respective stringer tape 11, (12) extending longitudinally between the outer and inner edge regions 17 and 19 includes laid-in-weft threads L4 which are resilient and stretchable whereby the region 18 and the portion of the sealing strip 23 lying thereover are rendered yieldingly stretchable upon the application of transverse pull to the fastener 10. Thus, when stresses develop transversely of the fastener 10, such stresses are readily taken up or absorbed by the intermediate stretchable region 18 (including the sealing strip 23 coextensive therewith) without being distributed to the inner edge region 19 at which the coupling elements 13, 14 are mounted. Such stresses would have otherwise caused the stringer tapes 11, 12 to split apart along the confronting edges 23a of the respective sealing strips 23, resulting in fluid leakage.

The knit pattern shown in Figure 5 is commonly known as "tricot" which is per se stretchable to some extent. The use of particularly stretchable threads such as spandex in the region 18 intermediate between the outer and inner edge regions 17 and 19 of the tape renders

21

these edge regions less stretchable and more stiff as desired. It will be understood that the omission of tricot stitches L2 in the intermediate region 18 will give rise to stretchability of the same region.

5

Figure 6 shows a modification of coupling elements 13, (14) in which the lower leg 13c, (14c) is deformed to produce an indent functionally similar to the recess 13d, (14d) for holding the sewing threads in place against movement when transverse pull is exerted.

10



CLAIMS:-

1. A fluid-tight slide fastener comprising:

(a) a pair of stringer tapes each including a knit system having on its one side a plurality of alternating longitudinal wales and grooves, said knit system including substantially non-stretchable inner and outer edge regions and a transversely stretchable intermediate region;

(b) a pair of rows of continuous coiled coupling elements each secured to the other side of the respective stringer tape along the inner edge region by sewing threads extending through said wales in said inner edge region; and

(c) a pair of elastically deformable sealing strips each attached to said one side of the respective stringer tape and substantially coextending with said tape except that its inner edge projects slightly beyond the extremity of the inner longitudinal edge of said tape, for bearing defromably against the inner edge of the other sealing strip.

2. A fluid-tight slide fastener according to claim 1, said knit system having a stretchable weft thread laid in said intermediate region to render this region alone stretchable transversely of the tape.

3. A fluid-tight slide fastener according to claim 2, said stretchable thread being a spandex yarn.



4. A fluid-tight slide fastener according to claim 1. 2 or 3. each of said coupling elements having a recess remotely from the tape for receiving said sewing threads to assist in preventing said coupling elements from being displaced transversely of the tape.

5. A fluid-tight slide fastener as described with reference to and as illustrated in Figures 1 to 5 modified as in figure 6 of the accompanying drawings.
