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PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Method of Manufacturing Double-Loop Stitched Slide Fasteners

I, TADAO YOSHIDA, a citizen of Japan, of 339, Suwadacho-2-chome, Ichikawa-shi, Japan, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of manufacturing double-loop stitched slide fasteners and more particularly to a method of stitching a coiled or U-shaped interlocking element having interengaging heads formed thereon onto a fastener tape, and has for its object to provide such a method whereby an interlocking element is stitched onto the fastener tape while forming a raised braid including the stitching thread and a separately fed yarn and extending longitudinally of the element to cover the top thereof. The interlocking element used may be a U-shaped element having leg portions formed in aligned parallel relation to each other during production of such element, or may be a coiled element having leg portions straightened similarly or may be an unstraightened element having tortuous leg portions not in alignment with but aslant to each other. In case of such unstraightened interlocking element the leg portions are aligned or straightened parallel to each other, according to the present invention, during the stitching operation.

As is well known, it is particularly important in the manufacture of a double-loop stitched slide fastener comprising a fastener tape having only one interlocking element stitched thereto on one side thereof that the leg portions of the element are firmly stitched onto the tape surface in regularly spaced apart relation to each other with high accuracy. Meanwhile, where an interlocking element which is comparatively small in size is stitched directly onto the fastener tape, it is rather difficult for the sewing needle to penetrate into the narrow spacing between adjacent leg portions, and especially with a coiled element the sewing needle has been required to operate in an inclined direction with respect to the general plane of the element. In the past, there have been further difficulties in performing such stitching operation in that the element is subjected to deformation during operation and that the alignment of the leg portions of the element is disturbed. A method has been proposed and put into practice to overcome such difficulties in which yarn is previously wrapped around the coil for the purpose of providing a sufficient margin to enable the latter to be stitched on to the fastener tape in a suitable manner thereby to secure the element to the fastener tape instead of stitching the element directly on to the latter. This method, however, is complicated and unsatisfactory.

The method, according to the present invention, of manufacturing double-loop stitched slide fasteners including a step of directing an interlocking element together with a fastener tape to which said element is to be stitched past the point of stitch formation on a double-loop stitch sewing machine, comprises intermittently advancing the interlocking element toward said point of stitch formation by distances each corresponding to the pitch of the interlocking element while progressively superposing fastener tape thereon, by use of a guide plate together with a feed roller mounted adjacent the point of stitch formation and having a peripheral configuration conforming to the configuration of the interlocking element and adapted to rotate intermittently while engaging head portions of the interlocking element which are in the region of stitch formation, regulating the pitch and configuration of opposing leg portions of said interlocking element in the region of stitch formation on the sewing machine and forming a raised covering braid extending along the exposed side of the interlocking element.

The present invention will now be described in connection with the accompanying drawings which illustrate some practical arrangements for carrying out the invention. The pre-

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sent invention being concerned with a method, the drawings only include showings of essential parts of the respective arrangements with details of associated mechanisms and interactions therebetween being omitted for the sake of clarity and convenience.

In the drawings:

Figs. 1 to 11, inclusive, illustrate diagrammatically some examples of stitching mechanism and products obtained thereby;

Fig. 1 represents a fragmentary front view of a slide fastener carrying a pair of double-loop stitched coiled interlocking elements;

Fig. 2 is a fragmentary rear view of the slide fastener showing stitches securing the coiled element to respective fastener tapes;

Fig. 3 is a cross sectional view substantially taken along the line A—A in Fig. 1;

Figs. 4 and 5 are perspective views illustrating the way the coiled element is stitched onto the fastener tape and the way a slide guide formation is braided;

Fig. 6 is a fragmentary plan view illustrating the step of stitching a straightened or finished coiled element onto a fastener tape;

Fig. 7 is a fragmentary side elevation, partly in section, corresponding to Fig. 6;

Fig. 8 is a fragmentary plan view of a preferred arrangement embodying the present invention adapted to straighten the coiled element or to align the opposing leg portions thereof immediately before actual stitching;

Fig. 9 is a fragmentary side elevation, partly in section, of the arrangement shown in Fig. 8;

Fig. 10 is a fragmentary plan view of another arrangement embodying the present invention which is adapted to rectify the leg portions of the coiled element into parallel aligned relationship simultaneously with the stitching operation;

Fig. 11 is a fragmentary side elevation of the arrangement shown in Fig. 10;

Figs. 12 to 19, inclusive, are diagrammatic showings of an illustrative example of the inventive arrangement adapted for use with a U-shaped interlocking element, a slide fastener produced with such arrangement and the details of the interlocking element;

Fig. 12 is a front view of a slide fastener produced, Fig. 13 is a fragmentary rear view of the fastener showing the way the U-shaped interlocking elements are stitched onto the respective fastener tapes.

