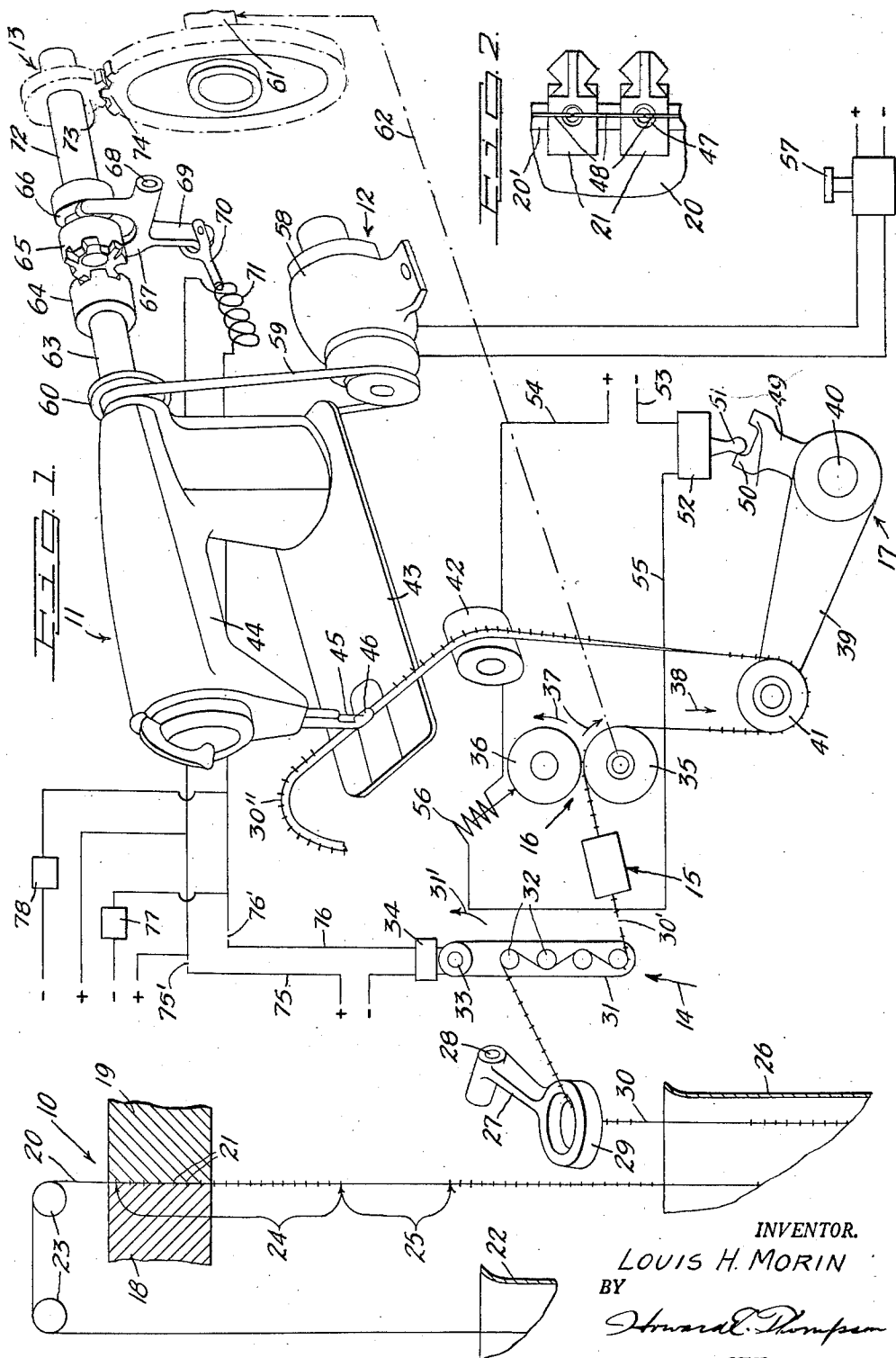


Dec. 25, 1962

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METHOD OF SYNCHRONIZING SEWING MACHINE OPERATION
WITH OPERATION OF CASTING MACHINE
Filed March 16, 1960

3,070,048



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1

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METHOD OF SYNCHRONIZING SEWING MACHINE OPERATION WITH OPERATION OF CASTING MACHINE

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Filed Mar. 16, 1960, Ser. No. 15,400
18 Claims. (Cl. 112-2)

This invention relates to the production of separable fastener stringers, wherein attachment of scoops to the stringer tapes is reinforced by a line of stitching. More particularly, the invention deals in a method of synchronizing operation of a sewing machine with operation of a casting machine, so as to produce the resulting end separable fastener stringer product in a continuous uninterrupted procedure, eliminating independent handling between the casting and sewing stations of the apparatus.

