

- 1 -

SEPARABLE SLIDE FASTENER

The present invention relates to a slide fastener and more particularly to a separable type of slide fastener having a separable terminal assembly.

A separable terminal assembly (normally referred
5 to as separable bottom end stop) of a separable slide fastener comprises a box-like retainer or socket mounted on one stringer tape at one end thereof, and a separable pin mounted on the other stringer tape at one end thereof and releasably engageable with the socket
10 for interconnecting the two stringer tapes. The separable pin is of a generally tube-like element and normally separated by configuration into two types, one being a substantially straight or slightly curved separable pin and the other being a doglegged or
15 angularly bent separable pin.

A disadvantage of the substantially straight separable pin proposed heretofore lies in the difficulty of its insertion into and extraction from a mating socket with a slider positioned next to the

separable terminal assembly. A muscular effort is necessary since the straight pin, as is moved along a bent channel defined jointly by the slider and the socket, abuts against interior walls of the slider and the socket. The doglegged separable pin is disadvantageous in that while the pin is inserted into or removed from the socket through the slider, a corner portion of its dogleg shape impinges against the interior walls of the slider, thus hindering a smooth movement of the pin. Further, the doglegged separable pin is likely to accidentally separate from the socket when a pull in opposite directions is exerted on the stringer tapes. For production, the doglegged pin requires a bending process which would cause the difficulty of reducing the manufacturing cost and maintaining a uniform quality in massproduction. A drawback common to both types of separable pin is in that during insertion and removal of the separable pin, the endmost coupling element located next to the separable pin is thrust by the sidewall of a slider's guide post, in a lateral direction away from the slider. The stringer tape tends to become ruptured at its longitudinal edge that has been stretched by such thrusting endmost coupling element, rendering the fastener useless.

It is believed possible by means of the present invention to provide an improved separable slide fastener which will eliminate the above-noted difficulties of the prior art devices.

It is also believed possible by means of the invention to provide a separable slide fastener including a separable terminal assembly which is so constructed as to allow smooth engagement and disengagement of a separable pin with respect to a mating retainer, and to prevent a splitting of the meshing coupling elements due to an accidental rupture of a stringer tape.

A further believed possibility of the invention is to provide a separable slide fastener with a separable terminal assembly having a separable pin which is simple in construction and hence can be manufactured less costly by massproduction, and which can be retained stably and securely in position on a stringer tape against accidental withdrawal from a mating retainer under lateral pulling forces.

According to a first aspect of the present invention, there is provided a separable slide fastener comprising: a pair of stringer tapes each carrying on its one longitudinal edge a row of coupling elements, each said coupling element having a bifurcated leg portion mounted astride said one longitudinal edge and a coupling head portion projecting transversely beyond said longitudinal edge; a slider slidably mounted on said rows of coupling elements for taking them into and out of interdigitating engagement with each other to close and open the slide fastener; and a separable terminal

assembly comprising a retainer mounted on one of said stringer tapes at one end thereof, and a separable pin mounted on the other stringer tape at one end thereof and releasably engageable with said retainer, said separable pin having a pair of plates disposed one on each side of said other stringer tape and interconnected at respective one longitudinal edges, each said plate having on the other longitudinal edge thereof a flange engaging said other stringer tape and an end wall held in abutting engagement with the endmost coupling element located next to said separable pin, CHARACTERIZED IN THAT said end wall slopes down in a direction from said one longitudinal edge of said plate toward said other longitudinal edge of the same so that said endmost coupling element tilts in a direction towards the next adjacent coupling element, said flanges terminating short of said sloped end walls of said plates so as to define therebetween a pair of openings for allowing said one longitudinal edge of said other stringer tape to flex laterally toward the other longitudinal edge of said other stringer tape, during insertion of said pin in said retainer.

According to a second aspect of the present invention there is provided a separable slide fastener comprising:

- (a) a pair of stringer tapes each carrying on its one longitudinal edge a row of coupling elements, each said coupling element having a bifurcated leg portion mounted astride said one longitudinal edge and a

coupling head portion projecting transversely beyond said longitudinal edge;

5 (b) a slider slidably mounted on said rows of coupling elements for taking them into and out of interdigitating engagement with each other to close and open the slide fastener; and

