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SEPARABLE BOTTOM-END-STOP ASSEMBLY
FOR SEPARABLE SLIDE FASTENER

The present invention relates to a separable
bottom-end-stop assembly for a separable slide
5 fastener.

There are known various separable slide
fasteners in which a separable bottom-end-stop assembly
of thermoplastic synthetic resin is mounted on adjacent
bottom ends of opposed fastener stringers. The
10 separable bottom-end-stop assembly generally comprises
a pair of pin members secured to the inner tape margins
at their respective bottom end portions, and a socket
member secured to one of the pin members. In some of
the known bottom-end-stop assemblies, the socket member
15 is attached to one of the pin members by snap action,
and in the others, the socket member is fused with one
of the pin members by using an ultrasonic horn, for
example.

However, in the former case, adequately firm
20 attachment of the socket member cannot be achieved;
yet, increasing the amount of "snap-action" strength

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causes uneasy insertion of the pin member into a bore of the socket member. The one pin member thus tends to be inclined relative to the socket member to assume an improper posture. Consequently, accurate and reliable assembling of such prior bottom-end-stop components cannot be carried out by a fully-automated assembling machine and must be done by a well-experienced person who operates various separate tools or devices, which is laborious and time-consuming.

In the latter case, although the one pin member can be inserted into the socket member's bore easily, but it is difficult to place the one pin member exactly in position relative to the socket member. Therefore, this prior bottom-end-stop assembly also cannot be assembled by a fully-automated machine.

According to the present invention, there is provided a separable bottom-end-stop assembly for a separable slide fastener including a pair of fastener stringers, each including a stringer tape carrying on its inner longitudinal margin a row of coupling elements, the inner tape-margin having a bottom end portion devoid of coupling elements, said assembly comprising: a first pin member of thermoplastic synthetic resin adapted to be secured to the bottom end portion of the inner tape-margin of one stringer; a second pin member of thermoplastic synthetic resin adapted to be secured to the bottom end portion of the inner tape-margin of the other stringer; a socket member of thermoplastic

synthetic resin secured to said first pin member and having a pair of flanged wings joined by a partition wall to define between said wings a first and second bore for receiving a portion of said first pin member and a portion of said second pin member, respectively, said partition wall having a central bulge swelling into said first bore for resiliently pressing said first pin member, when the latter is inserted into said first bore, against said wings' flanges that partly define said first bore; and one of said first pin member and said socket member having a pair of recesses, the other of said first pin member and said socket member having a pair of projections each adapted to be received in a respective one of said recesses when said socket member is secured to said first pin member.

It is believed possible by means of the present invention to provide a separable bottom-end-stop assembly in which the socket member can be attached to one of the pin members easily and accurately with adequate firmness.

It is further believed possible by means of the present invention to provide a separable bottom-end-stop assembly which can be assembled by a fully-automated machine.

Still another believed possibility of the invention

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is to provide a separable bottom-end-stop assembly in which one of the pin members can be inserted into the socket member's bore easily and reliably without lateral displacement.

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

Figure 1 is a fragmentary plan view of a separable slide fastener having a separable bottom-end-stop assembly embodying the present invention;

10 Figure 2 is a transverse cross-sectional view taken along line II-II of Figure 1;

Figure 3 is a longitudinal cross-sectional view taken along line III-III of Figure 1;

15 Figure 4 is an exploded perspective view of the bottom-end-stop assembly of Figure 1, with one of a pair of pin members omitted;

Figure 5 is a transverse cross-sectional view taken along line V-V of Figure 4;

20 Figure 6 is a side elevational view of a socket member of the bottom-end-stop assembly of Figure 1;

Figure 7 is a cross-sectional view illustrating the manner in which the socket member is secured to one of the pin members by fusing;

Figures 8A, 8B and 8C are fragmentary cross-sectional views of the socket member illustrating the manner in which the socket member is deformed while the pin member is forced into a bore of the socket member;

Figures 9 and 10 are transverse cross-sectional views similar to Figure 2, showing modified forms of the socket member;

Figure 11 is a transverse cross-sectional view showing a modification of the bottom-end-stop assembly;

Figure 12 is an exploded perspective view of a modified bottom-end-stop assembly, with one of a pair of pin members omitted;

Figure 13 is a cross-sectional view taken along line XIII-XIII of Figure 12;

Figure 14 is a cross-sectional view taken along line XIV-XIV of Figure 13;

Figure 15 is a cross-sectional view illustrating the manner in which the socket member is secured to one of the pin members by fusing; and

Figure 16 is a cross-sectional view similar to Figure 15, showing a modified form of the socket member.

