

April 20, 1965

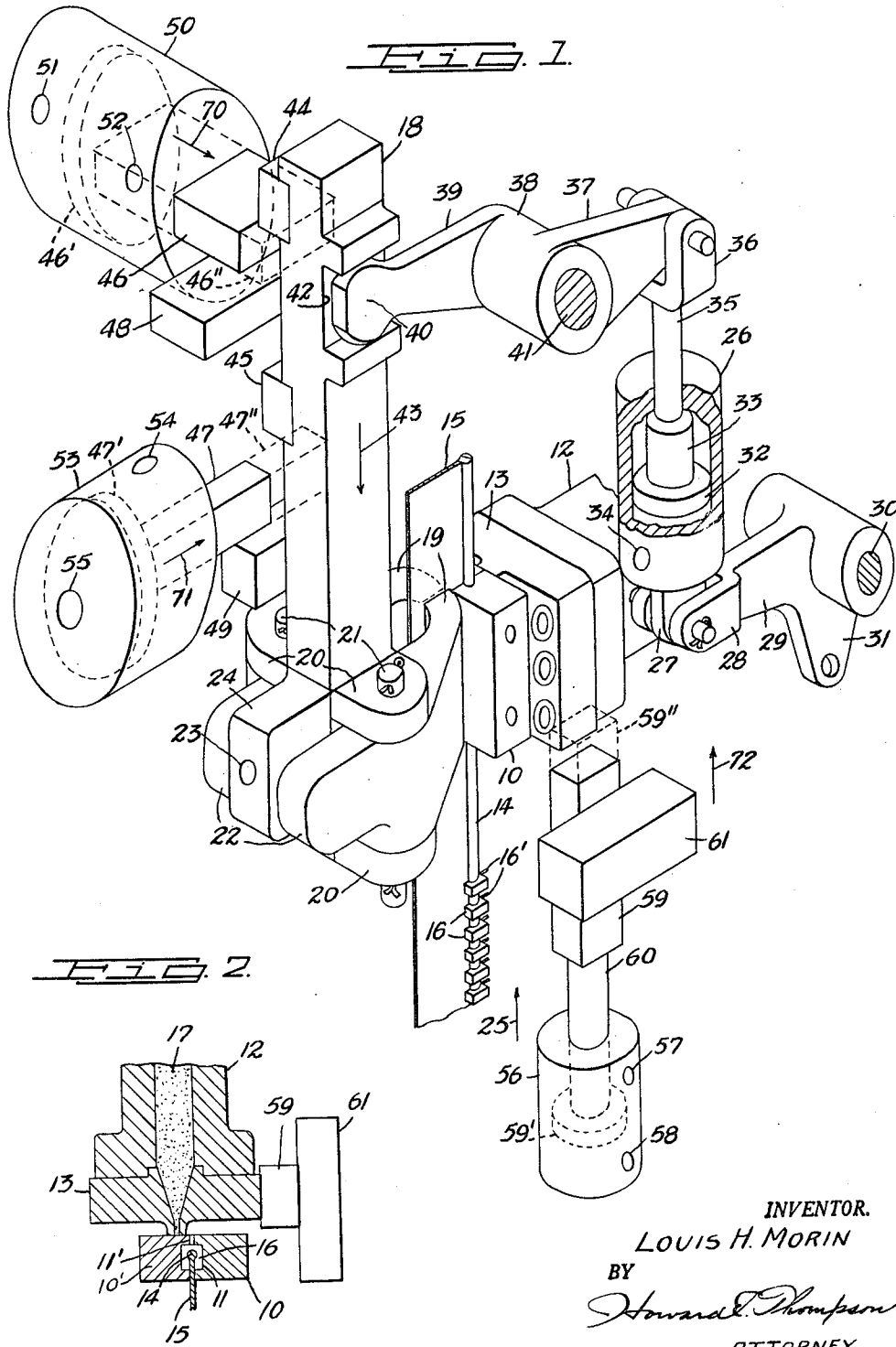
L. H. MORIN

3,178,772

APPARATUS FOR CONTROLLING TAPE FEED IN REGULATING
VARIABLE SPACINGS BETWEEN GROUPS OF SCOOPS

Original Filed July 9, 1959

2 Sheets-Sheet 1



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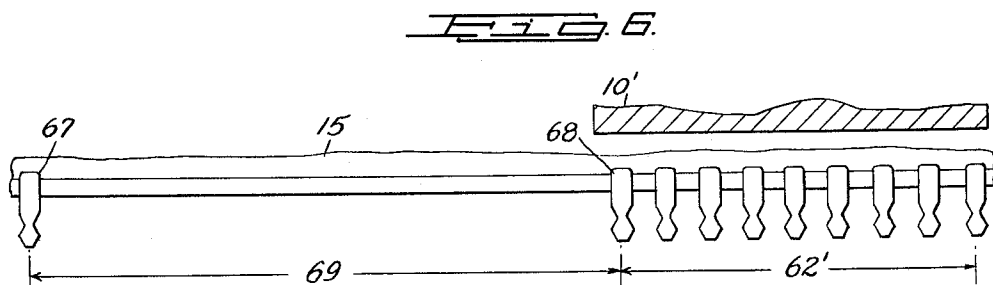
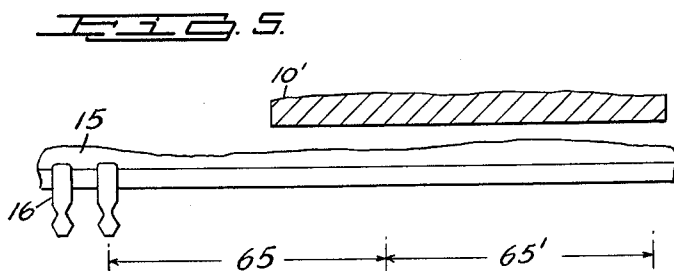
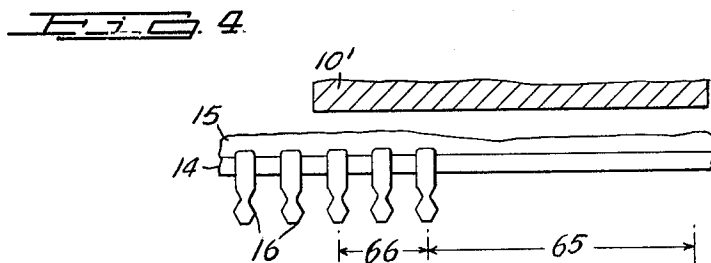
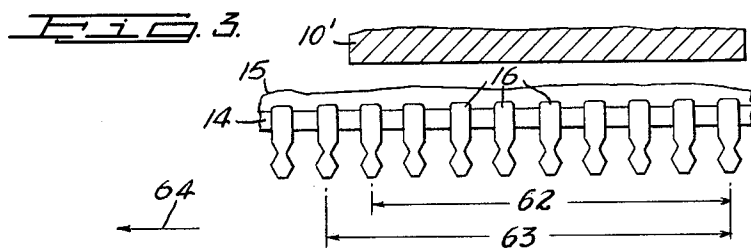
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APPARATUS FOR CONTROLLING TAPE FEED IN REGULATING VARIABLE SPACINGS BE- TWEEN GROUPS OF SCOOPS

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Continuation of application Ser. No. 826,085, July 9, 1959. This application May 8, 1962, Ser. No. 195,652
2 Claims. (Cl. 18—30)

This invention relates to an apparatus for the production of separable fasteners and more particularly for the production of a very long tape having groups of separable fastener scoops along one edge, said groups being separated into stringer lengths by segments of tape free from scoops.

More particularly, this invention relates to means in an apparatus of the type described, adapted to regulate the feed of the tape between a pair of casting dies and to regulate the position of injection nozzles whereby the length of the individual stringers and the gaps between them may be controlled.

This application is a continuation of application Serial No. 826,085, filed July 9, 1959 and now abandoned.

In application Serial No. 721,042 filed March 12, 1958, which matured into Patent No. 3,068,519 on December 18, 1962, an apparatus and method is disclosed for forming separable fastener stringer lengths on a very long length of tape. That application discloses an injection cylinder having an enlarged outer end with a series of vertically spaced nozzles arranged in a line. Dies are disclosed which are adapted to close about a segment of the tape and which have a plurality of identical, vertically spaced die cavities, each of which is comprised of a sprue passage and a scoop cavity. Each die cavity is thereby adapted to form a separate casting comprising a scoop adhered to the tape and a rod-like projection integral with the scoop and formed in the sprue passage.

