

SPECIFICATION **Method of Manufacturing Separable Sliding** **Clasp Fastener**

The present invention relates generally to the production of sliding clasp fasteners, and more particularly to a method of manufacturing sliding clasp fasteners of a separable type from a pair of fastener stringers of continuous or substantially endless length.

There have been proposed many separable sliding clasp fasteners equipped with a separable end connector which comprises a separable pin fixed to the bottom end of one of two opposed fastener stringers, a retainer pin fixed to the bottom end of the other stringer, and a retainer attached to the retainer pin for receiving the separable pin to connect the two fastener stringers at their bottom ends. In the case of known separable fasteners, each of the separable pin and the retainer pin is formed usually with use of a separate piece of material from the material which constitutes the fastener stringers per se. Such process is complicated and time-consuming.

According to the present invention, there is provided a method of manufacturing individual sliding clasp fasteners of a separable type from a pair of continuous sliding clasp fastener stringers having a pair of stringer tapes carrying along their respective inner longitudinal edges a pair of interengaged rows of coupling elements, comprising the steps of: feeding the continuous sliding clasp fastener stringers intermittently for a distance corresponding to a desired fastener length; placing a backing strip of synthetic resin on one surface of a first portion of the stringers while the stringers are held stationary between each intermittent movement, said strip extending transversely of the stringers; applying heat and pressure to the stringers at said first portion where the strip has been placed upon, to fuse adjacent coupling elements with each other, the coupling elements with the stringer tapes, and the latter with the strip, and to shape the fused coupling elements into a desired configuration ready for the formation of a separable pin and a retainer pin; cutting such fused and shaped coupling elements so as to finish the separable pin and the retainer pin; simultaneously with the finishing of the separable pin and the retainer pin, cutting the stringers along a line extending transversely across the stringers and passing near one end of each of the two pins, whereby said continuous sliding clasp fasteners stringers are severed into an individual sliding clasp fastener length; threading a slider through one of the stringers of said individual fastener length on which the retainer pin has been formed; and attaching a retainer to the retainer pin.

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

Figure 1 is a fragmentary plan view of a pair of continuous fastener stringers from which in-

dividual sliding clasp fasteners of a separable type are manufactured according to the present invention;

Figure 2 is a cross-sectional view taken along line II—II of Figure 1, illustrating the manner in which the stringers are fused and compressed;

Figure 3 is a fragmentary plan view of the stringers, showing the same after the fusing and compressing operation has been completed;

Figure 4 is a cross-sectional view taken along line IV—IV of Figure 3;

Figure 5 is a fragmentary plan view of the stringers, illustrating the manner in which the stringers are cut to form a separable pin. A retainer pin, and a top end stop, respectively;

Figure 6 is a fragmentary plan view of the stringers, showing the same after the cutting operation has been completed;

Figure 7 is a cross-sectional view taken along line VII—VII of Figure 6;

Figure 8 is a cross-sectional view taken along line VIII—VIII of Figure 6;

Figure 9 is a fragmentary plan view of the stringers; showing the same after a box-like retainer has been attached to the retainer pin;

Figure 10 is a schematic plan view of a separable sliding clasp fastener manufactured according to the present invention;

Figure 11 is an enlarged plan view of a top end stop of the separable sliding clasp fastener shown in Figure 10; and

Figure 12 is an enlarged plan view of a separable end connector of the separable sliding clasp fastener shown in Figure 10.

In Figure 1, there is fragmentarily shown a pair of sliding clasp fastener stringers 10, 11 of continuous length which comprise a pair of stringer tapes 12, 13 carrying a pair of interengaged rows of coupling elements 14, 15, respectively. Each coupling element 14, 15 is sewn to one of the stringer tapes 12, 13 along its inner longitudinal edge by a sewing thread 16 made of synthetic fibers such as polyester fibres or yarn blended therewith. Each row of coupling element 14, 15 is formed from a continuous filament of a thermoplastic synthetic resin into a helical coil structure including a plurality of turns spaced longitudinally of the tape. Each of the turns includes a pair of spaced legs 17, and a coupling head 18 extending between the legs 17. Each coupling element row 14, 15 has a plurality of connecting portions 19 each extending between adjacent turns. Although the coupling elements 14, 15 are herein shown to be helically coiled, they may be of a meandering or zigzag formation.

