May 14, 1968 H. A. JENSEN 3,382,641

CONTINUOUS TUBE PACKAGING MACHINE

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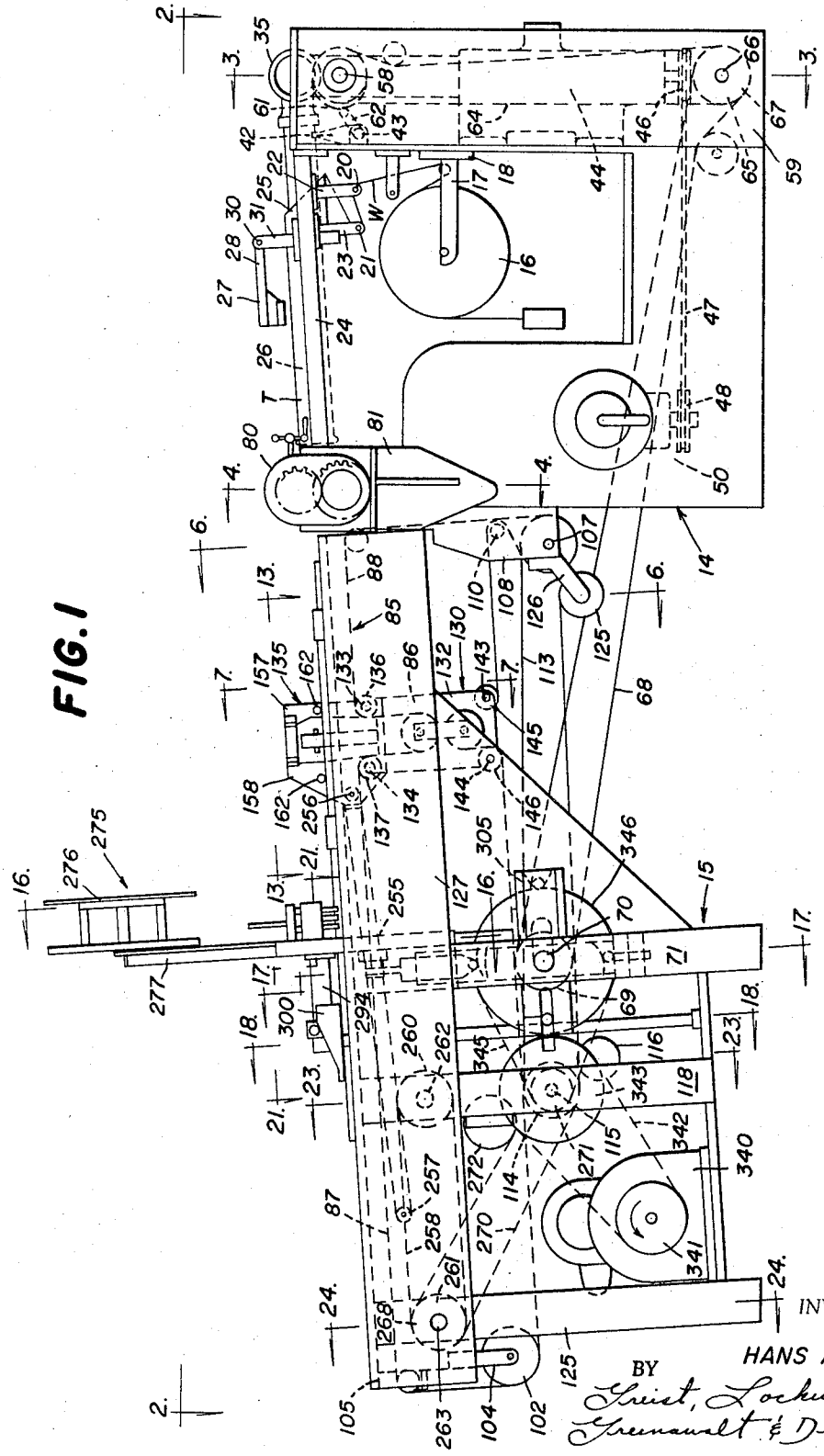
FIG. 1



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CONTINUOUS TUBE PACKAGING MACHINE

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FIG. 2

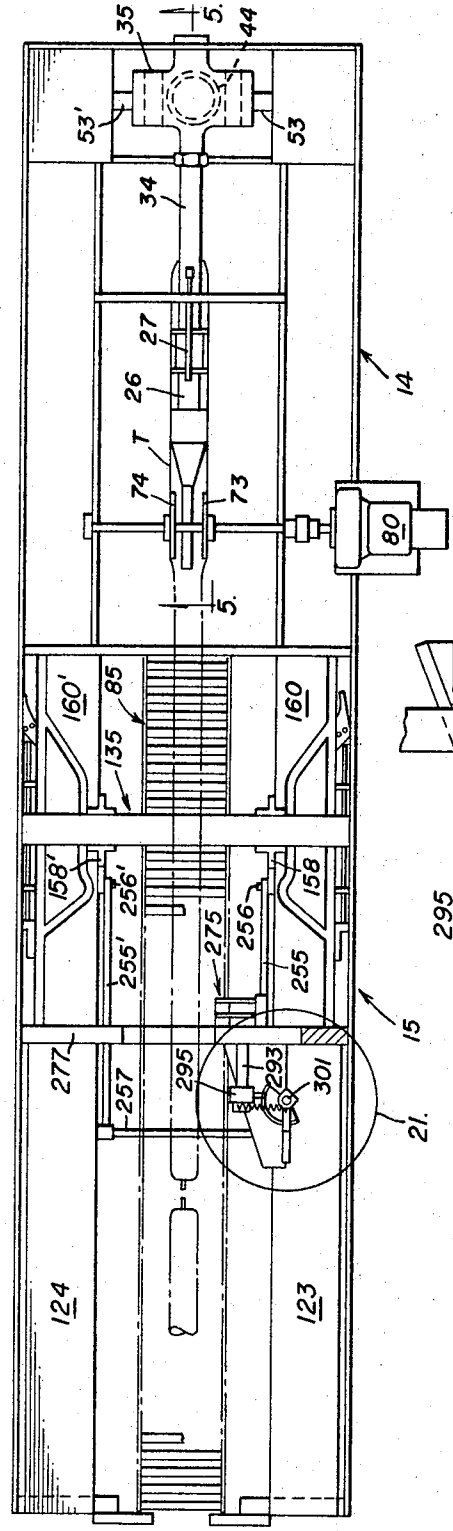
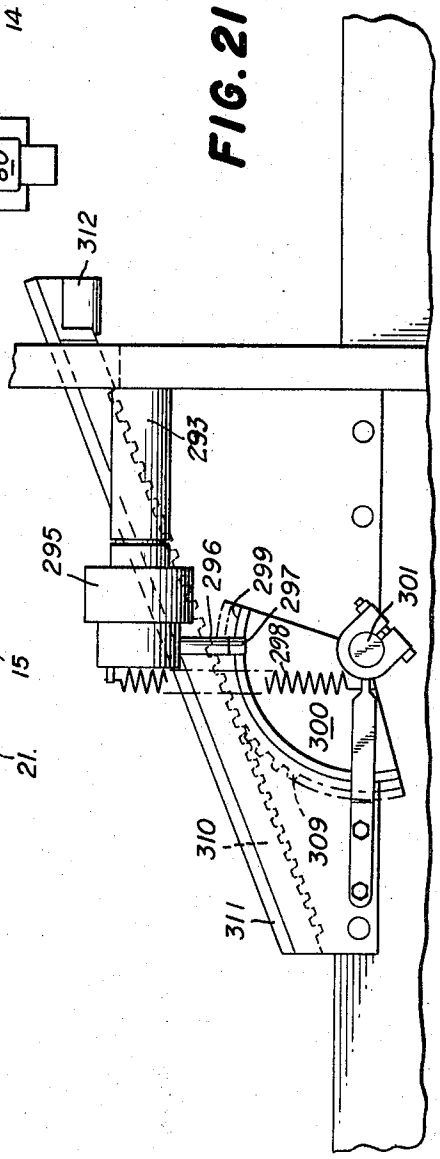