Application Serial No. 721,042 further discloses a device for regulating the tape feed in order to vary the number of scoops cast in a given stringer length. This device employs a tape gripper adapted to seize the tape while the dies are still closed, move with it through a vertical distance when the dies have opened, and then let go its hold after the dies have closed on the tape at a new position thereon. During an ordinary casting cycle this tape gripper advances through a normal increment sufficient to remove all previously formed scoops from between the dies. Thus, the following casting step forms on the tape a number of scoops equal to the number of die cavities in the mold. However, a stop mechanism is provided to limit the advance of the tape gripper during a selected casting cycle to a distance less than the normal increment, so that upon the closing of the dies during said cycle a number of castings formed during the preceding cycle will be relocated in die cavities, while other die cavities will remain free of castings. Operation of the injection mechanism fills only the latter die cavities with castable material. By this means stringer lengths having any desired number of scoops may be produced.

No mechanism was disclosed in application Serial No. 721,042 for producing a desired gap between stringer lengths. It is the object of this invention to provide such a mechanism as well as an improved form of stop mechanism for use in modifying the tape feed during the last casting cycle in the formation of a stringer.

It has been found that certain plastic castable materials

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tend to flow through the injection nozzles for a time even after the pressure exerted thereon by the compressed air-driven piston has been removed. This problem exists with respect to acetal resin, sold commercially under the name of Delrin. This effect is thought to result from the generation of gas in the heated portions of the material ahead of the piston, which gas continues to exert sufficient pressure on the confined material to cause it to flow through the nozzles. In the present invention means are provided to maintain the nozzles in a position where such flow is prevented during the advance of the tape while the gap between adjacent stringer lengths is formed.

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 schematic isometric view, diagrammatically illustrating the mechanism controlling tape feed in accordance with my conception, parts of the construction being broken away and in section.

FIG. 2 is a partial sectional view through the die and nozzle mechanism illustrating the hold position of the nozzle during the tape spacing operation.

FIGS. 3 to 6, inclusive, are views diagrammatically illustrating first the full feed of the tape in simultaneously casting an increment of scoops on a tape, then the partial feed of the tape to form the first space feeding of the tape, then a second stage of feeding for providing the tape spacing and, finally, the step of forming the next increment of scoops beginning with the next group of scoops formed on the stringer. In all of the views, the rod-like projection on the scoops which are formed in the sprue passages have been eliminated to simplify the illustration.

In order to illustrate my improved apparatus and for controlling spacing between stringer length scoops in the production of separable fastener stringers, a schematic illustration of the apparatus is diagrammatically shown in FIG. 1 of the drawing and, in said figure, 10 represents the dies, into the die cavities of which, one cavity being noted in FIG. 2 of the drawing comprised of sprue passage 11' and scoop cavity 11, plastic material is pressure injected from an injection sleeve 12 into the heated nozzles 13 and, thus, through sprue passages 11' into the respective scoop cavities. The present invention deals primarily with the formation of thermoplastic scoops on the edge 14 of a stringer tape 15, the scoops being generally indicated by the reference character 16, note FIG. 1 of the drawing.

In the showing of FIG. 1, the rod-like portions formed in the sprue passage and attached to the formed scoops are indicated at 16'. However, in later making reference to the illustrations in FIGS. 3 to 6, inclusive, it will be understood that, to simplify the illustration, the rod-like portions 16' have not been shown.

At this time, attention is directed to the disclosure in my prior application Ser. No. 721,042, filed March 12, 1958, in which the method of simultaneously forming increments of scoops on a stringer tape is clearly illustrated and, for this reason, no showing of the means for actuating the sleeve 12 and nozzles 13, nor the pressure injection of the plastic material 17, note FIG. 2, is deemed to be necessary.

The present invention deals primarily with apparatus for controlling feed of the tape during the casting operations, as well as in the tape spacing operation between

groups of scoops. In the diagrammatic showing, 18 represents a slide which carries, at its lower end, a pair of gripper jaws 19 pivoted to two pairs of lugs 20 on the slide, as indicated at 21. The jaws 19 operatively engage opposed surfaces of the stringer tape 15, in the manner diagrammatically illustrated. The jaws 19 include a pair of projecting ears 22 suitably actuated by compressed air introduced through the port 23 into a piston in the extension 24 of the slide causing movement of the jaws into operative engagement with the tape, this operation being suitably timed and synchronized with the operation of the other parts of the machine, it being understood that, when the air is released, suitable springs, not shown, move the jaws 19 into inoperative position for free movement longitudinally of the tape in establishing a new gripping engagement therewith, this latter movement being upward in the direction of the arrow 25 of FIG. 1.