Still more particularly, the invention deals in a method employing a series of control stations to compensate for various conditions which prevail in the synchronized operation between the two primary stations, namely the casting station and the sewing station.

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 or schematic illustration of the major portion of the synchronized operation between a casting station and a sewing station, parts of the construction being broken away to indicate different spacing between mechanisms in the schematic showing; and

FIG. 2 is an enlarged detail view of an edge portion of a stringer tape illustrating two scoops and diagrammatically showing a line of stitching engaging said scoops.

In order to more clearly visualize the method, the schematic showing of FIG. 1 is presented in order to present a general arrangement of the various stations and the controls governing the synchronized operation in question.

In the illustration of FIG. 1, 10 presents the casting station, 11 the sewing station, and these are the two primary stations employed in carrying out my method. At 12 I have shown the station providing high speed drive of the sewing station 11. 13 diagrammatically illustrates the station providing the synchronized operation of the sewing station 11. At 14 I have illustrated what may be termed the tape or work-piece tension and control station. At 15 I have diagrammatically illustrated the trimming station. At 16 is illustrated the tape or workpiece feed station and at 17 is illustrated the slack control station. While no specific controls are provided, the various stations mentioned above are the more important and, for this reason, have been classified.

At the station 10 would be the normal die casting machine employing a pair of dies 18 and 19 and, in the present illustration of one adaptation of my method, the dies will cast upon a stringer tape 20 seven scoops, as indicated at 21, constituting part of a complete stringer length. The tape 20 is guided to the casting station 10 from a tote can or other receptacle illustrated, in part, at 22 and guided over suitable rollers, as indicated at 23. The portion of the attached scoops to the stringer tape 20 designated by the bracket 24 can illustrate a complete stringer length; whereas, the bracket portion 25 would indicate spacing of the tape between each stringer length. The stringers thus formed and which may be referred to as the workpiece extend into another tote can or receptacle illustrated, in part, at 26.

At this time, it might be well to mention that the pro-

2

cedure of forming the groups of castings at the station 10 in forming the groups of plastic scoops ultimately defining a stringer length and the spacing of the tape between the stringer lengths is illustrated, for example, in my prior application Serial Number 721,042, filed March 12, 1958, and a further illustration of this procedure can be found in my prior application Serial Number 826,085, filed July 9, 1959, the foregoing being by way of illustration only.

The tape or workpiece tension and control station 14 comprises an oscillator 27, pivoted as indicated at 28, the oscillator having a ring 29, through which the continuous stringer tape or workpiece 30 passes prior to passage through a tension and control device 31 at the station 14. The device 31 includes a plurality of studs 32, around which the workpiece 30 passes, as diagrammatically illustrated. The device 31 is pivoted, as seen at 33. Mounted on the device 31 is a mercury switch 34.

The gate trimming station 15 is suitably spaced with respect to the station 14 and this is indicated by the break 30' in the workpiece, the station 15 having suitable gate trimming tools for removing the gate from the cast scoops, in a manner well known in this art. After the workpiece has been trimmed, it then passes through the tape feed station 16, comprising two feed rollers 35 and 36. The feed rollers rotate in the direction of the arrows 37 and the workpiece is fed downwardly in the direction of the arrow 38.

The slack control station 17 comprises an arm 39, pivoted as seen at 40, the arm supporting, at its free end, a swinging weighted idler roller 41, around which the workpiece passes. The workpiece then extends upwardly around a suitably positioned other idler roller 42 for guidance of the workpiece onto the table 43 of the sewing machine 44 at the station 11 and for guidance beneath the needle 45 and presser foot 46 at said station.