Fig. 14 is an enlarged fragmentary cross section taken along the line B—B in Fig. 12;

Fig. 15 is a fragmentary front view of the U-shaped interlocking element;

Fig. 16 is a fragmentary side view of same;

Fig. 17 is a plan view, partially in section, of the element;

Fig. 18 is a fragmentary plan view of the arrangement adapted for stitching of U-shaped interlocking elements; and

Fig. 19 is a fragmentary side view of the arrangement shown in Fig. 18.

EXAMPLE 1

Referring first to Figs. 6 and 7, there is shown an illustrative arrangement according to the present invention for use with a finished or straightened interlocking element 3 having interengaging head portions 1, which enable the slide fastener employing a pair of such elements to function as intended, and pairs of aligned leg portions 2 extending in parallel with each other. With this mechanism, the interlocking element is stitched onto a fastener tape 4 while at the same time a guide formation along which a slider is to slide is produced to form a product which ensures reliable interlocking and disengagement of the slide fastener employing such product.

A guide 5 is provided to feed the interlocking element, which is advanced in an intermittent manner precisely by a distance corresponding to the pitch of the legs with each fractional revolution of a toothed feed roller 6. It will be understood that, during such intermittent motion, the tape and element come to rest as one of the spacings 10 between longitudinally adjacent leg portions is brought to the point of stitch formation immediately below the then raised sewing needle 7. Upon each stoppage, the tape and element are brought into close contact with each other by means of a tape presser 8, and the sewing needle carrying a stitching thread 9 then penetrates through the spacing 10 between longitudinally adjacent leg portions of the element below and through the tape 4 to the underside of the tape, which is to form the front surface of the assembly when finished. On this occasion, a knitting yarn 12 fed by a looper 11 cooperates with the stitching thread 9, as shown in Figs. 4 and 5, to form a raised covering braid 13 (Fig. 7). It will readily be observed that, with this arrangement according to the present invention, the element is advanced precisely by a distance equal to the pitch of the legs with each fractional revolution of the feed roller 6, and the legs thereof which has thus been placed at the point of stitch formation is then firmly stitched onto the fastener tape while at the same time a raised covering braid is automatically formed by the double-loop stitching on the top of the interlocking element in a continuous manner.

EXAMPLE 2

Referring next to Figs. 8 and 9, there is shown another illustrative arrangement for carrying out the present invention in which a coiled interlocking element having interengaging head portions and pairs of unaligned leg portions is fed through a coil guide means to be stitched onto a fastener tape while a raised covering braid is formed on the top of the element by double-loop stitching, the two leg portions of each coil convolution being aligned

immediately before they are stitched. In the figures, numeral character 15 denotes a coil guide having a heater means 16 embedded therein; and numeral 17 denotes a heating roller having an integral toothed gear A at one end and a knurled portion B adjacent to said gear A, said roller being adapted to be rotated intermittently. The interlocking element 3 being fed along the top of the coil guide 15 is advanced intermittently with the interengaging head portions embraced in succession by adjacent teeth of the gear A and thus is heated to soften by the heating roller 17 and the coil guide 15 with heater 16 embedded therein. On this occasion, the knurling B on the heating roller 17 which is in pressure contact with the element acts to automatically rearrange and rectify the misalignment of the two leg portions 2 in each of the coil convolutions so that the latter are straightened parallel to each other and normal to the general plane of the element and hence the tape while on the other hand the toothed gear 19 on the feed roller 18 operates to advance the interlocking element intermittently by distances each corresponding to the pitch of the coil. It will be observed that the interlocking element is stitched onto a fastener tape 4 being fed over tape guides 20 and 21 by a sewing machine needle 7 and a cooperating looper 11 while at the same time a braided ridge 13 is formed on the top side of the interlocking element by double-loop stitching in substantially the same manner as in the previous examples.

