METHOD OF FIRST CASTING, THEN COOLING AND THEN APPLYING SCOOPS TO STRINGER TAPES

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Application July 22, 1955, Serial No. 523,731

8 Claims. (Cl. 29—410)

This invention relates to the method of producing separable fastener stringers, wherein scoops are first formed at a casting or forming station, then delivered to a time element creating and cooling station and, finally, to an applying or mounting station, at which the scoops are directly cramped on the beaded edge portion of a stringer tape. More particularly, the invention deals with a method of the character described, wherein scoops formed at a relatively high temperature can be directly applied upon plastic tapes such, for example, as nylon, wherein the temperature of the scoops is reduced at the time element creating and cooling station to a degree below the fusing point of the tape employed, thereby insuring positive coupling of the scoops with the tape without injury to the tape structure.

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 a diagrammatic side and sectional view, illustrating the three stations employed in the forming, cooling and applying of single scoops to a stringer tape.

Fig. 2 is a diagrammatic section on the line 2—2 of Fig. 1.

Fig. 3 is a partial section on the line 3—3 of Fig. 1, showing the crimping tools or jaws in inoperative position.

Fig. 4 is a view, similar to Fig. 3, showing the crimping tools or jaws in operative position.

Fig. 5 is a perspective view diagrammatically illustrating a casting station and part of a time element creating and cooling station of a modified method which I employ; and

Fig. 6 is a diagrammatic perspective view of the applying station associated with the showing in Fig. 5 and omitting parts of the construction.

In Figs. 1 to 4, inclusive, I have diagrammatically shown one adaptation of my method and, in Fig. 1, 10 represents the scoop forming or casting station. 11 represents the time element creating and cooling station and at 12 the scoop applying station. These stations are associated with each other in a manner more fully later described in providing a continuous uninterrupted operation of forming scoops and applying the same to stringer tapes.

The forming or casting station 10 includes means including an injection nozzle 13 for pressure injecting casting material into the cavity 14 of a pair of dies, the face view of one of which is indicated at 15 in the drawing. The cavity 14 is so shaped as to form a scoop 16 with the mounting end portion 17 thereof spread in the manner clearly illustrated in Fig. 2 of the drawing.

The dies are also provided to receive a core and transfer pin 18, as well as a supplemental core member 19. The member 19 has, on predetermined surfaces thereof, as noted in Fig. 2 of the drawing, longitudinal ribs or teeth 20 to form, on inner surfaces of the spread mounting end portion 17, corresponding ribs or teeth to establish gripping engagement with the beaded edge portion 21 of a stringer tape 22. At this time, it is pointed out that the tape 22 can be composed of any type or kind of synthetic material in the plastic group and, as an example, nylon tape is one of several illustrations.

The dies 15 also include a space passage 23 which leaves on the resulting cast scoop 16 an integral gate 24. At 25 is shown, in broken section, an elongated magazine, the upper portion of which is defined by two more or less channelled-shaped guides 26 which can be apertured, as seen at 27, for the circulation of cooling water therethrough. The guides 26 have inner surfaces 28, conforming generally to the contour of opposed sides of the scoop 16 to guide the scoops downwardly in the magazine, the two guides forming open sides, as indicated at 29.

In moulding the scoops 16, slight protruding beads 30, 31 will be formed on upper and lower opposed side surfaces of the mounting end portion 17 so that these mounting end portions will be slightly spaced apart in stacking or assemblage in the magazine. A blast of cool air is provided from a suitable source of supply through a tube, shown in part at 32 in Fig. 1 of the drawing, which will provide circulation of air through the openings 29 of the magazine and around the scoops. This further cools the scoops to reduce the same to a temperature, when fed to the tape at the mounting station 12, which will be well below the fusing temperature of the tape 22.