At this time, it would be well to point out that the station 11 can include at 45 and 46 a mechanism, such as illustrated in my prior application Serial Number 758,706, filed September 3, 1958, which will control passage of the needle 45 through the workpiece and, particularly, in guidance of the needle through apertures 47 in the scoops 21 cast upon the stringer tape 20 or the beaded edge 20' thereof, as diagrammatically seen in FIG. 2 of the drawing. Each stitch is indicated at 48 in said figure.

In connection with the foregoing, further adaptations of carrying out the stitching operation are also illustrated in my prior applications Serial Number 720,876, filed March 12, 1958, now Patent No. 3,022,560, and Serial Number 729,679, filed April 21, 1958, now Patent No. 2,979,796. Here it is also to be understood that tapes or strands can be stitched to the workpiece during this operation, as illustrated in the last mentioned application, but no specific illustration of this procedure is made in the present schematic showing. In the drawing, 30'' can represent the finished stitched end product which, in passing from the station 11, is in the form of a multiplicity of joined stringers which are then severed at the spacing section, indicated at 25, in forming the resulting stringer lengths, as known in this art.

The arm 39 of the station 17 has, adjacent its pivot 40, a bifurcated extension 49, the legs 50 of which operatively engage the lever 51 of a switch 52. The switch 52 is in a circuit designated by the wires 53, 54 and a wire 55, the latter extending to a solenoid coil, diagrammatically illustrated at 56, to which the wire 54 also extends. This coil 56 actuates a suitable clutch, which is not illustrated, that serves to stop rotation of the rollers 35 and 36. This operation takes place as and when the arm 39 moves downwardly from the position illustrated to a position where the righthand leg 50 actuates the lever

51, completing the circuit to the coil 56, so that, when too great a slack prevails in the workpiece, the feed of the workpiece to the station 17 is stopped by actuation of switch 52 to stop drive of the feed rollers 35, 36. In order to take up this slack, and operator attending a number of the machines will come to the machine in question and then operate a presser foot switch 57 controlling an electric circuit to the motor 58 at the station 12 for high speed operation of the station 11. This operation is through the medium of a belt 59 driven by the motor passing over a pulley 60 on the sewing machine 44. When the slack has been compensated for during this high speed operation of the station 11, the arm 39 will be raised to the position where the lefthand leg 50 will actuate the switch lever 51 to again permit the drive of the feed rollers 35 and 36. The drive to the rollers 35 and 36 is from a shaft 61, as diagrammatically illustrated by the dot-dash lines 62. The shaft 61 is in synchronized drive with the drive of the casting machine at the station 10, so that the normal feed of the rollers 35 and 36 will be substantially consistent with the number of scoops 21 simultaneously cast at the station 10 to take up the length of tape or workpiece occupied by the seven scoops formed on the tape at the casting station, this being by way of one illustration.

However, the diameters of the rollers 35, 36 are preferably made slightly large to provide slightly greater feed to the workpiece which, in many instances, would cause the development of a slack at the station 17. It has been found, from practice, that it is substantially impossible to provide a positive synchronism in stitching operation at station 11 with casting operations at station 10 due to many variances which cannot be controlled and, to avoid the presence of a drag at the station 11, it is preferred to provide the development of a definite slack at station 17 and the minimum tension at station 11 would be controlled by the weight of the roller 41, thus providing a definite and controlled stitching operation at station 11. Under normal conditions, it would take a long period of time before the arm 39 would reach a position causing the switch 52 to be operated.

In the present diagrammatic illustration, two sets of seven scoops are formed on the stringer, plus an added five scoops which define the stringer length 24. This would mean that the casting machine delivers less stringer or workpiece length to the can 26 which would result that, in time, the device 31 of station 14 would again swing in the direction of the arrow 31', actuating switch 34, to stop operation of station 11. After a period of time, the casting station 10 automatically will deliver an excessive amount of the workpiece to the can 10 and, gradually, the device 31 will move into its lowered position, breaking the circuit through the switch 34 and again automatically set the station 11 in operation to continue its progressive stitching of the workpiece. With the odd stringer lengths, this automatic cycle of operation would be repeated at intervals.

In connection with the foregoing, it is desirable that the tape spacing, as at 25, be equal to the amount of tape acquired at the casting station 10 in forming the seven scoops thereon, so that the stitching station, at 11, which continues to form seven stitches in each cycle of operation of the casting machine at the casting station, will form seven stitches through the spaced portion of the tape, in other words, at spaces similar to the space 25.