Individual sliding clasp fastener products 38 (Figure 10) are manufactured from the above-described continuous fastener stringers 10, 11 in the following manner.

First, a backing strip 20 made of a synthetic resin such as polyester is attached onto the reverse surface of the fastener stringers 10, 11 by adhesive-bonding, as shown in Figure 1. The

backing strip 20 extends transversely across the fastener stringers 10,11.

Then, the interengaged rows of coupling elements 14,15 are shaped or deformed with heat and pressure at a first portion 21 (Figure 1) thereof into the shape shown in Figures 3 and 4. This deformation is effected by means of an ultrasonic horn 22 and an anvil 23 which are designed to jointly compress the fastener stringers 10,11 and the backing strip 20 in a sandwich manner, as shown in Figure 2. At the time, the anvil 23 and the ultrasonic horn 22 are brought into pressed contact with the front surface of the fastener stringers 10,11 and the reverse surface of the strip 20, respectively.

The anvil 23 includes a mold cavity 24 having a length equal to a predetermined amount of leg-to-leg pitches (nearly six pitches in the illustrated example) of the coupling elements 14,15, a depth H_1 slightly smaller than the height H_2 of the coupling elements 14,15, and a width W_1 slightly smaller than the width W_2 of the interengaged rows of coupling elements 14,15. The anvil 23 is further provided with a pair of recesses 25,25 coextending with the cavity 24 along its opposite longitudinal edges. Accordingly, when the anvil 23 is lowered to compress the coupling elements 14, 15, the connecting portions 19,19 of the latter are pressed by the recesses 25,25 of the anvil 23 and are thus shaped into a pair of minor-thickness edge portions 26,26. The minor-thickness edge portions 26,26 each have a flat surface so that a slider 27 (Figure 4) can be moved thereon smoothly. Extending between the two edge portions 26,26 is a major-thickness central portion 28 of which the contour conforms substantially to that of the cavity 24.

Simultaneously as the coupling elements 14,15 are deformed from the shape of Figures 1 and 2 into that of Figures 3 and 4, the backing strip 20 is fused and compressed by the ultrasonic horn 22 with the results that the strip 20 is reduced in thickness as at 29 (Figure 4). Because the strip 20 can be attached to the fastener stringers 10,11 solely by this fusion-bonding, the aforementioned adhesive-bonding step may be omitted.

As best shown in Figure 4, the coupling elements 14,15 in the deformed first portion 21 are fused with each other as well as with the stringer tapes 12,13 which in turn are fused with the backing strip 20. The sewing threads 16 also are fused with the coupling elements 14,15 and are thus prevented from becoming loose. The extent to which the coupling elements 14,15 are deformed may be only appreciable and may be hardly observed when viewed in projection as shown in Figure 3. They may be deformed in part or whole, as the case may be.

Subsequently, a top end stop 30 (Figure 5) is formed on the fastener stringers 10,11. As shown in Figure 3, a film or strip 31 made of a synthetic resin is first placed on the fastener stringers 10,11 such that it extends across the interengaged coupling element rows 14,15,

overlying a group of coupling element turns adjacent the rear end of the deformed first portion 21. Then, pressure and heat is applied by means of an ultrasonic horn and an anvil (both not shown) to the film 31 for simultaneously fusing the film 31 with the stringer tapes 12,13 and the said group of turns of coupling elements 13,15 and shaping a pair of outer edges 32,33 of the top end stop 30 into a desired form. Thus, the top end stop 30 is formed at a position adjacent the rear end of the deformed first portion 21. Alternatively, the top end stop 30 may be formed at a location away from the deformed first position 21.

Then, the fastener stringers 10,11 are cut along dash-and-dot lines L (Figure 5) to provide a separable pin 34, a retainer pin 35, and a pair of opposed top end stop lugs 36, 37, respectively, as shown in Figure 6. This cutting operation is effected by a suitable punch with heat generated as by an ultrasonic horn (not shown).

With the continuous sliding clasp fastener stringers 10,11 fed intermittently for a distance corresponding to a desired fastener length, all of the preceding steps are carried out while the stringers 10,11 are held stationary between each intermittent movement. Thus, a plurality of pairs of fastener stringers of the individual fastener length have been obtained, each pair of fastener stringers 10,11 being furnished at its top end with the separable top end stop 30 and at its bottom end with the separable pin 34 and the retainer pin 35.