It will appear, from a consideration of Figs. 1 and 2 of the drawing, that the gates 24 pass downwardly through one of the openings 29, centrally thereof. The openings 29 are joined across the bottom of the magazine. However, the lower portions of the guides 26 have ledges 33 which support the scoops in the magazine. The bottom opening of the magazine is indicated at 34 in Fig. 1 of the drawing and this opening is provided for movement of a forked delivery finger 34, from the dotted line position shown in Fig. 1 to the full line position of said figure in delivering the lowermost scoop of the magazine onto the beaded edge 21 of the tape 22, one of such deliveries being indicated in Fig. 1.

At 35 is shown a forked platform, which guides and positions the scoop in the foregoing delivery, this platform being moved outwardly to clear the scoop in the feed of the tape 22 to bring the next adjacent section thereof in position to receive the next successive scoop, after which, the platform 35 is returned to operative position for guiding and positioning the scoop at the assembly or mounting station 12.

The finger 34 is pivotally mounted upon a lever 36, as seen at 37, suitable means, not shown, being provided to rotate the lever on the pivot for movement into the full and dotted line position shown in the drawing. The lever 36 is pivoted, as seen at 38, and is actuated to lower the pivot 37 so as to drop the forked finger 34 below the carriage in moving from the position shown in full lines to the position indicated in dotted lines, in other words, so as to pass beneath the lowermost scoop in the magazine, preparatory to engaging the gate end portion of the lowermost scoop, preparatory to feeding the same onto the tape.

At the assembling or scoop mounting station 12 is a guide plate 39 for guiding and positioning the tape 22 in proper position for reception of the advanced scoop. This plate also assists in aligning or positioning the scoop on the beaded edge 21 of the tape.

Below the plate 39 and at opposite sides of the tape are a pair of crimping tools or jaws 40, which are movable toward and from the scoops in crimping or compressing the mounting end portion 17 of each scoop upon the
beaded edge 21 of the tape, as diagrammatically seen in Figs. 3 and 4 of the drawing. In Figs. 5 and 6 of the drawing, I have diagrammatically shown, in perspective, a modified adaptation of the invention and, in said figures, 10', 11' and 12' indicate stations, which are generally similar to the stations 10, 11 and 12. The primary difference in the two structures and methods resides in producing, at the casting or forming station 10', a plurality of scoops 41, the gates 42 of which are united in a track or rail member 43, including a single feed sprue or gate 44. In Fig. 5, part of a discharge nozzle, similar to the nozzle 13, is indicated at 13'. 45 represents part of one of the dies in an opened position.

At 18' and 19' are shown core pins and members, similar to the pins and members 18 and 19, the only difference being that they are made sufficiently long to extend into and through all of the scoops 41. With this construction, instead of utilizing a magazine such as 25, a pair of guide members, one of which is shown at 46, are employed, these guide members being recessed, as indicated at 47, to receive the tracks or rails 43 of each cast scoop assembly. The guides 46 will be sufficiently long to store a sufficient number of the cast units at the time element creating and cooling station 11'. This station will have one or more cool air blasts coming from tubes 32', similar to the tube 32. It will also be apparent, in this connection, that several of the tubes 32 can be employed in conjunction with the structure shown in Fig. 1 of the drawing.

At the lower end of the guides 46 or the station 11', I provide a slidable delivery unit 48, into which the track or rail member 43 of the lowermost cast scoop assembly is delivered, preparatory to being moved to the applying or mounting station 12', as diagrammatically illustrated in Fig. 6 of the drawing. It will be apparent that suitable means, not shown, will be provided to support the scoop assemblies in the guides 46 as the delivery unit 48 is moved forwardly. However, upon returning to the position beneath the guides 46, the next successive scoop assembly will drop into the delivery unit 48 for feed to the assembly or mounting station 12'. The delivery unit 48 can be utilized to properly position the several scoops 41 on the beaded edge 21 of the stringer, and means will be provided, similar to the guide plate 39, to centralize the tape 22' at the station 12'. This is not repeated for sake of clarity. Further, only a single crimping tool or jaw 40' is illustrated in Fig. 6, it being understood that two of such jaws are employed in securing the normally spread mounting faces 41' of the several scoops upon the beaded edge 21'.

