WOVEN SLIDE FASTENER

This invention relates to a woven slide fastener of the type in which fastener elements formed of a continuous monofilament in the shape of a coil are woven into a longitudinal side portion of a tape fabric at the same time that the tape fabric is woven. Hereafter, the fastener elements shall be referred to simply as "elements".

In the prior art, the coil-shaped elements of the woven slide fastener of the foregoing type are woven into the tape fabric under a condition in which the continuous monofilament, which is much thicker and sturdier than the weft and warp threads of the fabric, is bent into a coil-shaped configuration. Consequently, the fastener chain tends to stretch or elongate in the longitudinal direction and the coil loops tend to become skewed. More specifically, stability of coil spacing and the desirable upstanding attitude of the coil loops are difficult to maintain merely by weaving the elements into a longitudinal side edge of the tape fabric. Various attemps have been made to improve upon this problem. In one arrangement, such as disclosed in the specification of Japanese Patent Publication No. 46-7018, the warp threads at portions where the elements are woven are arrayed more densely than the warp threads constituting the main body of the tape fabric. While this arrangement prevents collapse of the coil loops, longitudinal expansion and contraction of the fastener chain cannot be prevented, and the problem of element spacing stability remains unsolved. Further, as disclosed in the specification of Japanese Patent Application Laid-Open No. 56-60504, a binding warp thread is so arrayed as to run astride the tops of two elements and pass below a foundation weft thread between these two elements, thereby forming double weft threads arranged between the elements into a loop and disposing the weft threads as a pad between upper and lower leg portions of the elements. This enhances element resistance against

twisting and skewing to improve spacing stability. However, since the binding warp threads are clustered by the weft threads, the fastener chain is increased in thickness and loses pliability.

According to a first aspect of the present invention there is provided a woven slide fastener having a tape fabric body, a continuous monofilament forming coil-shaped fastener elements and inserted in double picks in a longitudinal side edge of the tape fabric body, warp threads and a weft thread extending continuously from the tape fabric body and woven together with the warp threads to form a unitary body, said woven slide fastener comprising a plurality of upper binding warp threads running substantially linearly along an upper side of upper leg portions of the fastener elements, a plurality of lower binding warp threads running substantially linearly along a lower side of lower leg portions of the fastener elements, said upper and lower warp threads being arranged in warp threads constituting an element weave-in portion, and coil-fastening warp threads disposed between the binding warp threads and arranged to span and interlace with the continuous monofilament and the weft thread extending from the tape fabric body to the element weave-in portion on upper and lower sides of the continuous monofilament forming the elements, said weft thread being arranged to run over the upper binding warp threads and under the coil-fastening warp threads on the side of the upper leg portions of the elements and to run under the lower binding warp threads and over the coil-fastening warp threads on the side of the lower leg portions of the elements, and further comprising gap-closing warp threads arranged in an edge portion of the element weave-in portion on the side of coupling heads and interlaced with said weft thread so as to close gaps between mutually adjacent coupling heads of the elements.

According to a second aspect of the present invention there is provided a woven slide fastener having a tape fabric body, a continuous monofilament forming coil-shaped fastener elements and inserted in double picks in a longitudinal side edge of the tape fabric body, warp threads, and a weft thread extending continuously from the tape fabric body and woven together with the warp threads to form a unitary body, said woven slide fastener comprising a plurality of upper binding warp threads running substantially linearly along an upper side of upper leg portions of the fastener elements, a plurality of lower binding warp threads running substantially linearly along a lower side of lower leg portions of the

fastener elements, said upper and lower warp threads being arranged in warp threads constituting an element weave-in portion, and coil-fastening warp threads disposed between the binding warp threads and arranged to span and interlace with the continuous monofilament and the weft thread extending from the tape fabric body to the element weave-in portion on upper and lower sides of the continuous monofilament forming the elements, said weft thread being arranged to run over the upper binding warp threads and under the coil-fastening warp threads on the side of the upper leg portions of the elements and to run under the lower binding warp threads and over the coil-fastening warp threads on the side of the lower leg portions of the elements, and further comprising a gap-closing warp thread arranged at an edge of the element weave-in portion on the side of coupling heads of the elements, said weft thread being wound around said gap-closing thread to close gaps between mutually adjacent coupling heads of the elements.