In the operation of the method, the casting machine never ceases in performing its continued cycles of operation. This can result in a build up of storage in the tote can 26 and, particularly, when the workpiece 30 is not withdrawn from this can when the feed rollers 35, 36 are idle, or for any other reason. The operator, in actuating the high speed actuation of the station 11 through station 12 and actuation of switch 57, can rectify this condition to the point where all surplus in the can 26 is

eliminated, leaving, at all times, a loop in the workpiece disposed in the can.

Now, let us consider the synchronized operation of the station 11. This is accomplished by providing on the machine 44 an extended shaft 63, to which is fixed a clutch segment 64, in connection with which a similar segment 65 operates, the latter having an annular grooved portion, as indicated at 66, in conjunction with which a fork clutch shifting member 67 operates. The member 67 is pivoted, as diagrammatically indicated at 68, and includes an offset lever 69, the latter carrying a core portion 70 operating in a solenoid coil, as diagrammatically illustrated at 71. The segment 65 is keyed to and movable longitudinally of a shaft 72, to which is fixed a gear, diagrammatically illustrated at 73, this gear meshing with a gear 74 on the shaft 61. This construction, schematically illustrated, provides for the synchronized drive of the station 11, so that the sewing machine of the station 11 will stitch along the tape or workpiece a distance comparable to that part of the tape or workpiece, upon which the series of seven scoops are cast at the station 10. In other words, in each cycle of operation of the casting station 10, the sewing station 11 will perform the synchronized number of stitches, namely seven, so that both stations are in synchronism with each other.

In connection with the foregoing, it is also pointed out that the oscillator 27 at and near the station 14 is independently controlled and operated by the operator to be put into operation as and when there is a large accumulation of the tape or workpiece in the can 26, so as to shake the tape and eliminate any tangles which might develop and, thus, insure proper feed of the tape or workpiece to the control device 31 of the station 14.

The control station 14 serves to perform three functions, first, to create a tension on the tape or workpiece in its passage over the plurality of studs 32. As a second function, let us assume that when, unnoticed by an operator, a tangle develops somewhere along the line, this tangle would develop an added friction which would cause the device 31 at station 14 to swing on its pivot 33 in the direction of the arrow 31'. When this operation takes place, the mercury switch 34 will be operated to close a circuit through wires 75 and 76 directed to and energizing the coil 71 to move the clutch segment 65 into inoperative position, thus stopping operation of the station 11. It will appear, from the drawing, that a break 75' and 76' is shown in the wires 75, 76 to correspond with the break 30' to clearly indicate spacing of station 14 with respect to station 15 and the remainder of the apparatus.

Also in circuit with the wires 75 and 76 are diagrammatically illustrated two circuit control devices 77 and 78 for again automatically stopping operation of station 11 as and when the bobbin thread breaks or is consumed or a needle thread fed to the needle 45 of the machine breaks or is consumed. Here again, it will be understood that the casting station 10, during any stoppage of the station 11, continues to operate which brings about the collection of the stringer tape or workpiece in the can 26, as previously described. Until the operator is notified of the stoppage through operation of 77 or 78 and until the necessary repair or replacement has been made, the station 11 remains idle and this idle period is caught up to by the operator's operation of the button switch 57, putting the high speed station 12 into operation to catch up on the normal synchronized operation of the apparatus.

As and when excessive tension in the workpiece mentioned above, which caused the device 31 to rise and actuate the switch 34, has been cared for, the device 31 will then assume its normal operative position, again breaking the circuit through the switch 34, allowing the station 11 to continue to function. When tangles and the like develop in the machine, these tangles must be released and freed by the operator before the machine is put into its normal operation.

A third function of the station 14 is as follows. Due to the increment factor that is being created by the cast-

ing of seven scoops at the casting station 10, it is obvious that, in many cases, less scoops are cast as, for example, the casting of five additional scoops mentioned heretofore. This means that there are two scoops uncast for every separable fastener chain. It will, thus, be apparent that the normal loop of the workpiece in the can 26 will become short and eventually set up an excessive tension which again would result in swinging the device 31 of station 14 in the direction of the arrow 31', again causing the switch 34 to be actuated, which results in stoppage of operation of the station 11. Here again, upon notice to the operator, the switch 57 will be actuated to again catch up on the stitching of the workpiece collectively in the can 26 from continued operation of station 10 during the period that the station 11 remained at rest. It is here well to point out that one operator can care for a reasonably large number of synchronized apparatus of the type and kind under consideration and, accordingly, there is likely to be a period of time before an operator can reach any particular apparatus to care for the speed operation of the station 11 in the manner heretofore described.