FIG. 21



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CONTINUOUS TUBE PACKAGING MACHINE

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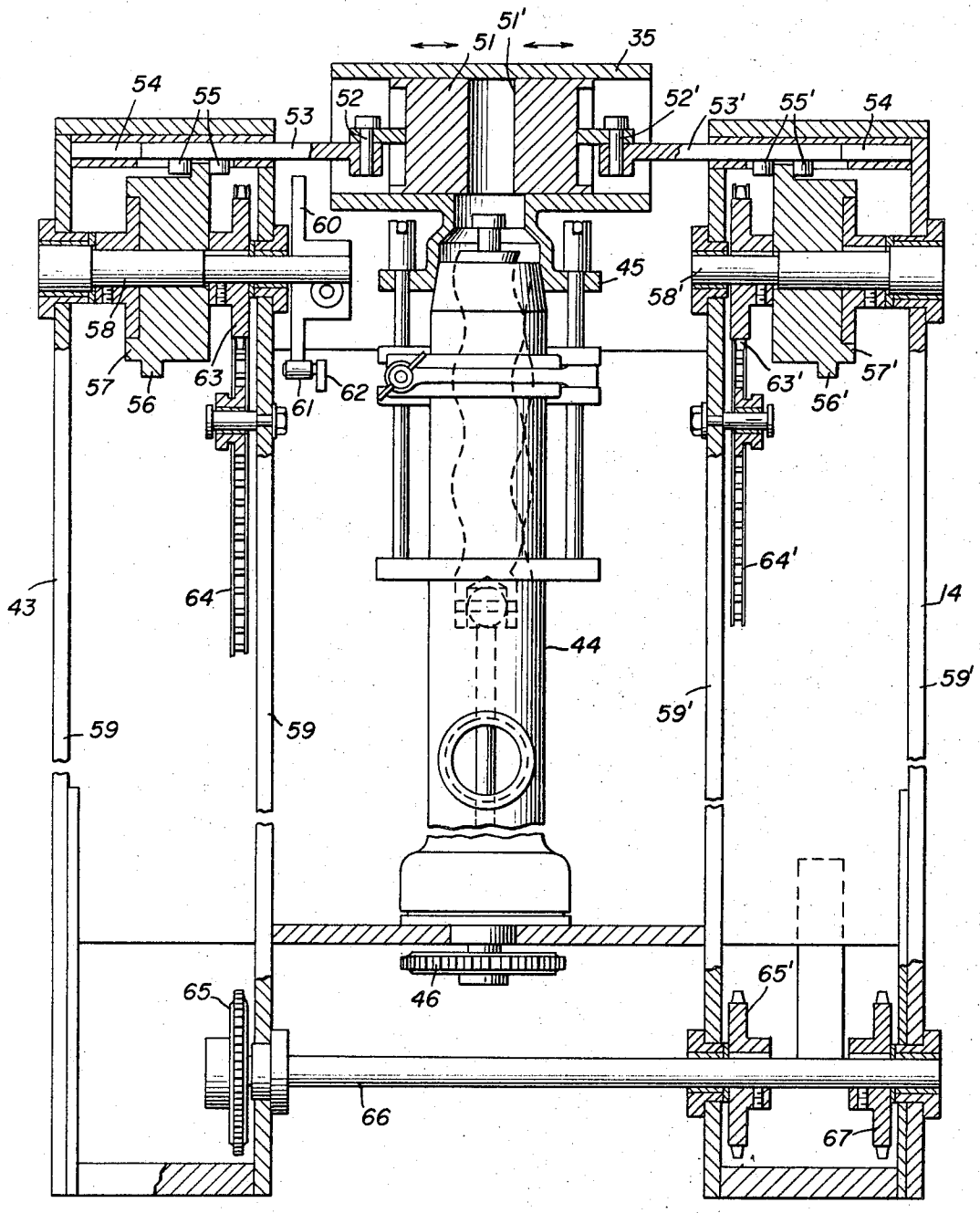
FIG. 3



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May 14, 1968 H. A. JENSEN 3,382,641