Turning for a moment to the method as shown in Figs. 1 to 4, inclusive, it will appear that the gates 24 are removed by a suitable trimming tool, as diagrammatically seen at 24' in Fig. 1 of the drawing. In like manner and during the operation of applying one group of castings 41 to the tape, the adjacent group of castings will be trimmed to remove the gates 42, the member 43 and the primary gate 44.

After the scoops have been attached to the tape, the unit 48 is moved down to the next member, then returned to the position beneath the guides 46 and again upwardly to the lower surface of the guides 46. After the positioning is completed, the gates 24 are removed by a suitable trimming tool 24'. No further explanation of the method is necessary.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. The continuous method of producing separable fastener stringers on a machine, each stringer comprising a stringer tape made of a synthetic material having die cast scoops thereon of a material having a higher melting point than the fusing point of the tape, which comprises successively casting gated scoops at a casting station on said machine at a high rate of speed and at a temperature higher than the fusing point of said tape, each scoop having spread mounting end portions and also having spacing means thereon for spacing the scoop from other scoops at a casting station on said machine; moving each scoop while at a temperature above said tape fusing point from the casting station to said collecting station which is spaced from the casting station, continuing to cast successive scoops at the casting station and moving the same and collecting a quantity thereof at the collecting station, supporting at least the major portion of each scoop at the collecting station in spaced relation to each other by means of said spacing means, cooling each scoop to an extent during the collection of the same at the collecting station so that the temperature thereof falls below the fusing point of said tape by bringing a cooling agent into heat exchange relation with the scoop; then moving each scoop at the collecting station, while still at an elevated temperature but below the fusing point of the tape, to an applying station on said machine spaced from the collecting station so that the spread mounting end portions of the scoop engage an edge of said tape, compressing said spread mounting end portions of the scoop about the edge of the tape to mount said scoop thereon, said scoops during application to the tape being at a temperature sufficiently elevated to facilitate said compression step; applying each scoop to the tape, as described, at a rate substantially equal to the casting rate of the scoops while intermittently moving the tape to space said scoops thereon; and then trimming each scoop on the tape to remove the gate therefrom.

2. The method of claim 1 wherein said tape is made of nylon and said scoops are made of metal.

3. The method of claim 2 wherein said scoops are made of zinc or a high zinc alloy.

4. The continuous method of producing separable fastener stringers on a machine, each stringer comprising a stringer tape made of a synthetic material having die cast scoops thereon of a material having a higher melting point than the fusing point of the tape, which comprises successively casting gated scoops at a casting station at a high rate of speed, each scoop having spreading means thereon for spacing the scoop from other scoops at a collecting station; moving each scoop while at an elevated temperature above said tape fusing point from the casting station to said collecting station spaced from the casting station, supporting at least the major portion of each scoop at a casting station in spaced relation to each other by means of said spacing means, cooling each scoop to an extent during the collection of the same at the collecting station so that the temperature thereof falls below the fusing point of said tape by bringing cool air into direct heat exchange relation with the scoop and by circulating a cooling fluid through the collecting station in an indirect heat exchange relation with the scoop; then moving each scoop at the collecting station, while still at an elevated temperature but below the fusing point of the tape, to an applying station spaced from the collecting station so that the scoop engages an edge of said tape, mounting each said scoop on the tape; applying each scoop to the tape, as described, at a rate substantially equal to the casting rate of the scoops while intermittently moving the tape to space said scoops thereon; and then trimming each scoop on the tape to remove the gate therefrom.