To briefly state the method of operation without dealing specifically with detailed operation of the respective units, it will be apparent that what are generally referred to as increments of the tape 20 are periodically brought to position at the station 10 and, in the illustration given, seven scoops are formed on this tape increment at the station 10 and spacing between stringer lengths, as at 25, is common with the aforesaid increment, thus, in normal operation, the sewing or stitching station 11 in each cycle of operation of station 10 produces seven stitches in the workpiece where the scoops are arranged and in the spacings, as at 25, between scoops of adjacent stringer lengths. Now then, in the event of the build-up in the slack, station 17 actuates to break the feed through rollers 35, 36, until such time as the arm 39 of station 17 reaches its normal position, as diagrammatically illustrated in the drawing; whereupon, the circuit to the feed rollers is continued. In connection with the foregoing, it will be apparent that the station 11 continues its operation until the slack has been taken up, which automatically sets rollers 35 and 36 in operation.

The slack created at station 17 may be due to the increased feed of rollers 35, 36 or to any other condition that may arise in delivery of the workpiece to the station 17. As previously set forth, upon breakage or consumption of either bobbin thread or needle thread, devices 77 and 78 are actuated, in which event and when corrections or replacements are made, the operator high speeds the operation of the machine through station 12 in order to consume the workpiece which has collected in the can 26 by virtue of continued uninterrupted operation of station 10.

Further, when station 14 or the device 31 thereof is swung in the direction of the arrow 31' in conditions which have previously been set forth, then the switch 34 is actuated to de-clutch station 13, causing station 11 to become idle and remain so until such time as station 14 assumes its normal position and/or the operator has corrected difficulties causing actuation of station 14, in some of which events, the station 12 is put into operation to provide high speed operation of station 11.

It might be well to bring out, at this time, that, in the present schematic or diagrammatic illustration, no thought is given to accuracy in ratios between drives and in the structural illustration of the several parts. At this time, it is also well to point out that suitable controls will be provided to prevent operation of the motor 58 at station 12 as and when clutch segment 65 is in engagement with segment 64. In this same connection, it will be understood that, when station 11 is driven through the synchronized drive station 13, the shaft of the motor 58 will be freely rotated through the belt drive 59, but the motor is not energized, as the switch 57 is in inoperative position.

It will be understood that during high speed operation of station 11 through actuation of station 12, the station 17 is performing its normal function to apply a constant controlled tension on the workpiece delivered to station 11 and stations 14, 15 and 16 continue to operate; thus it will be apparent that stations 14, 15, 16 and 17 will perform their normal function during high speed operation of the machine.

It will be understood that, in the stoppage of the sewing machine through any one of the controls heretofore mentioned, the feed rollers 35, 36 will also be automatically brought to a stop as and when the switch 52 is actuated to stop feed of the rollers, in the manner more fully heretofore described. In this connection, it will be understood that conventional type controls will be provided for starting operation of the sewing machine as and when corrections bringing about the automatic stoppage of the machine have been cared for.

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

1. The method of producing a continuous line of separable fastener stringers with scoops attached to a continuous stringer tape, which comprises casting spaced stringer lengths of scoops on a continuous tape at a casting station to form a continuous taped workpiece, drawing the workpiece from the casting station and advancing it at a feeding station located between the casting station and a stitching station towards the stitching station at a rate synchronized with the rate of casting at the casting station, stitching the scoops onto the tape of the workpiece at the stitching station at a predetermined rate synchronized with the rate of casting at the casting station, creating tension in the workpiece between the casting station and the feeding station responsive inversely to the amount of workpiece between the casting station and the feeding station, sensing the amount of said tension and controlling the stitching operation therefrom by interrupting the stitching operation when the tension increases above a predetermined amount and by resuming stitching operation when the tension falls below a predetermined amount to prevent said tension from exceeding a predetermined amount, creating a slack under tension in the workpiece between the feeding station and the stitching station, sensing the amount of said slack in the workpiece and controlling thereby the advancement of the workpiece at the feeding station towards the stitching station by interrupting the advancement at said feeding station when the slack increases above a predetermined amount and by resuming the advancement at said feeding station at said synchronized rate when the slack decreases below a predetermined amount.