CONTINUOUS TUBE PACKAGING MACHINE

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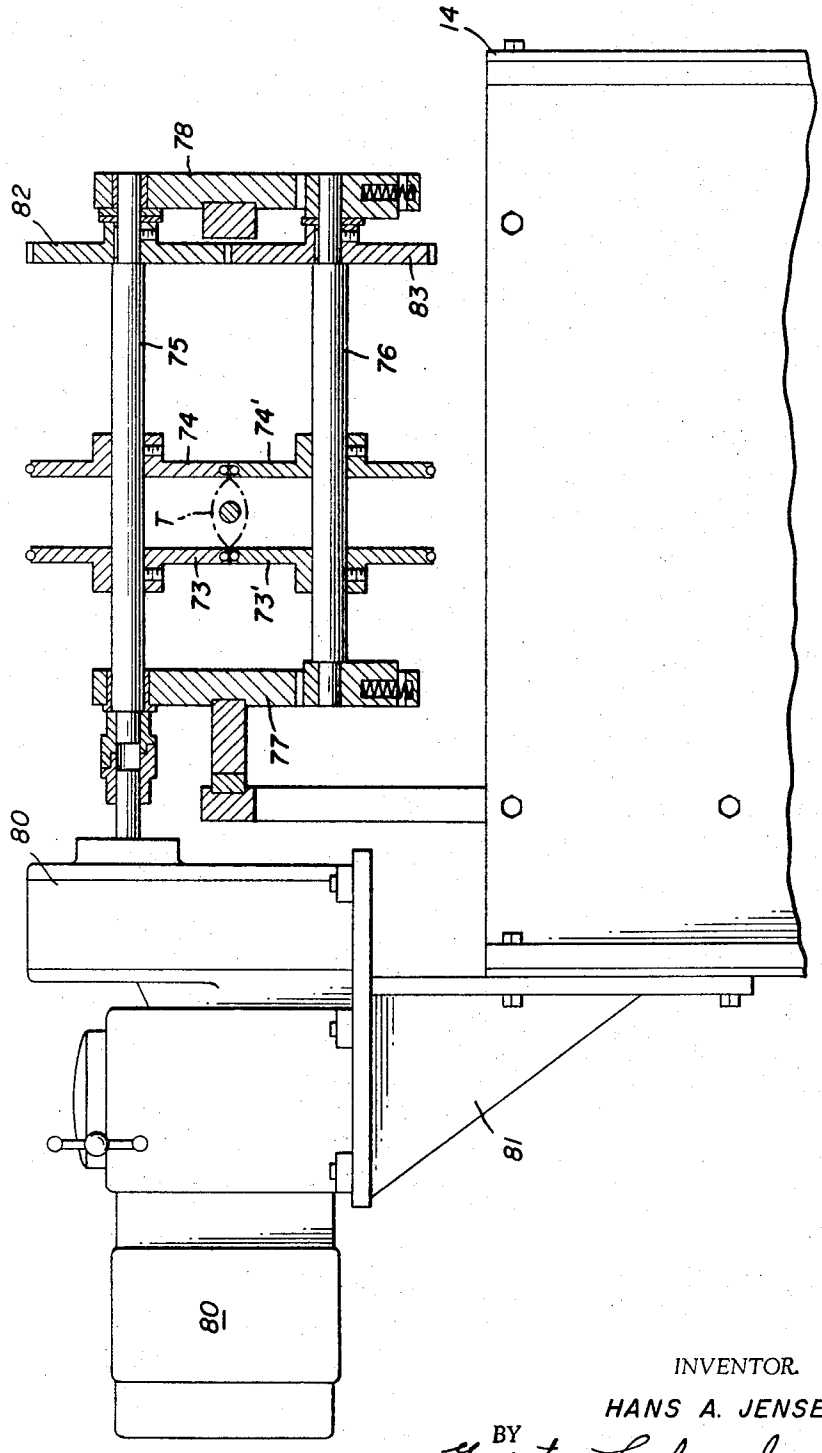
FIG. 4



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CONTINUOUS TUBE PACKAGING MACHINE

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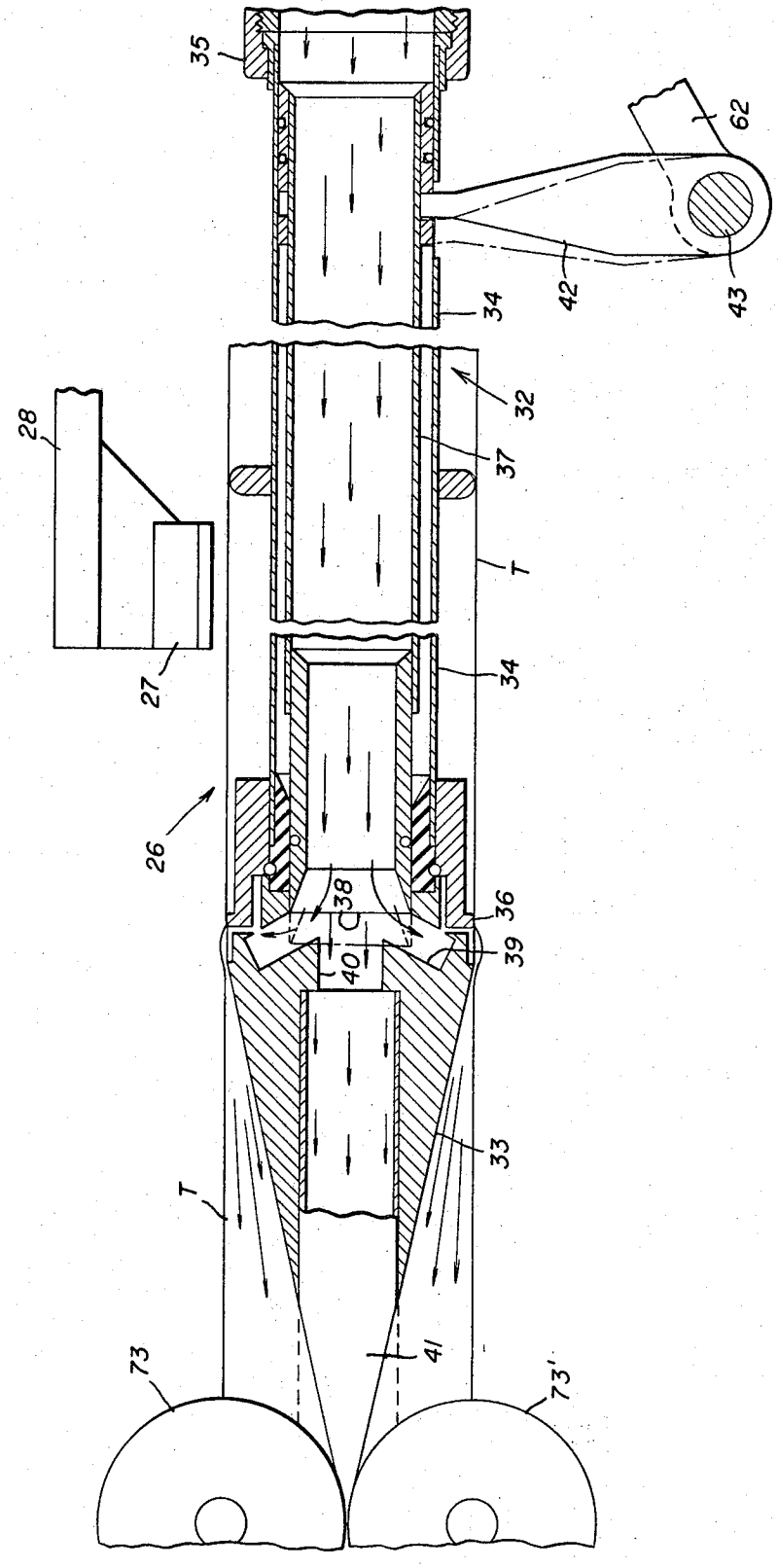