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

Fig. 1 is a perspective view illustrating a principal portion of a first embodiment;

Fig. 2 is a perspective view illustrating a principal portion of a second embodiment; and

Fig. 3 is a perspective view illustrating a principal portion of a third embodiment.

Fig. 1 is a perspective view illustrating a principal portion of a woven slide fastener according to a first embodiment of the

present invention. The woven slide fastener is formed by molding elements which describe coil-shaped loops consisting of a continuous, synthetic resin monofilament while the continuous monofilament is inserted in double picks, and weaving the elements into a longitudinal side portion of a fastener tape at the same time that

the tape is woven. A flat coil 1 comprises a continuous monofilament 1', which has been deformed under pressure at regular intervals, and is produced by winding the monofilament 1' into a coil while the monofilament is bent at the deformed portions to form heel portions a and coupling head portions b. Each element unit is connected at its ends, namely at its heel portions a, with an element unit at either side thereof to construct an element row B forming the flat coil. Upper binding warp threads 2 extend substantially linearly along the upper sides of upper leg portions c of the elements, and coil-fastening warp threads 6 are arrayed alternately between the upper binding warp threads 2. Lower binding warp threads 3 extend substantially linearly along the lower sides of lower leg portions d of the elements, and the coil-fastening warp threads 6 are alternately arrayed between the lower binding warp threads 3 just as described in connection with the upper binding warp threads. Numeral 4 denotes a looped weft thread which forms a single weft in order to be inserted in double picks by a needle-type weaving machine. The weft thread 4 is arranged in such a manner that loops are formed near the upper and lower leg portions of the elements by the upper and lower binding warp threads extending substantially linearly at the longitudinal edge portion where the elements are woven into the tape. These weft threads 4 are interlaced with warp threads 5 to weave the body of the tape fabric. When the weft threads 4 run across the elements on the upper leg side thereof, the upper binding warp threads 2 and coil-fastening warp threads 6 are alternately arrayed up and down in the form of a plain fabric structure. Likewise, when the weft threads 4 run across the elements on the lower leg side thereof, the lower binding warp threads 3 and coil-fastening warp threads 6 are alternately arrayed up and down in the form of a plain fabric structure. Though the upper and lower binding warp threads 2, 3 are illustrated as being perfectly linear, they actually run in a somewhat undulating pattern in the vertical direction owing to tension applied by the weft threads 4, but appear to extend substantially

linearly when the fastener is viewed in its entirety. The warp thread 5 mentioned above weaves the tape fabric by being interlaced with the weft threads 4. The coil-fastening warp threads 6 are alternately arrayed in such a manner that one is disposed between mutually adjacent threads of the upper binding warp threads and one between mutually adjacent threads of the lower binding warp threads. The fastening warp threads 6 are woven in at 2/2 with respect to the weft thread 4 and at 1/1 with respect to the continuous monofilament 1', and are interlaced with the weft thread 4 and with the continuous monofilament 1' to weave in the flat coil 1 as a portion of the tape fabric.

In the first embodiment illustrated in Fig. 1, the slide fastener includes three upper binding warp threads, five lower binding warp threads 3, and four coil-fastening warp threads 6. However, the number of warp threads of each type may be increased or decreased depending upon the thickness, length and shape of the element leg portions.