2. The method of producing a continuous line of separable fastener stringers as described in claim 1, wherein the workpiece is continuously collected in loose form in advance of a station where said tension creating, sensing and controlling steps take place as the workpiece emerges from the casting station.

3. The method of producing a continuous line of separable fastener stringers as described in claim 1, wherein the workpiece is continuously collected in a pile in advance of the tension creating, sensing and controlling operations as the workpiece emerges from the casting station, and wherein the workpiece is oscillated as it is advanced from the pile to remove tangles therefrom before being tensioned.

4. The method of producing a continuous line of separable fastener stringers with scoops attached to a continuous tape, which comprises casting at a casting station stringer lengths of scoops on a continuous tape and intermittently interrupting said casting to define blank tape lengths between said stringer lengths, whereby there is formed at said casting station a continuous taped workpiece with spaced stringer lengths of scoops thereon, drawing the workpiece from the casting station and advancing it at a feeding station located between the

7

casting station and a stitching station towards the stitching station at a rate synchronized with the rate of casting at the casting station, stitching the scoops onto the tape of the workpiece at the stitching station at a predetermined rate synchronized with the rate of casting at the casting station, creating tension in the workpiece between the casting station and the feeding station, sensing the amount of said tension and controlling the stitching operation in response to the tension sensed by interrupting stitching operation when the tension exceeds a predetermined amount and resuming the stitching operation at said synchronized rate when the tension decreases below a predetermined amount to prevent said tension from exceeding a predetermined amount, creating a slack under tension in the workpiece between the feeding station and the stitching station, sensing the amount of said slack in the workpiece, and controlling thereby the advancement of the workpiece at the feedstation towards the stitching station by interrupting the advancement at said feeding station when the slack increases above a predetermined amount and for resuming the advancement at said feeding station at said synchronized rate when the slack decreases below a predetermined amount, and periodically speeding up stitching operations to take up excess slack in the workpiece at said slack sensing and control station due to slack accumulation at the latter station resulting from the intermittent interruptions in casting operations.

5. An apparatus for producing a continuous line of separable fastener stringers with scoops attached to a continuous stringer tape, comprising a drive, means operated from said drive for casting stringer lengths of scoops on a continuous tape at a casting station to form a continuous taped workpiece, means for advancing the workpiece towards a stitching station at a rate synchronized with the rate of casting at the casting station and including a feed device located between the casting station and the stitching station, and operated from said drive, means operated from said drive for stitching the scoops onto the tape of the workpiece at the stitching station at a predetermined rate synchronized with the rate of casting at the casting station, means for creating tension in the workpiece between said casting station and said feed device responsive inversely to the amount of workpiece between the casting station and the feed device, for sensing the amount of said tension and for controlling automatically the stitching operation in response to the tension sensing operation by interrupting the drive to said stitching means when the tension increases above a predetermined amount and by reestablishing the drive to said stitching means when the tension falls below a predetermined amount to prevent said tension from exceeding a predetermined amount, means for creating a slack under tension in the workpiece between the feed device and the stitching means, for sensing the amount of said slack in said workpiece and for automatically controlling thereby the advancement of the workpiece at the feed device towards the stitching station in response to the slack sensing operation by interrupting the drive to said feed device when the slack increases above a predetermined amount and by reestablishing the drive to said feed device when the slack decreases below a predetermined amount.

6. An apparatus for producing a continuous line of separable fastener stringers with scoops attached to a continuous stringer tape as described in claim 5, comprising a container between the casting station and the tension creating, sensing and controlling means in position to collect the workpiece as it is discharged from the casting station, and means for oscillating the workpiece as it is advanced from the container to remove tangles therefrom.