FIG. 5

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CONTINUOUS TUBE PACKAGING MACHINE

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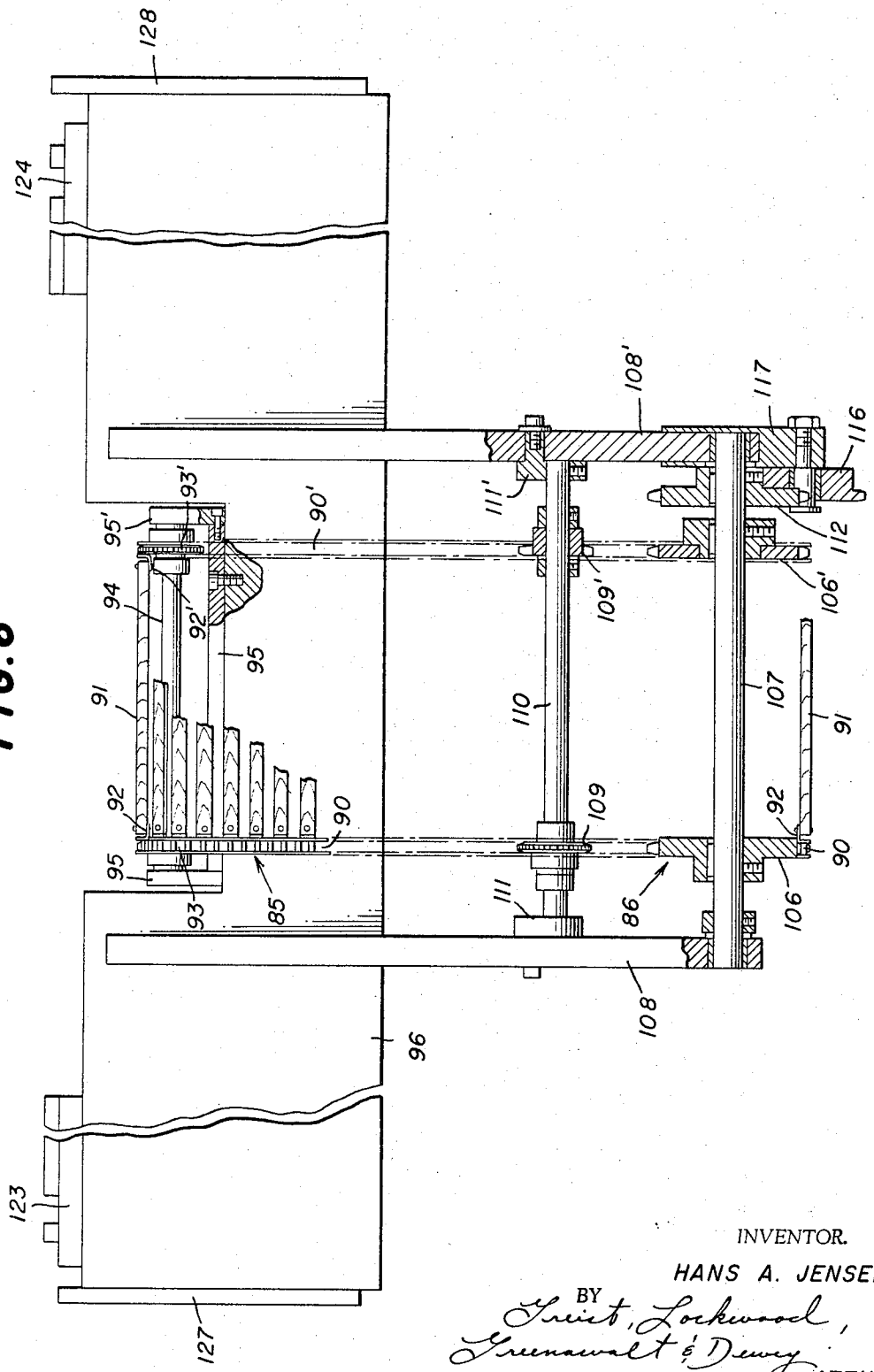
FIG. 6