In the manufacture of each sliding clasp fastener product 38 (Figure 10), the opposed fastener stringers 10,11 are separated apart from each other, and a slider 27 is then threaded through the fastener stringer 11 on which the retainer pin 35 has been formed. Finally, a box-like retainer 39 is secured to the retainer pin 35 by fusion-bonding, adhesive-bonding or other suitable means, as shown in Figure 9. The separable pin 34, the retainer pin 35 and this box-like retainer 39 jointly constitute a separable end connector 40. In this manner, a plurality of individual sliding clasp fastener products 38, only one of which is shown in Figures 10 to 12 inclusive, are manufactured.

Claims

1. A method of manufacturing individual sliding clasp fasteners of a separable type from a pair of continuous sliding clasp fastener stringers having a pair of stringer tapes carrying along their respective inner longitudinal edges a pair of interengaged rows of coupling elements, comprising the steps of: feeding the continuous sliding clasp fastener stringers intermittently for a distance corresponding to a desired fastener length; placing a backing strip of synthetic resin on one surface of a first portion of the stringers while the stringers are held stationary between each intermittent movement, said strip extending transversely of the stringers; applying heat and pressure to the stringers at said first portion where the strip has been placed upon, to fuse



backing strip 20 extends transversely across the fastener stringers 10,11.

Then, the interengaged rows of coupling elements 14,15 are shaped or deformed with heat and pressure at a first portion 21 (Figure 1) thereof into the shape shown in Figures 3 and 4. This deformation is effected by means of an ultrasonic horn 22 and an anvil 23 which are designed to jointly compress the fastener stringers 10,11 and the backing strip 20 in a sandwich manner, as shown in Figure 2. At the time, the anvil 23 and the ultrasonic horn 22 are brought into pressed contact with the front surface of the fastener stringers 10,11 and the reverse surface of the strip 20, respectively.

The anvil 23 includes a mold cavity 24 having a length equal to a predetermined amount of leg-to-leg pitches (nearly six pitches in the illustrated example) of the coupling elements 14,15, a depth H_1 slightly smaller than the height H_2 of the coupling elements 14,15, and a width W_1 slightly smaller than the width W_2 of the interengaged rows of coupling elements 14,15. The anvil 23 is further provided with a pair of recesses 25,25 coextending with the cavity 24 along its opposite longitudinal edges. Accordingly, when the anvil 23 is lowered to compress the coupling elements 14, 15, the connecting portions 19,19 of the latter are pressed by the recesses 25,25 of the anvil 23 and are thus shaped into a pair of minor-thickness edge portions 26,26. The minor-thickness edge portions 26,26 each have a flat surface so that a slider 27 (Figure 4) can be moved thereon smoothly. Extending between the two edge portions 26,26 is a major-thickness central portion 28 of which the contour conforms substantially to that of the cavity 24.

Simultaneously as the coupling elements 14,15 are deformed from the shape of Figures 1 and 2 into that of Figures 3 and 4, the backing strip 20 is fused and compressed by the ultrasonic horn 22 with the results that the strip 20 is reduced in thickness as at 29 (Figure 4). Because the strip 20 can be attached to the fastener stringers 10,11 solely by this fusion-bonding, the aforementioned adhesive-bonding step may be omitted.

As best shown in Figure 4, the coupling elements 14,15 in the deformed first portion 21 are fused with each other as well as with the stringer tapes 12,13 which in turn are fused with the backing strip 20. The sewing threads 16 also are fused with the coupling elements 14,15 and are thus prevented from becoming loose. The extent to which the coupling elements 14,15 are deformed may be only appreciable and may be hardly observed when viewed in projection as shown in Figure 3. They may be deformed in part or whole, as the case may be.