To actuate the slide in the synchronized manner referred to, a static air cylinder 26 is employed, the lower end of which has an extending lug 27, to which is pivoted a yoke 28 at the end of a lever 29, suitably pivoted, as at 30, the lever being actuated by any suitable means which is coupled with the apertured arm 31 of the lever. Within the cylinder 26 is an air actuated piston 32, having a reduced portion 33 which is held in constant seat upon the upper end of the cylinder by introduction of air from a static supply source through a port 34 to form what might be termed an air spring backing for the piston 32. The piston 32 includes a rod 35 extending upwardly through the end of the cylinder 26 and has, at its upper end, a yoke 36, within which is pivoted one arm 37 of a lever 38, the other arm 39 of said lever having an enlarged rounded head portion 40. The lever 38 is arranged on a suitable pivot 41.

At one side of the upper end of the slide 18 is a bifurcated slot 42, within which the head 40 of the arm 39 operates in longitudinal movement of the slide. It will be understood, in this connection, that, as the cylinder 26 and piston 32 are moved upwardly, the slide 18 is moved downwardly in the direction of the arrow 43 in FIG. 1 in the feed movement of the grippers 19 and the tape 15 held thereby.

The slot 42 is disposed on one side surface of the slide and suitably mounted in the other side surface of the slide are two hardened steel shoulder pieces 44 and 45, in conjunction with which two piston rods of rectangular cross sectional form, as at 46 and 47, respectively, operate. The rods in their extended position are arranged upon supports 48 and 49, respectively.

The piston of the rod 46 is indicated at 46' and is disposed in a two-way air cylinder 50, the central parts of which are indicated at 51 and 52, suitable means being provided for supplying air under pressure to these ports and the exhaust of air from opposed ends of the cylinder 50 in actuation of the rod 46 from its inoperative full line position to its extended operative position, indicated in dotted lines in FIG. 1 at 46''. As will be explained below, rod 46 regulates the position of slide 18 for the purpose of controlling the number of scoops in a stringer length.

In like manner, the rod 47 is actuated by a piston, indicated at 47', in a two-way air cylinder 53, the cylinder 53 having ports, as at 54, 55 for admission of air under pressure from a suitable source in movement of the rod 47 into the full line position shown in FIG. 1 and the dotted line position indicated at 47''. Rod 47 serves to regulate the position of slide 18 for the purpose of controlling the size of the tape gap between stringer lengths as will appear below.

At 56 is indicated another two-way air cylinder having ports 57 and 58 actuating a stop block 59 through the medium of a piston, indicated at 59' in the cylinder 56, the block being connected with the piston through a rod 60 adjacent and at one side of the block 59 is a stationary block 61 to back-up the block 59. Here again, it will be

apparent that the piston 59' moves the block 59 into the full line position shown in FIG. 1, as well as into the dotted line position indicated at 59''. As will be explained below, stop block 59 is operative in blocking the injection of castable material into the die cavities during the formation of the tape gap.

All of the cylinders 50, 53 and 56 or the supply of air thereto will have suitable automatic controls, not shown, for synchronizing the operation of the grippers 19 and discharge of the plastic material into the die cavities 11, consistent with any particular predetermined operation. For example, a definite control is provided for the groups of scoops formed on the beaded edge 14 in determining the predetermined stringer lengths. Also, the spacing between adjacent groups of the scoops will be determined.

In this connection, FIGS. 3 to 6, inclusive, will show a procedure followed in employing my apparatus which is not necessarily consistent with the showing in FIG. 1, but can be illustrative of one method for carrying my invention into effect. In all of these figures, the sectional illustrations at 10' diagrammatically show the position of the dies 10 with respect to the formation of the scoops and the spacing of the tape.