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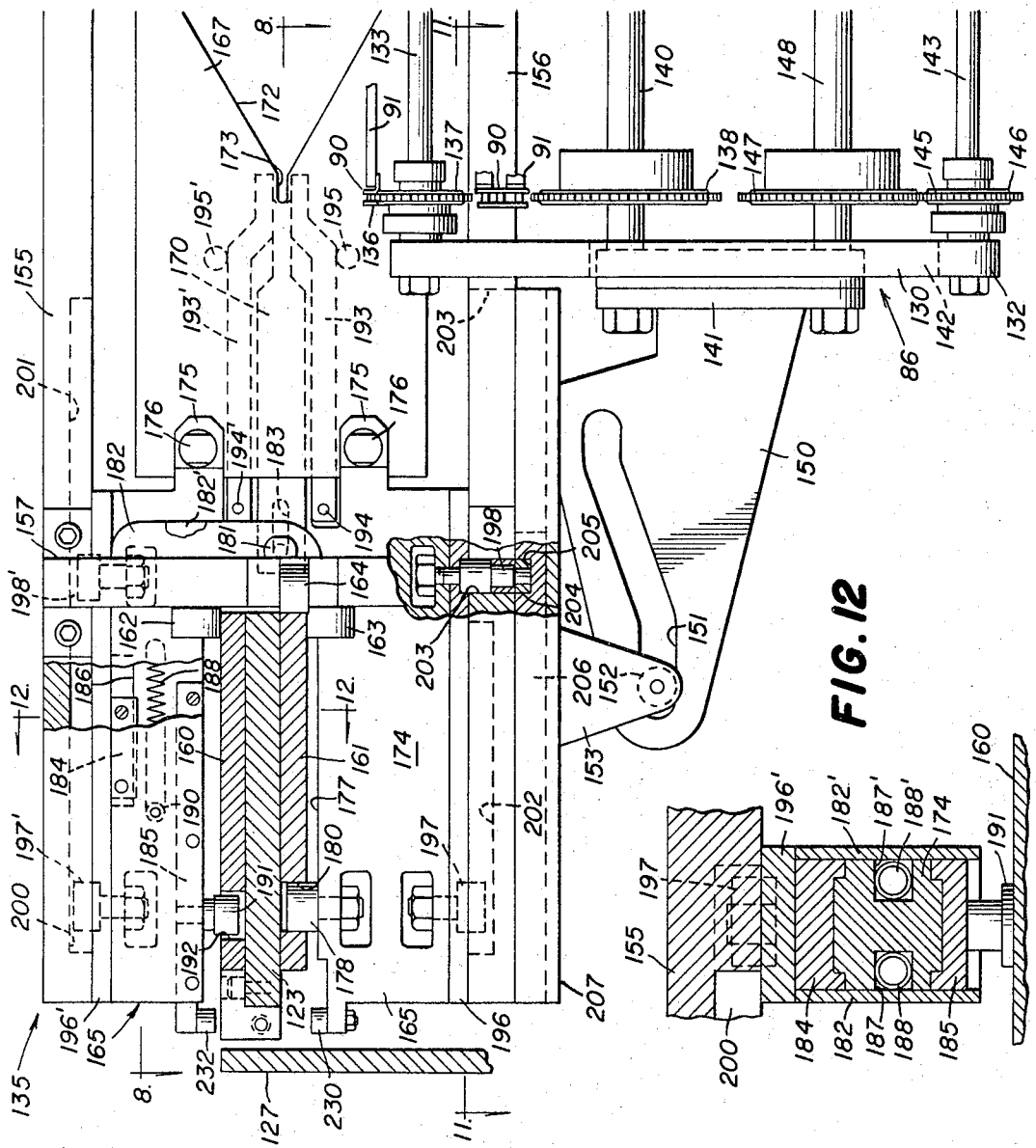

FIG. 7

FIG. 12

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CONTINUOUS TUBE PACKAGING MACHINE

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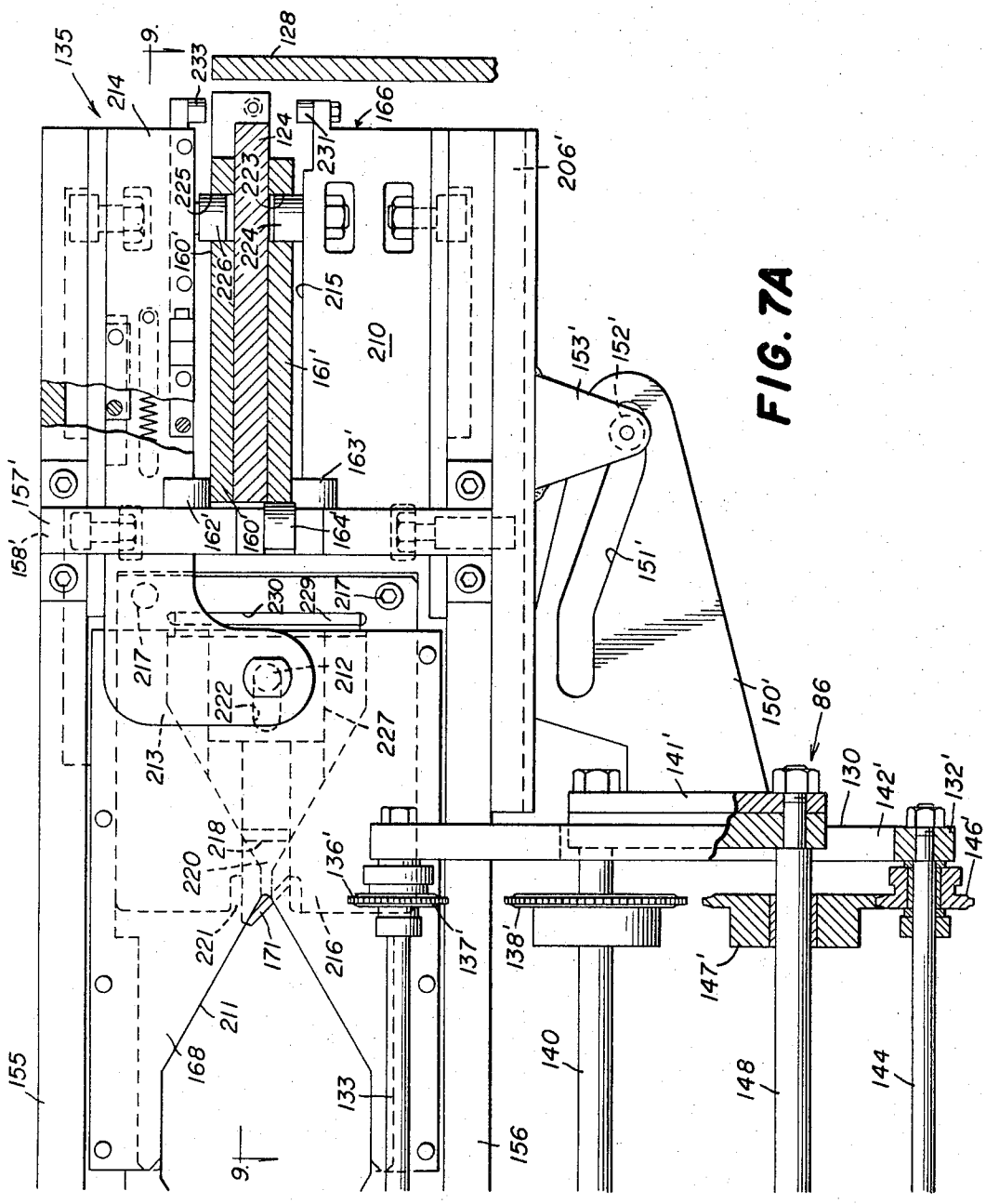