Figure 1 shows a separable slide fastener 1 comprising a pair of fastener stringers each including a stringer tape 2, 3 carrying on and along its inner longitudinal margin 2a, 3a a row of coupling elements 7

in the form of separate scoops of thermoplastic synthetic resin. A separable bottom-end-stop assembly 100 is mounted on adjacent bottom ends of the stringers at the respective bottom end portions of the confronting inner tape-margins 2a, 3a. The bottom end portion is devoid of several coupling elements 7, the number of which is not pertinent here. A slider (not shown) is threaded on the opposed coupling element rows 7, 7 for movement therealong to close and open the slide fastener 1.

As shown in Figures 1-4, the separable bottom-end stop assembly 100 includes a first separate pin member 5 of thermoplastic synthetic resin mounted on the bottom end portion of one of the inner tape-margins 2a by injection-molding, a second separate pin member 6 of thermoplastic synthetic resin mounted on the bottom end portion of the other inner tape-margin 3a by injection-molding, and a socket member 4 of thermoplastic synthetic resin secured to the first pin member 5 by fusing in a manner described below.

As shown in Figure 4, the socket member 4 has a pair of flanged upper and lower wings 10, 11 joined by a partition wall 14 extending centrally of the wings 10, 11 to defined a first longitudinal through bore 15 and a second longitudinal blind bore 16 for receiving a portion of the first pin member 5 and a portion of the second pin member 6,

respectively. The socket member 4 has a pair of slits 17, 17, each communicating with a respective one of the first and second bore 15, 16, for receiving the respective stringer tapes 2, 3, as shown in Figure 2.

5 The partition wall 14 has a central bulge 19 swelling into the first bore 15 for resiliently urging or pressing the first pin member 5 against the flanges 13, 13 of the upper and lower wings 10, 11 when the first pin member 5 is inserted into the first bore 15.
10 In an alternative form shown in Figure 9, the partition wall 14 has in the central bulge 19 a slot 20 extending from a top end of the partition wall 14 and terminating short of a bottom end of the partition wall 14. In an another alternative form shown in Figure 10, the
15 central bulge 19 of the partition wall 14 has a thickness smaller than the other portions of partition wall 14.

Each of the wings 10, 11 has in its inner face a groove 28 extending along the base of the partition
20 wall 14 and opening into the first bore 15, facilitating the deforming of the partition wall 14 when the first pin member 5 is forced into the first bore 15, as described below in connection with Figures 8A, 8B and 8C.

25 The socket member 4 also has at its top end a pair of opposed projections 18, 18 extending from respective inner faces of the upper and lower wings 10,

11 into the first bore 15, for a purpose described below.

5 The first pin member 5 includes an upper portion 23 and a lower portion 24 having a thickness slightly smaller than not only the thickness of the upper portion 23, but also the distance between the upper and lower wings 10, 11. When the socket member 4 is secured to the first pin member 5, the lower portion 24 of the first pin member 5 is received in the first bore 15.

10 The first pin member 5 also has in opposite faces a pair of recesses 25, 25 for receiving the respective projections 18, 18 of the upper and lower wings 10, 11 when the socket member 4 is secured to the first pin member 5, as shown in Figures 1, 3 and 7. Each of the

15 recesses 25 is disposed across the border between the upper and lower portions 23, 24.

The lower portion 24 of the first pin member 5 has on its opposite faces a plurality of ridges 24a (Figures 4 and 5). The ridges 24a are melted and fused

20 with the inner faces of the upper and lower wings 10, 11 when the socket member 4 and the first pin member 5 are joined together by applying heat and pressure in a manner described below in connection with Figure 7.

The second pin member 6 (Figure 1) has a recess

25 for receiving a projection 26 of the first pin member 5 when the first and second pin members 5, 6 are placed exactly in position for correct interengaging of the opposed coupling element rows 7, 7 of the two



stringers.

To attach the socket member 4 to the first pin member 5, the first pin member 5 of Figure 4 is inserted into the first bore 15 of the socket member 4 (Figures 4 and 6) from the top end thereof. At that time the socket member 4, which has in its free form a thickness t_1 (Figure 8A), is expanded or deformed so as to have an increased thickness t_2 (Figure 8B). Then the socket member 4 recovers as the projections 18, 18 of the upper and lower wings 10, 11 are received in the recesses 15, 15, respectively, of the first pin member 5.

Finally, the upper and lower wings 10, 11 are compressed between an ultrasonic horn 30 and a coacting anvil 31, as shown in Figure 7, causing the central bulge 19 to resiliently urge or press the first pin member 5 against the flanges 13, 13 of the upper and lower wings 10, 11. As a result, the socket member 4 is integrally joined with the first pin member 5 by fusing at 32, 33 (Figures 2 and 3), at which time the ridges 24a of the first pin member 5 are melted and fused with the inner faces of the upper and lower wings 10, 11. The resultant socket member 4 has a thickness t_3 (Figure 8C) slightly smaller than the thickness t_1 .