(c) a separable terminal assembly comprising a retainer mounted movably on one of said stringer tapes and slidable along the row of coupling elements, and a separable pin mounted on the other
10 stringer tape at one end thereof and releasably engageable with said retainer, said separable pin having a pair of plates disposed one on each side of said other stringer tape and interconnected at respective one longitudinal edges, each said plate
15 having on the other longitudinal edge thereof a flange engaging said other stringer tape and an end wall held in abutting engagement with the endmost coupling element located next to said separable pin; characterised
20 by said end wall sloping down in a direction from said one longitudinal edge of said plate toward said other longitudinal edge of the same so that said bifurcated leg portion of said endmost coupling element tilts in a direction away from the next adjacent coupling element, said flanges terminating short of said sloped end walls of said plates so
25 as to define therebetween a pair of openings for allowing said one longitudinal edge of said other stringer tape to flex laterally toward the other longitudinal edge of said other stringer tape.

Figure 1 is a fragmentaly plan view, partly in cross section, of a separable slide fastener embodying the present invention;

Figure 2 is an enlarged perspective view of a
5 left half of the separable slide fastener shown in Figure 1;

Figure 3 is a cross-sectional view taken along line III - III of Figure 2;

Figure 4 is a cross-sectional view taken along
10 line IV - IV of FIG. 2;

Figure 5 is a plan view, partly brocken away for clarity, of Figure 2;

Figure 6 is a view similar to Figure 5, showing a stringer tape as flexed in a lateral direction; and

15 Figure 7 and 8 are fragmentary plan views, partly in cross section, of the separable slide fastener, showing successive movements of two stringer tapes as they are brought into lateral alignment with each other.

20 As shown in Figure 1, a separable slide fastener 10 generally comprises a pair of stringer tapes 11, 12 each carrying on and along its one longitudinal edge 13 a row of discrete coupling elements 14, a separable terminal assembly 15 mounted on lower ends of the
25 stringer tapes 11, 12 at a lower end of the rows of coupling elements 14, 14, and a slider 16 slidably

- 6 -

mounted on the rows of coupling elements 14, 14 for taking them into and out of interdigitating engagement with each other to close and open the separable slide fastener 10.

5 Each of the coupling elements 14 has a bifurcated leg portion 17 mounted astride the longitudinal tape edge 13, and a coupling head portion 18 projecting from the leg 17 transversely beyond the longitudinal tape edge 13. The coupling head 18
10 includes a lateral projection 19 and an opposite recess or pocket 20 for receiving the projection 19 of an adjacent coupling element 14. The longitudinal tape edge 13 is beaded or enlarged in cross section as it includes, as shown in Figures 3 and 4, a pair of
15 reinforcing cords or stuffer warps 21, 21 disposed one on each surface of the stringer tape 11, 12. The reinforcing cords 21, 21 are united with the tape 11, 12 during the formation of the tape 11, 12. A pair of reinforcing films 22, 22 is mounted on the stringer
20 tapes 11, 12, respectively, at the lower ends thereof. Each of the reinforcing films 22, 22 overlies the beaded longitudinal edge 13 of a corresponding one of the stringer tapes 11, 12 and the substantially entire area of each surface of the stringer tape 11, 12.
25 The separable terminal assembly 15 includes a box-shaped retainer or socket 23 and a retainer pin 24 extending therefrom, the retainer 23 and the retainer

(22)

- 7 -

pin 24 being secured by clinching to the lower end of the stringer tape 12 along the beaded longitudinal edge 13 thereof, and a substantially straight separable pin 25 secured by clinching to the lower end of the stringer tape 11 along the beaded longitudinal edge 13 thereof and receivable in a longitudinal opening 26 in the retainer 23.

As shown in Figure 2, the separable pin 25 has a generally C-shaped cross section and includes a pair of substantially rectangular front and rear plates 27, 28 interconnected at one edge by a sidewall 29 to define therebetween a longitudinal groove 30 for receiving therein the beaded longitudinal edge 13 and the reinforcing film 22 that are located at the lower end of the stringer tape 11. The front and rear plates 27, 28 have, at the respective other edges, a pair of longitudinal flanges 31, 32 extending toward one another. Each of the front and rear plates 27, 28 has a bevelled upper end wall 33 extending obliquely across the beaded longitudinal edge 14 of the stringer tape 11 and sloping down in a direction from the one edge to the other edge of the plate 27, 28 at an angle θ (Figure 1) to a line transverse to the separable slide fastener 10. The bevelled upper end walls 33 of the separable pin 25 are held in abutting engagement with a sidewall 34 of the leg portion 17 of the endmost coupling element 14a so that the longitudinal axis of the bifurcated leg portion 17.