FIG. 7A

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CONTINUOUS TUBE PACKAGING MACHINE

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FIG. 8

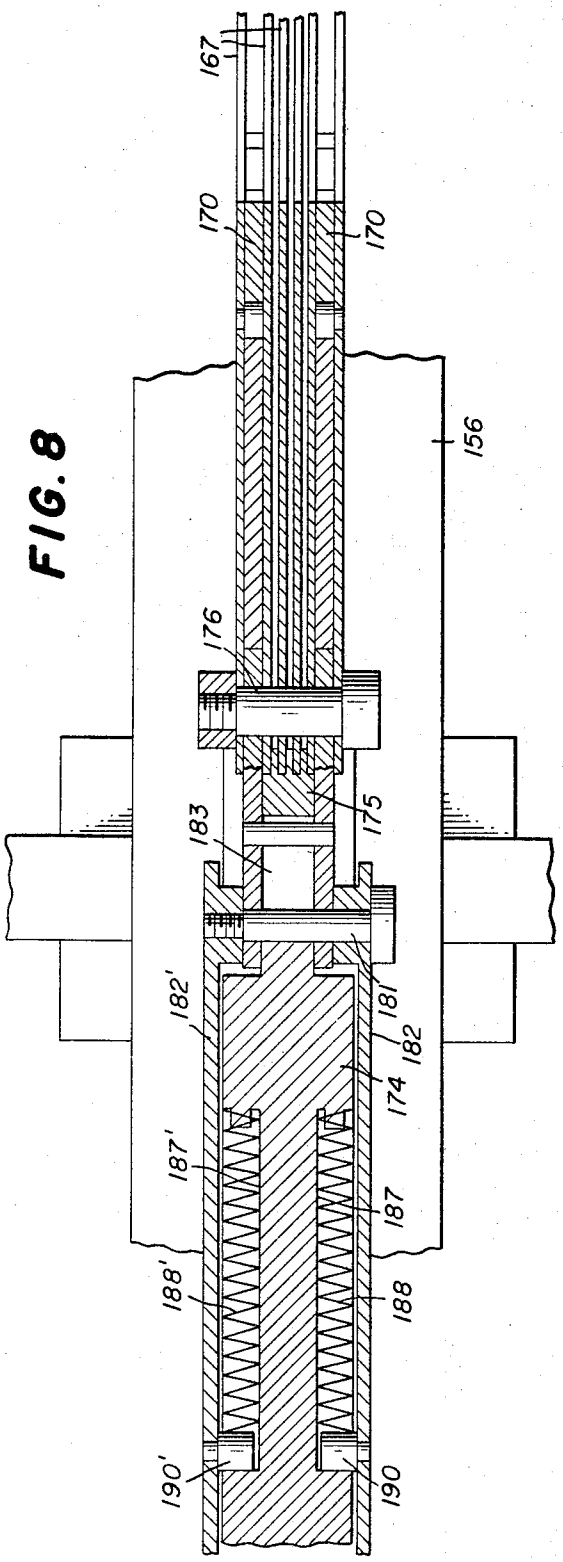

FIG. 9

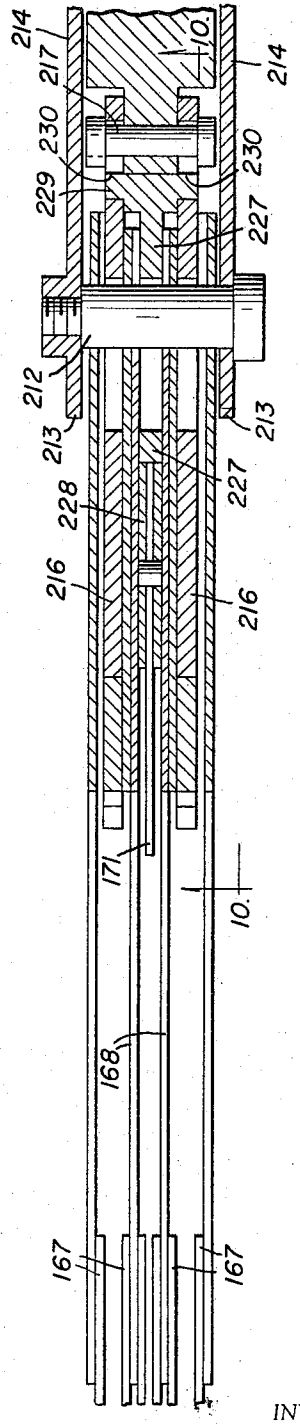

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FIG. 10