With this arrangement, the socket member 4 can be attached to the first pin member 5 easily and accurately with adequate firmness, partly because the first pin member 5 is resiliently pressed by the

central bulge 19 of the partition wall 14 against the flanges 13, 13 of the upper and lower wings 10, 11, and partly because the projections 18, 18 of the wings 10, 11 are received in the respective recesses 25, 25 of the first pin member 5.

In a modification shown in Figure 11, the first pin member 5 has on its opposite faces a pair of projections 18', 18', and each of the upper and lower wings 10, 11 of the socket member 4 has an opening or recess 25' communicating with the first bore 15 for receiving a respective one of the projections 18'. The first pin member 5 also has a longitudinal groove 5a receptive of a portion of the partitions wall's central bulge 19.

Figure 12 illustrates another modification in which each of the upper and lower wings 10, 11 has on its inner face a plurality of parallel longitudinal guide ridges 35 (Figures 12-15) facing the first bore 15 for being slidably engageable with a respective one of opposite faces of the first pin member 5 while the latter is inserted into the first bore 15. The lower portion 24 of the first pin member 5 is flat at opposite places and has a thickness substantially equal to the distance between the upper and lower wings 10, 11. As shown in Figures 14 and 15, each of the guide ridges 35 has a height decreasing progressively toward a bottom end of the socket member 4 for facilitating the inserting of the first pin member into the first bore 15. The

maximum height of the guide ridges 35 is slightly smaller than the height of projections 18. The first pin member 5 also has one or more additional ridges 36 projecting from a bottom face of each recess 25 and having a height slightly smaller than the depth of the recess 25. The socket member 4 is integrally joined with the first pin member 5 when the upper and lower wings 10, 11 are compressed between the ultrasonic horn 30 and the coacting anvil 31, as shown in Figure 15, at which time the ridges 35 of the wings 10, 11 are melted and fused with the opposite faces of the first pin member 5. At the same time, the ridges 36 of the first pin member 5 also are melted and fused with the respective projections 18, 18 of the wings 10, 11.

Alternatively, each of the guide ridges 35 may be composed of a plurality of spaced segments 35a, as shown in Figure 16.



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CLAIMS

1. A separable bottom-end-stop assembly for a separable slide fastener including a pair of fastener stringers, each including a stringer tape carrying on its inner longitudinal margin a row of coupling elements, the inner tape-margin having a bottom end portion devoid of coupling elements, said assembly comprising:

(a) a first pin member of thermoplastic synthetic resin adapted to be secured to the bottom end portion of the inner tape-margin of one stringer;

(b) a second pin member of thermoplastic synthetic resin adapted to be secured to the bottom end portion of the inner tape-margin of the other stringer;

(c) a socket member of thermoplastic synthetic resin secured to said first pin member and having a pair of flanged wings joined by a partition wall to define between said wings a first and second bore for receiving a portion of said first pin member and a portion of said second pin member, respectively, said partition wall having a central bulge swelling into said first bore for resiliently pressing said first pin member, when the latter is inserted into said first bore, against said wings' flanges that partly define said first bore; and

(d) one of said first pin member and said socket member having a pair of recesses, the other of said first pin member and said socket member having a pair of projections each adapted to be received in a respective one



of said recesses when said socket member is secured to said first pin member.

5 2. A separable bottom-end-stop assembly according to Claim 1, said pair of recesses being disposed in opposite faces of said first pin member, each of said projections being disposed adjacent to a top end of said socket member and extending inwardly from a respective one of said wings.

10 3. A separable bottom-end-stop assembly according to Claim 1, said pair of projections extending from opposite faces of said first pin member, each of said recesses being disposed in a respective one of said wings and opening to said first bore.

15 4. A separable bottom-end-stop assembly according to Claim 1, said first pin member having a longitudinal groove for receiving a portion of said partition wall's central bulge when said socket member is secured to said first pin member.

20 5. A separable bottom-end-stop assembly according to Claim 2, each of said wings having on its inner face a plurality of parallel longitudinal guide ridges facing said first bore for being slidably engageable with a respective one of the opposite faces of said first pin member while the latter is inserted
25 into said first bore, said guide ridges being adapted to be fused with said first pin member by melting when said socket member is secured to said first pin member by applying heat and pressure.



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6. A separable slide fastener according to Claim 5, each of said guide ridges having a height decreasing progressively toward a bottom end of said socket member.

5 7. A separable bottom-end-stop assembly according to Claim 6, each of said guide ridges including a plurality of spaced segments.

10 8. A separable bottom-end-stop assembly according to Claim 5, said first pin member having at least one additional ridge projecting from a bottom face of each of said recess, said additional ridge in each of said recess being adapted to be melted and fused with a respective one of said projections of said socket member when said socket member is secured to
15 said first pin member by applying heat and pressure.

9. A separable bottom-end-stop assembly according to Claim 6, the maximum height of said guide ridges being slightly smaller than the height of said projections.

20 10. A separable bottom-end-stop assembly according to Claim 8, said additional ridge having a height slightly smaller than the depth of said recess.