the endmost coupling element 14a tilts downwardly away from the longitudinal axis of the second endmost coupling element 14 at the angle θ . The longitudinal flanges 31, 32 of the separable pin 25 extend from lower ends of the plates 27, 28 toward the upper end walls 33 and terminate short of the upper end walls 33 so as to define a pair of openings 35, 35 between the flanges 31, 32 and the plates 27, 28, respectively. With the openings 35, 35 thus provided, the longitudinal edge 13 is allowed to flex, as shown at 13a in Figure 6, in a lateral direction toward the other longitudinal edge of the stringer tape 11 when the endmost coupling element 14a is subjected to a lateral thrust applied in the direction of the arrow A during engagement or disengagement of the separable pin 25 with the retainer 23.

The separable pin 25 also has a recessed portion 36 disposed adjacent to the coupling head portion 18 of the endmost coupling element 14a, for receiving therein the coupling head portion 18 of the endmost coupling element 14b disposed next to the retainer pin 24. The sidewall 29 has on its upper end an auxiliary projection 37 extending into the recess 36 in alignment with the pocket 20 of the endmost coupling element 14a. The projection 37 is receivable in the pocket 20 of the endmost coupling element 14b when the slide pastener 10 is closed.

The slider 16 is of a conventional construction and includes a pair of parallel spaced wings 38 (one wing being omitted for clarity) joined at their one end with a neck or guide post 39 so as to define a substantially Y-shaped guide channel 40 for the passage therethrough of the rows of coupling elements 14, 14. Each of the wings 38 has on its opposite side edges a pair of longitudinal guide flanges 41, 41 projecting toward the opposed wing and terminating short of the latter for the entry of the stringer tape 11, 12. The guide post 39 has a substantially wedge-shaped cross section and includes opposite sidewalls 42, 42 extending convergently toward the other end of each wing 38 for guiding the coupling head portions 18 of the rows of coupling elements when they are coupled and uncoupled together. Each of the sidewalls 42 slopes at an angle to a longitudinal central axis common to the slider 16 and the slide fastener 10 such that the longitudinal axis of the endmost coupling element 14a extends at a right angle to one sidewall 42 engageable with the endmost coupling element 14a. That is to say, the angle of inclination of the one wall 42 is the same as the tilting angle θ of the endmost coupling element 14a.

Operation of the separable slide fastener 10 is described below. When the stringer tapes 11, 12 are to be interconnected as shown in Figure 1, the separable

pin 25 is inserted, in such a manner as shown in Figures 7 and 8, into the opening 26 in the retainer 23 through the Y-shaped guide channel 40 in the slider 16 with the latter is positioned next to the retainer 23.

5 During that time, the endmost coupling element 14a is forced to displace laterally outwardly from the slider 16. However, partly because of the tilted arrangement of the endmost coupling element 14a and partly because of the openings 35 in the separable pin 25, the

10 longitudinal tape edge 13 is allowed to flex for taking up or cancelling out the laterally thrusting force applied on the endmost coupling element 14a by the guide post 39 of the slider 16. Thus the endmost coupling element 14a can pass through a branch of the

15 Y-shaped guide channel 40 while being guided between one sidewall 42 of the guide post 39 and the guide flanges 41 of the slider 16. With the slide fastener 10 thus constructed, the separable pin 25 can be smoothly brought into and out of engagement with the

20 retainer 23 without special manipulation. Thus the stringer tape 11 is free from rupture at the longitudinal edge 13 which would otherwise occur when the endmost coupling element 14a is laterally displaced in the slider 16 to stretch the longitudinal tape edge

25 13. Then the slider 16 is moved upwardly in a fastener closing direction for interdigitating the rows of the coupling elements 14, 14. As shown in Figure 1, the

auxiliary projection 37 is received in the pocket 20 in the endmost coupling element 14b so as to prevent substantial reduction of coupling strength of the intermeshing rows of coupling elements at a portion adjacent to the tilted endmost coupling elements 14a, 14b. Removal of the retainer pin 25 from the retainer 23 can smoothly be accomplished in the reverse order of the just mentioned insertion.

As the retainer pin 23 is of a substantially straight tubular element and therefore is easy to manufacture in massproduction; it is attachable to the stringer tape 11 with utmost ease and can be stably held in position against displacement from the retainer 23.