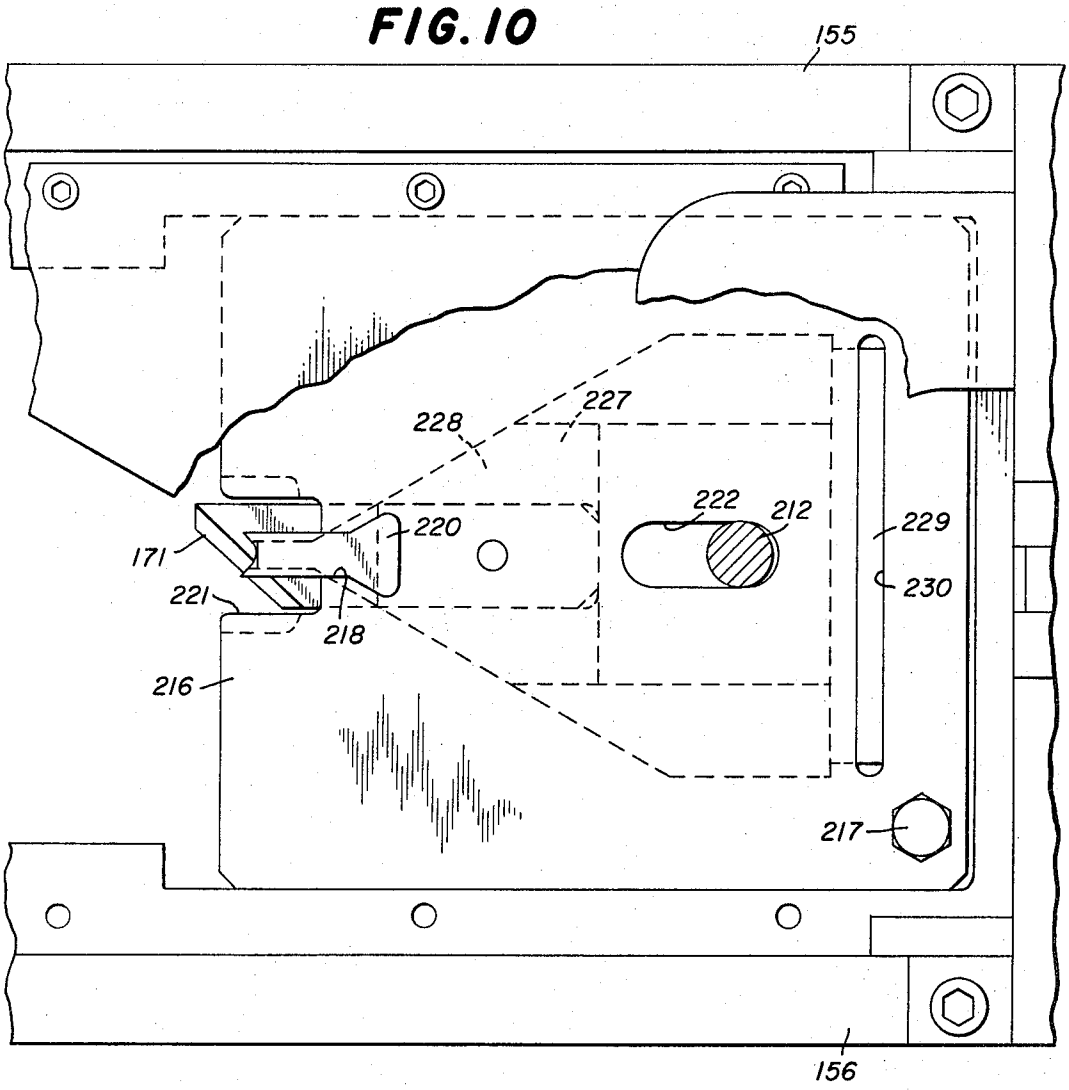
155
228
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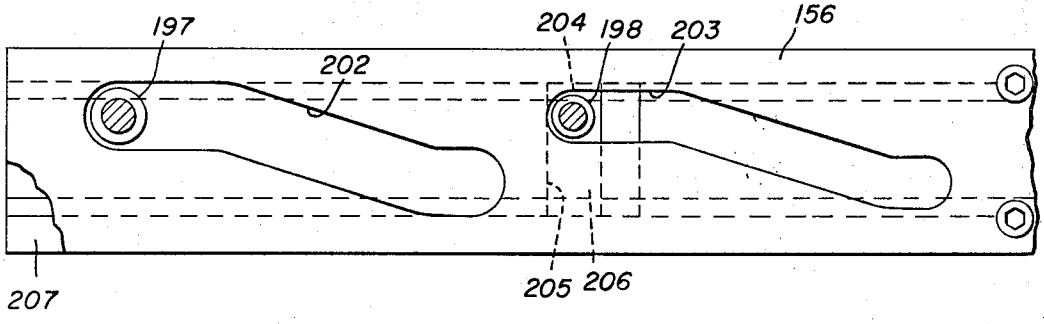
FIG. 11


197
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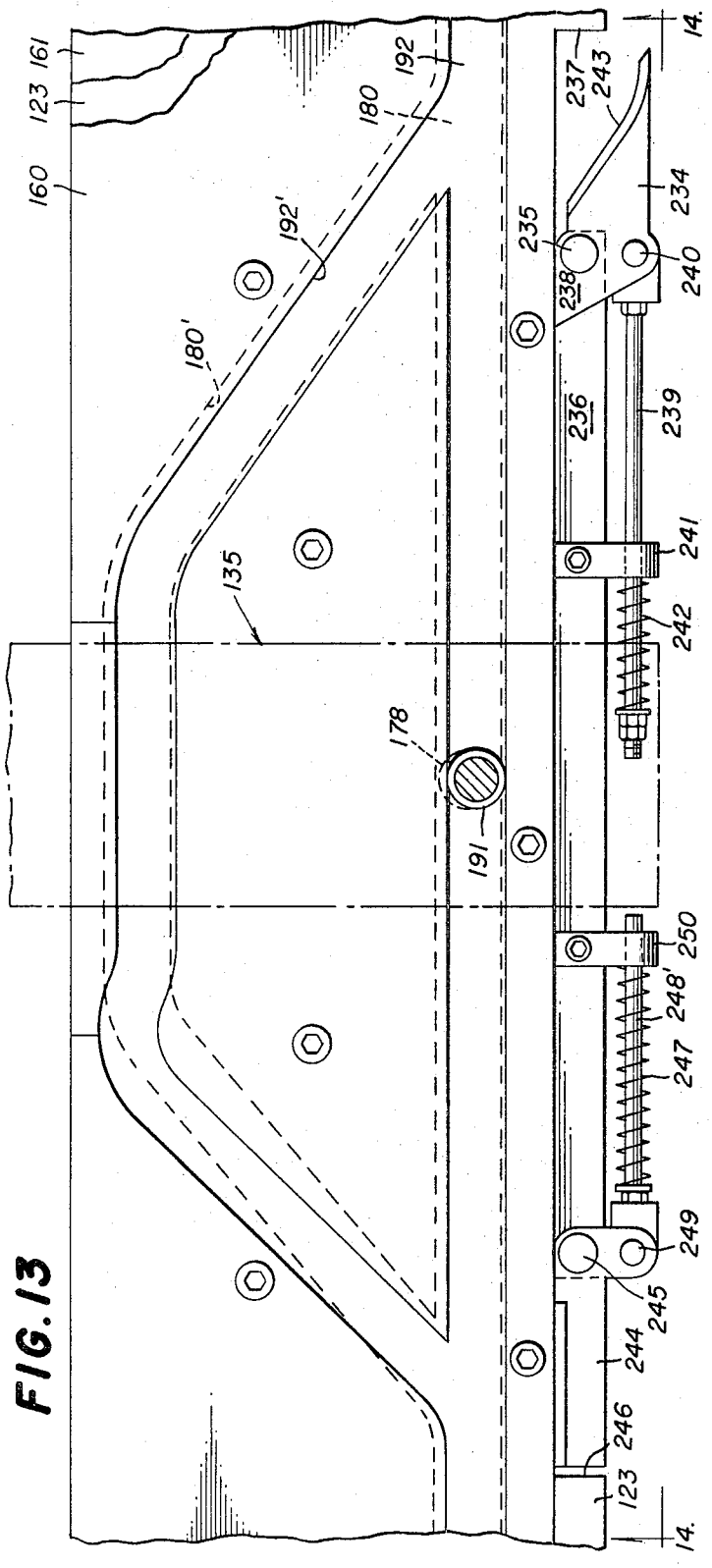