7. The method of producing a continuous line of

8

separable fastener stringers with scoops attached to a continuous stringer tape, which comprises casting stringer lengths of scoops on a continuous tape at a casting station through recurrent predetermined cycles to form a continuous taped workpiece, drawing the workpiece from the casting station at a feeding station between the casting station and a stitching station and towards said stitching station at a rate which is synchronized with the rate of casting at the casting station and which is sufficient to maintain an excess of workpiece between said casting station and said feeding station, stitching the scoops onto the tape of the workpiece at the stitching station at a predetermined rate synchronized with the rate of casting at the casting station, and sensing the amount of said excess and controlling the operation of the stitching machine in response to the excess sensed by reducing automatically the rate of stitching below said predetermined rate when the excess is below a predetermined amount and by resuming the stitching operation at said predetermined rate when the excess exceeds said predetermined amount, while the casting operation is permitted to continue through said recurrent cycles without interference.

8. The method as described in claim 7, wherein said sensing and controlling steps are carried out by creating tension in part of said excess varying inversely in accordance with the variations in said excess within a range inclusive of said predetermined excess amount, sensing said tension, and controlling the stitching operation from said tension sensing step by reducing the rate of stitching operation below said predetermined rate when the tension increases above a predetermined value corresponding to a reduction in said excess below said predetermined amount and by resuming the stitching operation of said predetermined rate when the tension decreases below a predetermined value corresponding to a rise in said excess above said predetermined amount.

9. The method as described in claim 7, wherein each of said casting cycles involves the discharge of the workpiece from the casting station at different rates during each cycle.

10. The method as described in claim 7, comprising the step of creating a slack under tension and sensing the amount of said slack in the workpiece at a slack sensing and control station between the feeding station and the stitching station and controlling thereby the advancement of the workpiece at the feeding station towards the stitching station by interrupting the advancement at said feeding station when the slack increases above a predetermined amount and by resuming the advancement at said feeding station at said synchronized rate when the slack decreases below a predetermined amount.

11. The method as described in claim 8, wherein said sensing step also senses the presence of tangles in the workpiece on its way to the feeding station, and wherein the controlling step is carried out by interrupting the stitching operation when said excess falls below said predetermined amount or when a tangle is formed in said excess and by resuming the operation of the stitching operation at said predetermined rate when the excess is increased above said predetermined amount or when said tangle is removed.

12. An apparatus for producing a continuous line of separable fastener stringers with scoops attached to a continuous stringer tape, comprising means for casting stringer lengths of scoops on a continuous tape at a casting station to form a continuous taped workpiece, means for stitching the scoops onto the tape of the workpiece at a predetermined rate synchronized with the rate of casting at the casting station and comprising a drive to said stitching means, means between the casting means and the stitching means driven from said drive for drawing the workpiece from said casting means and feeding it towards the stitching means at a rate to maintain an excess of workpiece between said casting means and said drawing means, and means for sensing the amount of

said excess and for automatically interrupting said drive to said stitching means when said excess falls below a predetermined amount and for automatically resuming said drive to said stitching means automatically when said excess again exceeds said predetermined amount.

13. An apparatus as described in claim 12, wherein said sensing and controlling means comprises means for creating tension in part of said excess varying inversely in accordance with the variations in said excess within a range inclusive of said predetermined excess amount, and means for sensing said tension and for controlling the stitching operation from said sensing means by automatically interrupting the drive to said stitching means when said tension increases above a predetermined value corresponding to a reduction in said excess below said predetermined excess amount and by automatically resuming said drive to said stitching means automatically when said tension falls below said predetermined value.

14. An apparatus as described in claim 12, wherein said casting means comprises means for operating said casting means through recurrent cycles in which said workpiece is discharged from said casting means at different rates during each cycle.

15. An apparatus as described in claim 12 comprising means for creating a slack under tension in the workpiece between said drawing means and said stitching means, for sensing the amount of said slack, and for automatically interrupting the operation of said drawing means in response to the sensing of said slack, when the slack increases above a predetermined amount and for automatically resuming operation of said drawing means in response to the sensing of said slack when the slack decreases below a predetermined amount.

16. An apparatus as described in claim 12, comprising manually controllable means for driving the stitching means at a rate greater than the rate of operating said stitching means from said drive, when the connection from said drive to said stitching means is interrupted.

17. An apparatus as described in claim 12, comprising means between the casting means and the excess sensing means for collecting the excess in loose form, and means for oscillating the loose workpiece as it is advanced from said collecting means to said excess sensing means for removing tangles therefrom.

18. An apparatus as described in claim 13, wherein said sensing means includes means for sensing tangles in the workpiece and for increasing the tension in said excess in the presence of a tangle above said predetermined value.

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