The retainer 23 in the illustrated embodiment is integral with the retainer pin 24 and fixed to the longitudinal tape edge 13. However, according to the invention, the separable terminal assembly 15 may include a movable retainer (now shown) which is movably mounted on one stringer tape and slidable along the rows of coupling elements to permit separation of the two stringer tapes from the lower end, without the necessity of opening the slide fastener from the upper end. The movable retainer also performs a similar function to that of the fixed retainer 23 and is not removable from the lower end of the slide fastener.



- 12 -

Claims:-

1. A separable slide fastener comprising:

(a) a pair of stringer tapes each carrying on its one longitudinal edge a row of coupling elements, each said coupling element having a bifurcated leg portion mounted astride said one longitudinal edge and a coupling head portion projecting transversely beyond said longitudinal edge;

(b) a slider slidably mounted on said rows of coupling elements for taking them into and out of interdigitating engagement with each other to close and open the slide fastener; and

(c) a separable terminal assembly comprising a retainer mounted on one of said stringer tapes at one end thereof, and a separable pin mounted on the other stringer tape at one end thereof and releasably engageable with said retainer, said separable pin having a pair of plates disposed one on each side of said other stringer tape and interconnected at respective one longitudinal edges, each said plate having on the other longitudinal edge thereof a flange engaging said other stringer tape and an end wall held in abutting engagement with the endmost coupling element located next to said separable pin; characterised by said end wall sloping down in a direction from said one longitudinal edge of said plate toward said other longitudinal edge of the same so that said bifurcated leg portion of said



- 13 -

endmost coupling element tilts in a direction away from the next adjacent coupling element, said flanges terminating short of said sloped end walls of said plates so as to define therebetween a pair of openings for allowing said one longitudinal edge of said other stringer tape to flex laterally toward the other longitudinal edge of said other stringer tape, during insertion of said pin in said retainer.

2. A separable slide fastener according to claim 1, said coupling head including a lateral projection and an opposite pocket, said separable pin further having a sidewall interconnecting said plates along said one edges thereof, and a recessed portion adjacent to said coupling head of said endmost coupling element, said sidewall having an auxiliary projection extending into said recessed portion and receivable into said pocket in the endmost coupling element on said one stringer tape.

3. A separable slide fastener according to claim 1 or 2, said one longitudinal edge of each said stringer tape including a pair of reinforcing cords disposed one on each side of said stringer tape and united with said stringer tape.

4. A separable slide fastener according to claim 1, 2 or 3, said endmost coupling element tilting at an angle to a line transverse to the longitudinal central axis of the slide fastener, said slider including a pair of spaced wings joined at one end with a guide post so as to define between said wings a substantially



(59)

- 14 -

Y-shaped guide channel for the passage of said rows of coupling elements, said guide post having opposite sidewalls converging toward the other end of said wings, one of said sidewalls, which is engageable with said endmost coupling element, sloping at said angle with respect to the longitudinal axis of said slider.

5. A separable slide fastener according to any preceding claim, said separable terminal assembly including a retainer pin integral with and extending from said retainer, said retainer pin and said retainer being fixed to said one stringer tape.

6. A separable slide fastener comprising:

(a) a pair of stringer tapes each carrying on its one longitudinal edge a row of coupling elements, each said coupling element having a bifurcated leg portion mounted astride said one longitudinal edge and a coupling head portion projecting transversely beyond said longitudinal edge;

(b) a slider slidably mounted on said rows of coupling elements for taking them into and out of interdigitating engagement with each other to close and open the slide fastener; and

(c) a separable terminal assembly comprising a retainer mounted movably on one of said stringer tapes and slidable along the row of coupling elements, and a separable pin mounted on the other stringer tape at one end thereof and releasably engageable with said retainer, said separable pin



-15-

29

5 having a pair of plates disposed one on each side of said other stringer tape and interconnected at respective one longitudinal edges, each said plate having on the other longitudinal edge thereof a flange engaging said other stringer tape and an end wall held in abutting engagement with the endmost coupling element located next to said separable pin; characterised by said end wall sloping down in a direction from said one longitudinal edge of said plate toward said other longitudinal edge of the same so

10 that said bifurcated leg portion of said endmost coupling element tilts in a direction away from the next adjacent coupling element, said flanges terminating short of said sloped end walls of said plates so as to define therebetween a pair of openings for allowing

15 said one longitudinal edge of said other stringer tape to flex laterally toward the other longitudinal edge of said other stringer tape, during insertion of said pin in said retainer.

20 7. A separable slide fastener substantially as described with reference to and as illustrated in the accompanying drawings.