Reference is made to FIG. 3, which shows a die 10' adjacent a stringer tape 15, the beaded edge 14 of which bears a number of scoops 16. The particular die shown extends over the nine scoops lying within the distance 62 and would have nine die cavities constructed in accordance with the teachings of application Serial No. 721,042, referred to above. This die could be used in accordance with the teachings of that application to cast a stringer length of any desired number of scoops. Where a number is desired which is not a whole number multiple of the number of die cavities in the die, the increment of scoops cast in the final casting cycle will be less than said number. This is accomplished by limiting the movement of the tape gripper following the next-to-last casting cycle on the stringer to less than distance 62. The dies then close on the tape for the last casting cycle, a number of the just formed scoops being relocated in die cavities, while other die cavities are left free of scoops for the reception of castable material. By this method any number of scoops less than the number of die cavities in the die may be produced in the last casting cycle.

In the embodiment disclosed, rod 46 may be advanced to extend operative position 46'' prior to the movement of the tape gripper 18 which follows the next-to-last casting cycle on a stringer length. Such movement will then be limited as shoulder piece 44 strikes rod 46. The reduced tape advance will thus result in a reduced number of castings during the last casting cycle, as explained above. During the last casting cycle both rod 47 and block 59 will remain in the full line positions shown in FIG. 1, out of contact with shoulder piece 45 and die 10, respectively. By varying the thickness of rod 46 during different production runs it is possible to use the same set of dies for the production of different stringer lengths, as such variation modifies the distance travelled by the tape in advancing preparatory to the final casting cycle and thus modifies the number of scoops cast during such cycle. Rod 46 serves much the same function as stop 59 of application Serial No. 721,042, although these elements differ in structure and method of operation.

Once a stringer length has been produced with a desired number of scoops therein, a gap or gaps must be provided on the tape free of scoops, such as that between scoops 67 and 68 in FIG. 6. It is desirable that the size of this gap be independent of the size of the dies, so that the same dies may be used in a machine adjustable to produce a variety of gap sizes. This result is achieved by means of the piston rod 47 and the block 59 and their associated mechanism and may be illustrated by FIGS. 3-6. In FIG. 3 dies 10' are shown adjacent a stringer tape 15, the beaded edge 15 of which bears a number of scoops 16. The die has nine die cavities (not shown)

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sufficient to enclose the nine scoops in the distance 62. The normal feeding increment in this case is distance 63.

Suppose that the scoop shown farthest to the right in FIG. 3 (scoop 67 in FIG. 6) is the last scoop on a stringer length. A gap 69 may be produced by the following steps. The dies 10' are first opened as in FIG. 2. Simultaneously rod 47 is advanced into position 47'' (shown by dashed lines in FIG. 1). As a result when the gripper jaws close on the tape and slide 18 moves down in the direction of arrow 43, it will be halted by contact of shoulder piece 45 with rod 47. Therefore, the tape advance will be limited to distance 65 (FIG. 4), instead of the normal distance 63, and the situation in FIG. 4 will result. Distance 65 may be any desired distance less than the normal distance 63. By altering the thickness of rod 47 between production runs, the size of distance 65 may be varied. In FIG. 4 as the dies 10' close on the tape following this limited advance the three scoops lying within distance 66 will be relocated in three die cavities.

At this point in the cycle it is necessary to block the movement of the injection nozzles 13 into alinement with sprue passages 11' (see FIG. 2). Should such alinement occur, as it does in the casting cycles, castable material might flow into the die cavities. This flow may even occur where pressure is not exerted by the piston on the plastic material in the injection cylinder, if the formation of gas in the plastic in the nozzles keeps the pressure up therein.

In order to block the alinement of the nozzles and the die cavities during the formation of the gaps, block 59 is advanced into the dotted line position 59''. When in this position block 59 prevents the motion of nozzles 13 to the right, as seen in FIG. 2. As seen in that figure, alinement of the die cavities and nozzles is thereby prevented.

As the machine continues to operate, the dies 10 will open and the tape will again be advanced by the gripper. The distance advanced may be a normal feeding increment (if block 59 is withdrawn) or a shortened feeding increment (if block 59 remains in place). The position of rods 46 and 57 and block 59 during each cycle may be selected as desired by setting suitable timing devices, such as the timing chain of application Serial No. 721,042. This being the case, by selecting the proper combination of normal and shortened feeding increments and simultaneously keeping the nozzles away from the die cavities, gaps of any desired size may be produced between stringer lengths. In the illustration of FIGS. 5-6 a gap of distance 69 is produced by moving the tape after casting scoop 67, through two reduced feed increments of distance 65 and 65', without injecting castable material into the die. Then the tape is moved a final full feeding increment and the scoops shown within the distance 62' of FIG. 6 are cast.

