This invention relates to separable fasteners of the invisible-type, that is to say, wherein coupled scoops of a fastener are covered up one surface thereof and, wherein, two similar stringers can be utilized in forming the fastener and, still further, wherein the scoops are of a double action-type adapting the arrangement of sliders to move in both directions on the stringers in coupling and uncoupling the same.

More particularly, the invention deals in a method of producing fasteners of the character described by the use of a simple and economical die structure and, further, wherein the scoops embrace a larger portion of the stringer tapes which will result in a stronger scoop anchorage and greater degree of flexibility.

The novel features of the invention will be best understood from the following description, when taken together with the accompanying drawing, in which certain embodiments of the invention are disclosed and, in which, the separate parts are designated by suitable reference characters in each of the views and, in which:

FIG. 1 is an enlarged diagrammatic sectional view through coupled stringers, indicating attachment of the tapes thereof to suitable supports and also showing part of a slider in cross-section, the section through the stringers being on the line 1--1 of FIG. 2 and an end diagrammatic plan view illustrating two scoops of one stringer and a single scoop of the companion stringer in coupled relationship to each other, the precise contour of the scoops being only outlined in order to simplify the illustration.

FIG. 2 is an end view of the scoop of a stringer looking in the direction of the coupling end portion of the scoop, with the tape structure broken away.

FIG. 4 is a diagrammatic sectional view through a pair of dies for forming scoops according to my invention, the section being through the central portion of the scoop as formed and diagrammatically illustrating part of the tape feed for movement of the stringer tape relatively to the dies, when in open position.

FIG. 5 is a section, substantially on the line 5--5 of FIG. 4, omitting part of the construction of the dies.

FIG. 6 is a view similar to FIG. 5, taken substantially on the line 6--6 of FIG. 4; and

FIG. 7 is a view similar to FIG. 5 and 6, taken on the broken line 7--7 of FIG. 4 and omitting part of the construction.

In illustrating one adaptation and use of my invention, I have shown, in FIGS. 1 to 3, inclusive, one type of scoop structure applied to stringers in accordance with the method later described and, in this illustration, what are generally known as double action scoops are illustrated.

Scoops of this type and kind facilitate operation of sliders in both directions on the stringers to couple and uncouple the same. Further, a single structure is formed and two similar structures are coupled together in forming the resulting fastener.

Considering FIGS. 1 and 2, 16, 19 indicate parts of two similar stringer tapes, having beaded edges 11, 11' which, in the resulting fastener, are widely spaced from the plane of the portions of the tapes 10, 10', to which the supports 12, 12' are attached, as by the stichings 13, 13'. In formation of the stringers, as later described, the tapes will include, adjacent the beads 11, 11', acute angular offset portions 14, 14', which join the tapes in abutting edge portions 15, 15', as clearly illustrated in FIG. 1 of the drawing. The beads 11, 11' can be of any cross-sectional contour. However, in the present illustration, they are substantially square in cross-sectional form. 14, 14' may be said to comprise a scoop engaging portion.

At 16, 16' are shown the scoops of two stringers and, in FIG. 2, one of the scoops 16' only is shown and two of the scoops 16 are shown to illustrate diagrammatically the general engagement of the scoops of both stringers.

Each scoop has an inner wide mounting portion 17, 17' arranged, for the most part, on one surface of the stringer tape, these portions having a reduced part 18, 18' extending over the beads 11, 11'. The outer upper mounting portion 19, 19' is generally of the width of the reduced part 18, 18', as will clearly appear from a consideration of FIG. 2 of the drawing, and is disposed upon the other surface of the tape and bead, as will clearly appear in the showing of 19 in FIG. 1 of the drawing. 19, 19' are generally triangular in cross-sectional contour and extend integrally with part of 16, 16' and also with part of the coupling end portion 20, 20' of the scoops, which again will clearly appear from a consideration of FIG. 4 of the drawing. It will also be noted, from a consideration of FIG. 1, that the exposed surface of 19 conforms to and fits snugly upon the surface of 14' and 11' and, of course, the same is true with the arrangement of 14 and 11 upon the corresponding surface of 19' when the stringers are coupled together.