Subsequently, a top end stop 30 (Figure 5) is formed on the fastener stringers 10,11. As shown in Figure 3, a film or strip 31 made of a synthetic resin is first placed on the fastener stringers 10,11 such that it extends across the interengaged coupling element rows 14,15,

overlying a group of coupling element turns adjacent the rear end of the deformed first portion 21. Then, pressure and heat is applied by means of an ultrasonic horn and an anvil (both not shown) to the film 31 for simultaneously fusing the film 31 with the stringer tapes 12,13 and the said group of turns of coupling elements 13,15 and shaping a pair of outer edges 32,33 of the top end stop 30 into a desired form. Thus, the top end stop 30 is formed at a position adjacent the rear end of the deformed first portion 21. Alternatively, the top end stop 30 may be formed at a location away from the deformed first position 21.

Then, the fastener stringers 10,11 are cut along dash-and-dot lines L (Figure 5) to provide a separable pin 34, a retainer pin 35, and a pair of opposed top end stop lugs 36, 37, respectively, as shown in Figure 6. This cutting operation is effected by a suitable punch with heat generated as by an ultrasonic horn (not shown).

With the continuous sliding clasp fastener stringers 10,11 fed intermittently for a distance corresponding to a desired fastener length, all of the preceding steps are carried out while the stringers 10,11 are held stationary between each intermittent movement. Thus, a plurality of pairs of fastener stringers of the individual fastener length have been obtained, each pair of fastener stringers 10,11 being furnished at its top end with the separable top end stop 30 and at its bottom end with the separable pin 34 and the retainer pin 35.

In the manufacture of each sliding clasp fastener product 38 (Figure 10), the opposed fastener stringers 10,11 are separated apart from each other, and a slider 27 is then threaded through the fastener stringer 11 on which the retainer pin 35 has been formed. Finally, a box-like retainer 39 is secured to the retainer pin 35 by fusion-bonding, adhesive-bonding or other suitable means, as shown in Figure 9. The separable pin 34, the retainer pin 35 and this box-like retainer 39 jointly constitute a separable end connector 40. In this manner, a plurality of individual sliding clasp fastener products 38, only one of which is shown in Figures 10 to 12 inclusive, are manufactured.

Claims

1. A method of manufacturing individual sliding clasp fasteners of a separable type from a pair of continuous sliding clasp fastener stringers having a pair of stringer tapes carrying along their respective inner longitudinal edges a pair of interengaged rows of coupling elements, comprising the steps of: feeding the continuous sliding clasp fastener stringers intermittently for a distance corresponding to a desired fastener length; placing a backing strip of synthetic resin on one surface of a first portion of the stringers while the stringers are held stationary between each intermittent movement, said strip extending transversely of the stringers; applying heat and pressure to the stringers at said first portion where the strip has been placed upon, to fuse

19

adjacent coupling elements with each other, the coupling elements with the stringer tapes, and the latter with the strip, and to shape the fused coupling elements into a desired configuration ready for the formation of a separable pin and a retainer pin; cutting such fused and shaped coupling elements so as to finish the separable pin and the retainer pin; simultaneously with the finishing of the separable pin and the retainer pin, cutting the stringers along a line extending transversely across the stringers and passing near one end of each of the two pins, whereby said continuous sliding clasp fasteners stringers are severed into an individual sliding clasp fastener length; threading a slider through one of the stringers of said individual fastener length on which the retainer pin has been formed; and attaching a retainer to the retainer pin.

2. A method according to claim 1, wherein said strip is attached to said one surface of the stringers by adhesive-bonding.

3. A method according to claim 1, wherein said step of applying heat and pressure is carried out by an ultrasonic horn and an anvil.

4. A method according to claim 1, wherein said

step of cutting the fused coupling elements and the stringers is carried out by a punch and an ultrasonic horn.

5. A method according to claim 1, further comprising the steps of: placing a film of synthetic resin on the other surface of a second portion of the stringers such that the film extends across the coupling elements, said film being located adjacent to said first portion of the stringers; applying heat and pressure to the stringers at said second portion where the film has been placed upon, to fuse adjacent coupling elements with each other, the coupling elements with the stringer tapes, and the film with the coupling elements and the stringer tapes, and to shape the fused coupling elements and the film into a desired configuration ready for the formation of a pair of top end stop lugs; and cutting such fused and shaped coupling elements so as to finish the top end stop lugs.

6. A method according to claim 5, wherein the last-mentioned heat-and-pressure applying step for the top end stop lugs is carried out simultaneously with the first-mentioned heat-and-pressure applying step for the separable pin and the retainer pin.

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1982. Published by the Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.



* C L M S *