Gaps as small as that produced by removing one scoop from an increment thereof may be achieved by advancing the tape through a distance equal to the distance between the center lines of adjacent scoops, omitting the casting step, then moving the tape through a full feeding increment, and casting a full increment of scoops for the beginning of the next stringer.

In the apparatus disclosed there is no need to provide a timing device to prevent the application of piston pressure to the material in the nozzles during the gap-forming cycles. Even if such pressure is applied during these cycles in the same manner as in a casting cycle, no casting will form, since the nozzles are held in the blocked position of FIG. 2 by block 59.

It will be understood that the means actuating the arm 31 of lever 29 imparts a constant motion thereto which would be the normal feed of the tape by the grippers 19. However, when 46 and 47 are moved into operative engagement with the slide 18, the air in the cylinder 26 below the piston 32 is compressed in the manner of a spring to compensate for the limited movements imparted to the grippers 19, as more clearly heretofore set forth.

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For purposes of description, the stringer tape may be regarded as an extended member, upon an edge portion of which the scoops are formed. In the method, the heated plastic material, as contained within the heated nozzle 13, can be regarded as a liquid material which hardens in the dies to form the solid plastic castings. Further, it will be apparent that with my present method, while a scoop length can be controlled and regulated by the addition of scoops in accordance with the teachings in my prior application, hereinbefore referred to, the positioning of previously cast scoops in the dies is also utilized in controlling the length of tape spacing between groups of scoops.

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

1. An apparatus for producing a long continuous member having groups of regularly spaced castings along its length, each of said groups being separated from the adjacent group by a desired casting-free gap, said apparatus comprising

- (a) a pair of dies movable from an open to a closed position about the continuous member;
- (b) die surfaces on the dies defining, when the dies are in the closed position about the continuous member, a plurality of die cavities, said die cavities being unconnected, and of similar size, shape, and orientation and being arranged linearly along the continuous member;
- (c) a plurality of injection nozzles linearly arranged, said nozzles being movable into a casting position in which each nozzle communicates with a die cavity and into a blocked position in which flow through the nozzle into the die cavity is prevented;
- (d) advance means for advancing the continuous member relative to the dies following the production of castings in the die cavities, said means normally advancing the continuous member a normal feed increment sufficient to move the castings so produced clear of the dies;
- (e) first blocking means operable during the formation of a group of castings and movable from an inoperative position in contact with the advance means into an operative position in which operative position the movement of the advance means is limited to produce an advance of the continuous member over a first distance less than the normal feed increment such that a number of castings produced in the casting cycle prior to said advance are positioned relative to the dies so that motion of the dies into the closed position results in the relocation of said number of castings in die cavities while at least one die cavity remains free of a relocated casting;
- (f) second blocking means operable during the formation of the gap and movable from an inoperative position into an operative position in contact with the advance means in which operative position the movement of the advance means is limited to produce an advance of the continuous member of a second distance less than the normal feed increment;
- (g) third blocking means operable during the formation of the gap and movable from an inoperative position into an operative position in contact with said nozzles in which operative position the motion of the injection nozzles from the blocked position into the casting position is prevented.

2. The device of claim 1 wherein the advance means comprises an intermittently operable gripper adapted to grasp the continuous member and travel with said continuous member; wherein the first and second blocking means comprises rods moved by air-operated pistons, said rods, when in their operative positions, limiting the motion of the advance means by contacting portions of the gripper; and wherein the third blocking means comprises a rod moved by an air operated piston, said rod, when in its operative position contacting the nozzles and preventing

motion of the nozzles into a position of alinement with
the die cavities.

2,464,050	3/49	Morin	-----	18—59
2,467,047	4/49	Morin	-----	18—30
2,686,338	8/54	Morin	-----	18—1
2,695,419	11/54	Morin	-----	18—1
2,728,110	12/55	Morin	-----	18—59

References Cited by the Examiner

UNITED STATES PATENTS

2,447,355 8/48 Morin ----- 18—30

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