The coupling end portions 20, 20' are generally of the contour outlined in FIG. 2 and shown in FIG. 3. In the latter figure, the scoop 16 is shown by way of illustration. As viewed in plan, the coupling end portion has flared sides 21, 21', which form the coupling heads of the scoops, inner ends of the heads having inwardly bevelled surfaces 22, 22' which form the female coupling portions of the scoops engaged by the heads, as will clearly appear in FIG. 2, to retain the stringers against separation. A large clearance is shown between the scoops simply to illustrate that slight clearances are provided for free coupling engagement between the scoops in the normal size of the scoops of the stringers.

Upper and lower surfaces of the heads are contracted, as clearly noted at 23, 23' in FIG. 1 of the drawing. This provides free coupling engagement of the scoops beyond the beads 11, 11' of the stringers, as will clearly appear. The wide portions 17, 17' join the reduced parts 18, 18' in shoulders 24, 24'. These shoulders are indicated in dotted lines on the scoops 16 of FIG. 3 of the drawing.

It will appear, from a consideration of FIGS. 1 and 2 of the drawing, that the outer contracted extremities 25, 25' of the coupling heads of the scoops overlie the beads 11', 11 respectively, and this, in combination with 19 overlying 14' and 19' overlying 14, further retains the coupled stringers against separation.

In FIG. 1 of the drawing, I have diagrammatically shown at 26 a section through the contracted end of a slider to illustrate engagement of the rounded flanged walls 27 of the slider with the rounded surfaces of 17, 17'; 17, 17' of the scoops. It will be understood that the slider will be of a structure facilitating coupling and uncoupling of the scoops of the stringer, as with other faster devices of this type and kind.

Turning now to FIGS. 4 to 7, inclusive, I have here diagrammatically illustrated the method of forming scoops on stringers, such as shown in FIGS. 1 to 3, inclusive, and, while the showing in these figures deals with the formation of a single scoop, it will be understood that groups of scoops, or scoop increments, can be formed in the manner well known in the art. In these figures, reference will be made to the scoops 16 by way of illustration. 28 and 29 illustrate the two dies. 28' and 29' diagrammatically illustrate the water cooling passages for
the dies and on the abutting surfaces of the dies are the cavities for reception of the tape 10 and its beaded edge 11. The die 28 has cavity portions 30, 31 also illustrated in FIGS. 5 and 6 of the drawing which form 19 and the head, including the surfaces 21, outer extremity 25, as well as the contracted surfaces 23 of the head. The die 29 includes facing portions 32 which form 18 and 33 with form 17, as also illustrated in FIGS. 5 to 7, inclusive. Considering FIG. 6 of the drawing, it will appear that the cavity portion 32 includes, at its outer surface, bevelled wall portions 34, note FIG. 6, which form the surface 22, namely the female coupling portions of the scoop 35. Considering FIG. 6, the dies have abutting surfaces, as at 35, and, in this figure, I have indicated in dotted lines as 36 other abutting surfaces, which would be at the bottom of the dies, as shown in FIG. 4, and these surfaces, together with the surface 37, indicated in dotted lines in FIG. 4 and extending from the bead 11 to the parting line or surface 36, are the only surfaces that would require finished grinding, where the cavity portions of the dies are otherwise formed from powder metallurgy. This method is known in this art and results in a very economical die cost, as compared with the more or less conventional methods.