According to the first embodiment of the present invention, upper binding warp threads extending substantially linearly longitudinally of a fastener chain are arranged along the upper and lower surfaces of upper and lower element leg portions, respectively. As a result, elongation of the fastener chain is reduced in comparison with the conventional arrangement in which the binding warp threads are woven in by interlacing them with the element leg portions in over-and-under fashion. Coil spacing is therefore stabilized to a great degree. Since a coil-fastening warp thread is alternately arranged between the binding warp threads, each coil loop is maintained in a correct upstanding attitude. Moreover, by virtue of the fact that the weft threads 4 are arranged in the manner of a plain fabric structure, running above the upper binding warp threads 2 and below the coil-fastening threads 6 on the side of the upper leg portions c of the elements and running below the lower binding warp threads 3 and above the coil-fastening threads 6 on the side of the lower leg portions d, shifting of the binding warp threads 2, 3

is prevented so that the warp threads on the leg portions of the elements can be arrayed further apart without overlapping one another. This makes it possible to retain the elements over a wide range. The ability to hold the coil loops in the correct upstanding attitude and the stability of the coil spacing are greatly enhanced, the bending and tensile strength and the thrust-up strength of the fastener chain are improved, and the fastener chain itself is rendered thin and flexible.

Numerals 7, 7' in Fig. 1 denote gap-closing warp threads. In order to fill and close gaps between the leg portions of neighboring elements on the longitudinal side portion of the tape where the coupling heads are located, the two warp threads 7, 7' are arranged to cross at these gaps and to interlace the weft threads 4.

Fig. 2 illustrates a second embodiment of the invention. Unlike the first embodiment of the invention shown in Fig. 1, one less lower binding warp 3 is provided, two warp threads 7" are used in place of the single lower gap-closing warp thread 7', the two warp threads 7" alternately cross the upper gap-closing warp thread 7 in the form of a 1/3 structure and are interlaced with the weft threads 4, whereby the lower gap-closing warp threads 7" are endowed with a coil-fastening action. The construction of the woven slide fastener is similar to that of the first embodiment in other respects.

The first and second embodiments of the present invention thus provide effective woven slide fasteners in which the ability to maintain the coil loops in a correct upstanding attitude and the stability of coil spacing are vastly improved by providing binding warp threads extending substantially linearly longitudinally of a fastener chain, and arranging coil-fastening warp threads between the binding warp threads. Gap-closing warp threads are arranged to cross and flex at weft threads between neighboring element leg portions on the longitudinal side portion of the tape

where the coupling heads are located. The gaps between the leg portions are therefore filled and closed to hold the coupling head portions in a normal attitude and facilitate fastener coupling. The upper and lower binding warp threads are prevented from slipping off the elements by the crossed gap-closing warp threads and weft threads. In particular, element holding force is enhanced by alternately zig-zagging the lower gap-closing warp threads across the two leg portions of the elements, and bending and tensile strength are improved on the reverse side of the fastener chain.

Fig. 3 is a perspective view illustrating a principal portion of a woven slide fastener according to a third embodiment of the present invention. The woven slide fastener is formed by molding elements which describe coil-shaped loops consisting of a continuous, synthetic resin monofilament while the continuous monofilament is inserted in double picks, and weaving the elements into a longitudinal side portion of a fastener tape at the same time that the tape is woven. Parts designated by numerals 1 through 6 correspond to those represented by like numerals in Fig. 1 and shall not be described again.

Numeral 6' in Fig. 3 denotes a second coil-fastening warp thread arranged between a gap-closing warp thread 8 and the upper binding warp thread 2. The weft threads 4 pass below the lower binding warp threads 3, so that the coil-fastening warp thread 6', unlike the other coil-fastening warp threads 6, crosses the weft threads 4 intermediate the upper and lower leg portions c, d in the gaps between the leg portions of neighboring elements. In order to fill and close the gaps between the leg portions of neighboring elements on the longitudinal side portion of the tape where the coupling heads are located, the weft threads 4, which have been inserted in double picks, are wound around the gap-closing warp thread 8 by being turned back.