EXAMPLE 3

The illustrative arrangement shown in Figs. 10 and 11 is for use with a coiled interlocking element preliminarily heated to soften to such an extent as to allow free deformation thereof and is operable to secure the element to a fastener tape while straightening the element so that it has parallel spaced pairs of aligned leg portions and at the same time to form a raised covering braid extending along the top of the element. Though the element 3 is made deformable by means of a heating roller 17 and a coil guide 15 provided with a heater means 16 as with the case of Example 2, the unstraightened element with pairs of unaligned leg portions is fed onto an inclined surface formed on the coil guide 15 immediately before the element is stitched onto the tape 4 or just ahead of the point of stitch formation where the sewing needle 7 and the looper 11 cooperate to form stitches. The inclined surface acts upon successive coil convolutions so as to cause the convolutions and hence the spaces therebetween to extend substantially vertically facilitating the penetration of the sewing needle 7 through the element and the underlying fastener tape. It will be appreciated that the coil convolutions or the pairs of leg portions of the element are automatically straightened by a sewing thread 9 being properly carried through the successive spaces between adjacent coil convolutions during the rest periods of the interlocking element after its incremental forward travel corresponding to the pitch of the convolutions and are cooled to set in parallel with each other thus forming spaces allowing the interengaging head portions to interfit to those of a mating interlocking element. The looper operates to feed a knitting yarn 12 which cooperates with the sewing thread 9 to form a raised covering braid 13 along the top of the interlocking element 3 as described hereinbefore in connection with Example 2.

EXAMPLE 4

Figs. 18 and 19 illustrate another arrangement according to the present invention for double-looped stitching U-shaped interlocking elements formed of synthetic resin wire. A U-shaped interlocking element 3 in the figures is further shown in detail in Figs. 15 to 17 and has interengaging head portions 1 interconnected in staggered relation as seen in Fig. 16 and leg portions 2 joined to the head portions on opposite sides thereof. Each pair of opposite leg portions 2 defines therebetween a space 20 which receives a cord-like core insert 35. With this arrangement the double-loop stitching is performed while fitting such insert 35 into the spaces 20 progressively. Otherwise, the operation of this arrangement is substantially similar as that of Example 1. In Figs. 18 and 19, reference numeral 45 denotes a feed roller adapted to effect intermittent rotation and having teeth 46 formed about the periphery; and numeral 25 denotes an element guide for directing the interlocking element to the point of stitch formation on the sewing machine. Disposed above the element guide 25 are a rotatable core cord guide wheel 36 which partially extends into a number of said spaces 20 in the element adjacent thereto and guide rollers 37 and 38 over which a fastener tape 4 is fed from above to join with the interlocking element. A pair of take-up rollers 21 and 22 operate to advance the U-shaped element 3 straight along the top surface of the element guide 25 past the point of stitch formation in an intermittent manner by distances each corresponding to the pitch of the convolutions of the element under the control of the feed roller 45 which rotates intermittently. In the course of such advance the interlocking element 3 is combined progressively with the fastener tape 4 fed from above over the guide rollers 37 and 38 and with the core cord 35 fed over the guide wheel 36 in a horizontal direction, and subsequently at the point of stitch formation is double-loop stitched by means of a sewing needle 7 and a cooperating looper 11 to form a raised covering braid 13 along the top of the interlocking element as in the preceding examples, and finally withdrawn by the take-up rollers 21 and 22 exteriorly of the machine.

It will be apparent from the foregoing that,

in stitching a continuous coiled or U-shaped interlocking element on to a fastener tape, according to the present invention, the interengaging head portions and the opposing leg portions of the element are straightened to have an accurate pitch and configuration to ensure reliable and smooth interlocking of the fastener while on the other hand the sewing thread and knitting yarn are utilized to form a raised covering braid along the exposed surface of the element. It will be appreciated that the present invention provides a method which enables production of excellent high accuracy slide fasteners at an extremely high efficiency.

Having regard to the provisions of Section 9 of the Patents Act, 1949, attention is directed to the claims of Patent No. 881,289.

WHAT I CLAIM IS:—

1. A method of manufacturing double-loop stitched slide fasteners including a step of directing an interlocking element together with a fastener tape to which said element is to be stitched past the point of stitch formation on a double-loop stitch sewing machine, comprising intermittently advancing the interlocking element toward said point of stitch formation by distances each corresponding to the pitch of the interlocking element while progressively superposing fastener tape thereon, by use of a guide plate together with a feed roller mounted adjacent the point of stitch formation and having a peripheral configuration conforming to the configuration of the interlocking element and adapted to rotate intermittently while engaging head portions of the interlocking element which are in the region of stitch formation, regulating the pitch and configuration of opposing leg portions of said interlocking element in the region of stitch formation on the sewing machine and forming a raised covering braid extending along the exposed side of the interlocking element.

2. The method of manufacturing double-loop stitched slide fasteners substantially as described herein.

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