5. The continuous method of producing separable fastener stringers, each stringer comprising a stringer tape made of a synthetic material having die cast scoops thereon of a material having a higher melting point than the fusing point of the tape, which comprises successively casting gated scoops at a casting station at a high rate of speed and at a temperature above said tape fusing point from the casting station.
a collecting station spaced from the casting station, continuing to cast successive scoops at the casting station and collecting a quantity thereof at the collecting station, cooling each scoop to an extent during the collection of the same at the collecting station so that the temperature thereof falls below the fusing point of said tape; then moving each scoop at the collecting station, while still at an elevated temperature but below the fusing point of the tape, to an applying station spaced from the collecting station that the scoop engages an edge of said tape, mounting each scoop on the tape; applying each scoop to the tape, as described, at a rate substantially equal to the casting rate of the scoops while intermittently moving the tape to space said scoops thereon; and then trimming each scoop on the tape to remove the gate therefrom.

6. In a continuous method of producing separable fastener stringers on a machine wherein gated scoops are successively cast at a casting station and successively applied to a stringer tape at an applying station spaced from the casting station, the improvement comprising employing as said tape a synthetic material having a fusing temperature lower than the melting point of said scoops, said improvement further comprising casting each scoop with spacing means thereon for spacing the scoop from other scoops at a station intermediate said casting and applying stations; moving each scoop while at an elevated temperature above said tape fusing temperature from the casting station to said intermediate station, supporting at least the major portion of each scoop at the intermediate station in spaced relationship to each other by means of said spacing means, continuously moving the spaced scoops through the intermediate station while coincidently cooling the same to an extent so that the temperature thereof falls below the fusing temperature of said tape by bringing a cooling agent into heat exchange relation with the scoops; then moving each scoop at the intermediate station, while still at an elevated temperature but below the fusing point of the tape, to said applying station so that the scoop engages an edge of said tape, mounting the scoop on the tape; applying each scoop to the tape, as described, at a rate substantially equal to the casting rate of the scoops while intermittently moving the tape to space said scoops thereon; and then trimming each scoop on the tape to remove the gate therefrom.

7. The continuous method of producing separable fastener stringers on a machine, each stringer comprising a stringer tape of a synthetic material having die cast scoops thereon of a material having a higher melting point than the fusing point of the tape, which comprises successively forming castings at a casting station at a high rate of speed, each casting being integrally formed in a single injection and comprising a group of scoops connected by a gate to an elongated member; moving each casting, while at a temperature above the tape fusing point, from the casting station by engaging said member thereof between a pair of guides and passing the casting therealong to an intermediate station spaced from the casting station, continuously moving each casting through the intermediate station while coincidently cooling the scoops thereof to an extent so that the temperature of the same falls below said tape fusing point by bringing a cooling agent into heat exchange relation with said scoops; then moving each casting, while at an elevated temperature but below the tape fusing point, to an applying station by engaging said member thereof at the intermediate station and moving the same to said applying station so that the group of scoops thereof engage an edge of said tape, mounting said group of scoops simultaneously on the tape; applying each said group of scoops to the tape, as described, at a rate substantially equal to the casting rate of said castings while intermittently moving the tape to space said groups thereon; and then trimming each said group of scoops on the tape to remove the gates and member therefrom.

8. The continuous method of producing separable fastener stringers, each stringer comprising a stringer tape of a synthetic material having die cast scoops thereon of a material having a higher melting point than the fusing point of the tape, which comprises successively forming castings at a casting station at a high rate of speed, each casting being integrally formed in a single injection and comprising a group of scoops each connected by a gate to an elongated member; moving each casting, while at a temperature above the tape fusing point, from the casting station by engaging said member thereof and passing the casting to an intermediate station spaced from the casting station, cooling the scoops of said casting at the intermediate station to an extent so that the temperature of the same falls below said tape fusing point by bringing a cooling agent into heat exchange relation with said scoops; then moving each casting, while at an elevated temperature but below the tape fusing point, to an applying station by engaging said member thereof at the intermediate station and moving the same to said applying station so that the scoops thereof engage an edge of said tape, mounting said scoops on the tape; applying the scoops of each casting to the tape, as described, at a rate substantially equal to the casting rate of said castings while intermittently moving the tape to space said scoops thereon; and then trimming the scoops of each casting on the tape to remove the gates and member therefrom.

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