The third embodiment of the present invention thus provides a more effective woven slide fastener in which the ability to maintain the coil loops in a correct upstanding attitude and the stability of coil spacing are vastly

improved by providing binding warp threads extending substantially linearly longitudinally of a fastener chain, and arranging coil-fastening warp threads between the binding warp threads. A gap-closing warp thread is arranged to have weft threads wound thereon between neighboring element leg portions on the longitudinal side portion of the tape where the coupling heads are located. The gaps between the leg portions are therefore filled and closed to hold the coupling head portions in a normal attitude and facilitate fastener coupling. By winding the weft threads on the gap-closing warp threads, stitching stability at the time the elements are woven in is enhanced. Shifting of the gap-closing warp thread toward the tape fabric proper is prevented by the coil-fastening warp thread 6' arranged on the longitudinal side edge of the tape, thereby allowing the foregoing excellent effects to be maintained over a longer period of time.

As many apparently widely different embodiments of the present invention can be made without departing from the spirit and scope thereof, it is to be understood that the invention is not limited to the specific embodiments thereof except as defined in the appended claims.

Claims:

1. A woven slide fastener having a tape fabric body, a continuous monofilament forming coil-shaped fastener elements and inserted in double picks in a longitudinal side edge of the tape fabric body, warp threads, and a weft thread extending continuously from the tape fabric body and woven together with the warp threads to form a unitary body, said woven slide fastener comprising a plurality of upper binding warp threads running substantially linearly along an upper side of upper leg portions of the fastener elements, a plurality of lower binding warp threads running substantially linearly along a lower side of lower leg portions of the fastener elements; said upper and lower warp threads being arranged in warp threads constituting an element weave-in portion, and coil-fastening warp threads disposed between the binding warp threads and arranged to span and interlace with the continuous monofilament and the weft thread extending from the tape fabric body to the element weave-in portion on upper and lower sides of the continuous monofilament forming the elements, said weft thread being arranged to run over the upper binding warp threads and under the coil-fastening warp threads on the side of the upper leg portions of the elements and to run under the lower binding warp threads and over the coil-fastening warp threads on the side of the lower leg portions of the elements, and further comprising gap-closing warp threads arranged in an edge portion of the element weave-in portion on the side of coupling heads and interlaced with said weft thread so as to close gaps between mutually adjacent coupling heads of the elements.

2. A woven slide fastener having a tape fabric body, a continuous monofilament forming coil-shaped fastener elements and inserted in double picks in a longitudinal side edge of the tape fabric body, warp threads, and a weft thread extending continuously from the tape fabric body and woven together with the warp threads to form a unitary body, said woven slide fastener comprising a plurality of upper binding warp threads running substantially linearly along an upper side of upper leg portions of the fastener elements, a plurality of lower binding warp threads running substantially linearly along a lower side of lower leg portions of the fastener elements, said upper and lower warp threads being arranged in warp threads constituting an element weave-in portion, and coil-fastening warp threads disposed between the binding warp threads and arranged to span and interlace with the continuous monofilament and the weft thread extending from the tape fabric body to the element weave-in portion on upper and lower sides of the continuous monofilament forming the elements, said weft thread being arranged to run over the upper binding warp threads and under the coil-fastening warp threads on the side of the upper leg portions of the elements and to run under the lower binding warp threads and over the coil-fastening warp threads on the side of the lower leg portions of the elements, and further comprising a gap-closing warp thread arranged at an edge of the element weave-in portion on the side of coupling heads of the elements, said weft thread being wound around said gap-closing thread to close gaps between mutually adjacent coupling heads of the elements.

3. A woven slide fastener according to claim 2, wherein a coil-fastening warp thread nearest to said

gap-closing warp thread interlaces with the weft thread intermediate the upper and lower leg portions of each element.

4. A woven slide fastener substantially as described with reference to and as illustrated in Figure 1 of the accompanying drawings.

5. A woven slide fastener substantially as described with reference to and as illustrated in Figure 2 of the accompanying drawings.

6. A woven slide fastener substantially as described with reference to and as illustrated in Figure 3 of the accompanying drawings.