In FIG. 4 of the drawing, I have indicated, in part, at 38, the nozzle, through which the casting material is injected into the die cavities and 39 represents the sprue, which is later trimmed from the scoop in forming the resulting scoop structure. At 40 are illustrated a pair of gripping means for the tape 10 in feed of the dies relatively to the dies when in open position in bringing the next sectional portion of the tape between the dies in forming the next cast increment of scoops in producing the desired stringer length. It will appear, from a consideration of FIGS. 4, 5, and 7, that the side parts 41 of the die 28 and the part 43, FIG. 4, together with the parts 43, FIG. 5, and the parts 43', FIG. 7, only one of which is shown, collectively support the tape 10, including the bead 11 in the position of FIG. 4 for casting the scoop structure therearound. It will be understood with regard to the portion 42 of the die 29 that the die 28 also aids in maintaining the tape in position. It will clearly appear, from a consideration of FIG. 5, that the side parts 41 of the die 28 will extend into the die 29 beyond the parting line 36. In like manner, the sides of the die 29 extend slightly into the die 28 in forming the parting line 45, as clearly noted in FIG. 6 of the drawing.

By reason of the employment of the two mounting portions 17 and 19, the scoop is securely attached to not only the bed, but to a material part of the tape, as at 14, in securely attaching the scoops to the tape, it being understood that the castor molded material extends into the interstices of the braid. It will also be apparent that, when the stringers are attached to the supports, as at 12, 12' of FIG. 1 of the drawing, the stringers and scoops will be completely covered or, in other words, concealed.

Considering FIGS. 1 and 4 of the drawing, it will be apparent that the stringer tape, with its beaded edge, is arranged angularly to the longitudinal plane of engagement of the scoops with the one. In other words, the angularity of 14 or 14' is substantially 45° to this plane of engagement, which is one of the distinctive features of my fastener construction. In addition to this, another distinctive feature resides in the fact that part of the mounting portion of the scoop, as, for example, the part 19, 19', extends a major portion of the coupling end portions of the scoops formed by the surfaces 21, 22, 21', 22'. This will clearly appear from a consideration of FIGS. 1 and 2 of the drawing. In other words, 19, 19' may be said to comprise portions reinforcing the coupling end portions of the scoops.

For purposes of description, it will appear, from a consideration of FIG. 1, that the coupling end portions of the scoops may be said to be spaced from and arranged in a plane generally parallel to the plane of the attaching portions of the stringers or, in other words, the parts of the stringers to which the supports 12, 12' are secured. It may also be said that the outer mounting portions 19, 19' project beyond abutting portions of the stringer tapes when the stringers are coupled together.

Having fully described my invention, what I claim as new and desired to be secured by Letters Patent is:

An invisible separable fastener of the character defined comprising a pair of stringers, each stringer comprising a tape having a bead at one edge, the bead joining the attaching portion of the tape in an acute angular scoop engaging portion, scoops fixed to and spaced longitudinally of the stringer, each scoop having an inner wide mounting portion including the leading portions engaging the bead and said acute angular portion of the tape, means on said outer mounting portion of a scoop on one tape adapted when said pair of stringers is engaged to engage and support the bead and angular scoop engaging portion of a companion stringer, the wide mounting portion including a reduced part extending over said bead, said reduced part terminating in a coupling end portion including male and female portions, and said coupling end portion, for the most part, overlying the outer mounting portion of said scoop and engaged scoops having a substantially oval shaped cross section in a plane at right angles to the longitudinal axis of said fastener and said outer mounting portion of each scoop having a substantially triangular cross section in the same plane filling the space between oppositely disposed angular engaging portions of said tapes.

References Cited in the file of this patent

UNITED STATES PATENTS

2,032,858 Schaper Mar. 3, 1936
2,068,939 Winterhalter Jan. 26, 1937
2,218,090 Marinsky Oct. 15, 1940
2,263,920 Dau Nov. 25, 1941
2,738,560 Hug Mar. 20, 1956
2,849,774 Ryser Sept. 2, 1958
2,910,754 Morin Nov. 3, 1959
2,959,833 Ryser Nov. 15, 1960

FOREIGN PATENTS

489,657 Great Britain Aug. 2, 1938
482,804 Italy July 13, 1953
564,497 Italy June 18, 1957