FIG. 13

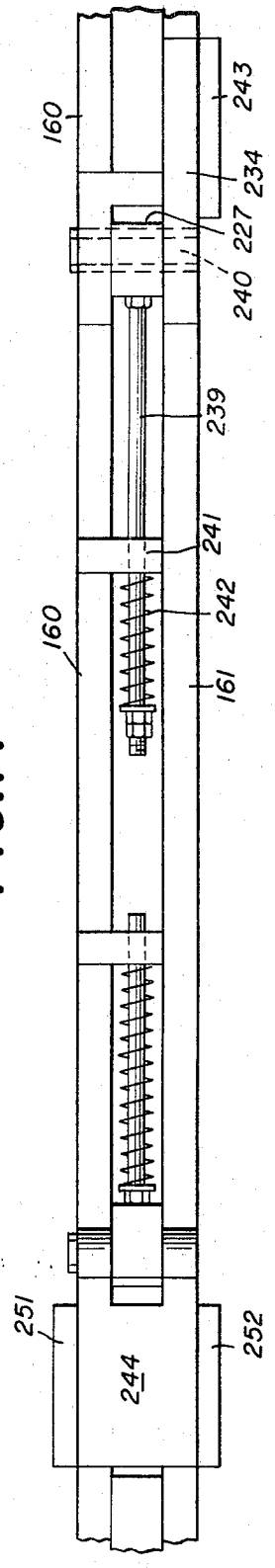

FIG. 14

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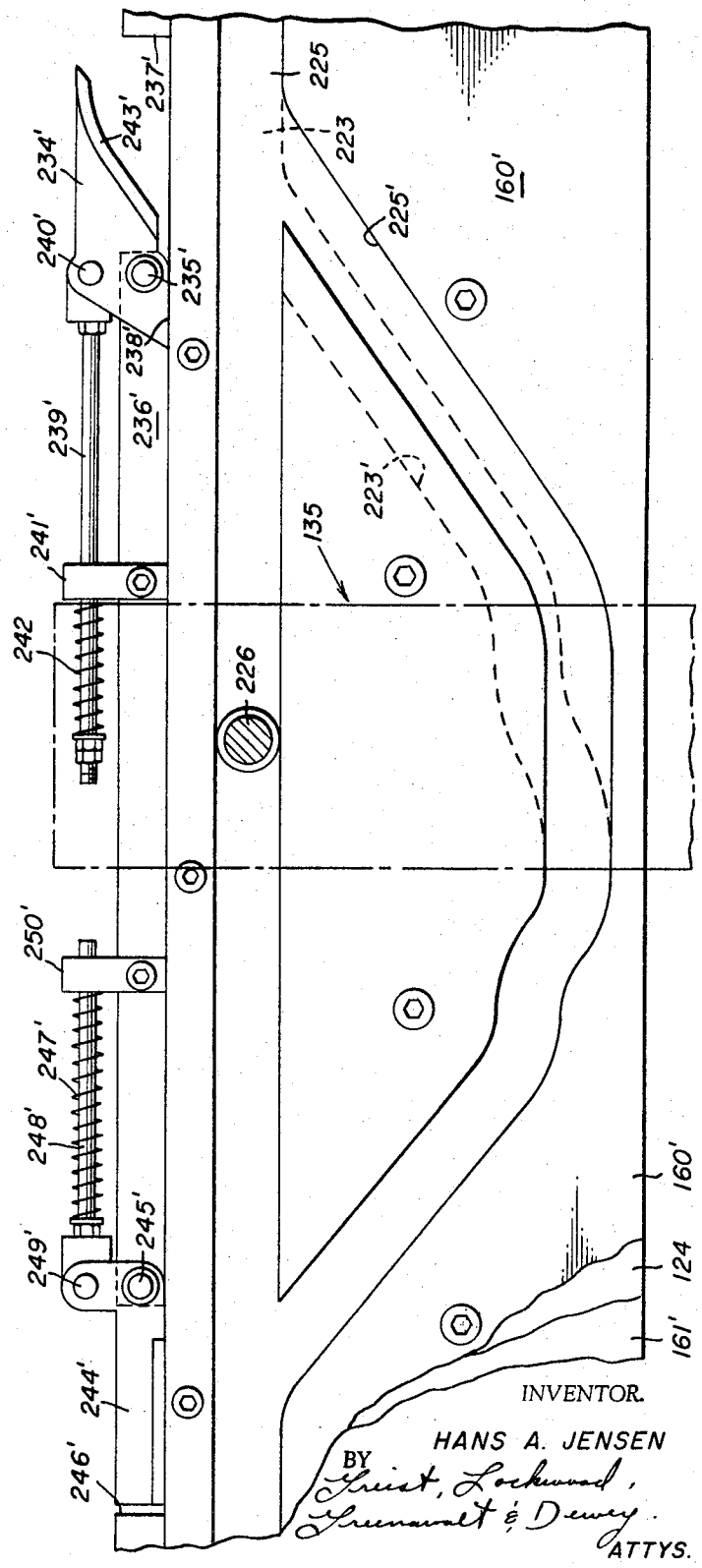
FIG. 15



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May 14, 1968 H. A. JENSEN 3,382,641

CONTINUOUS TUBE PACKAGING MACHINE

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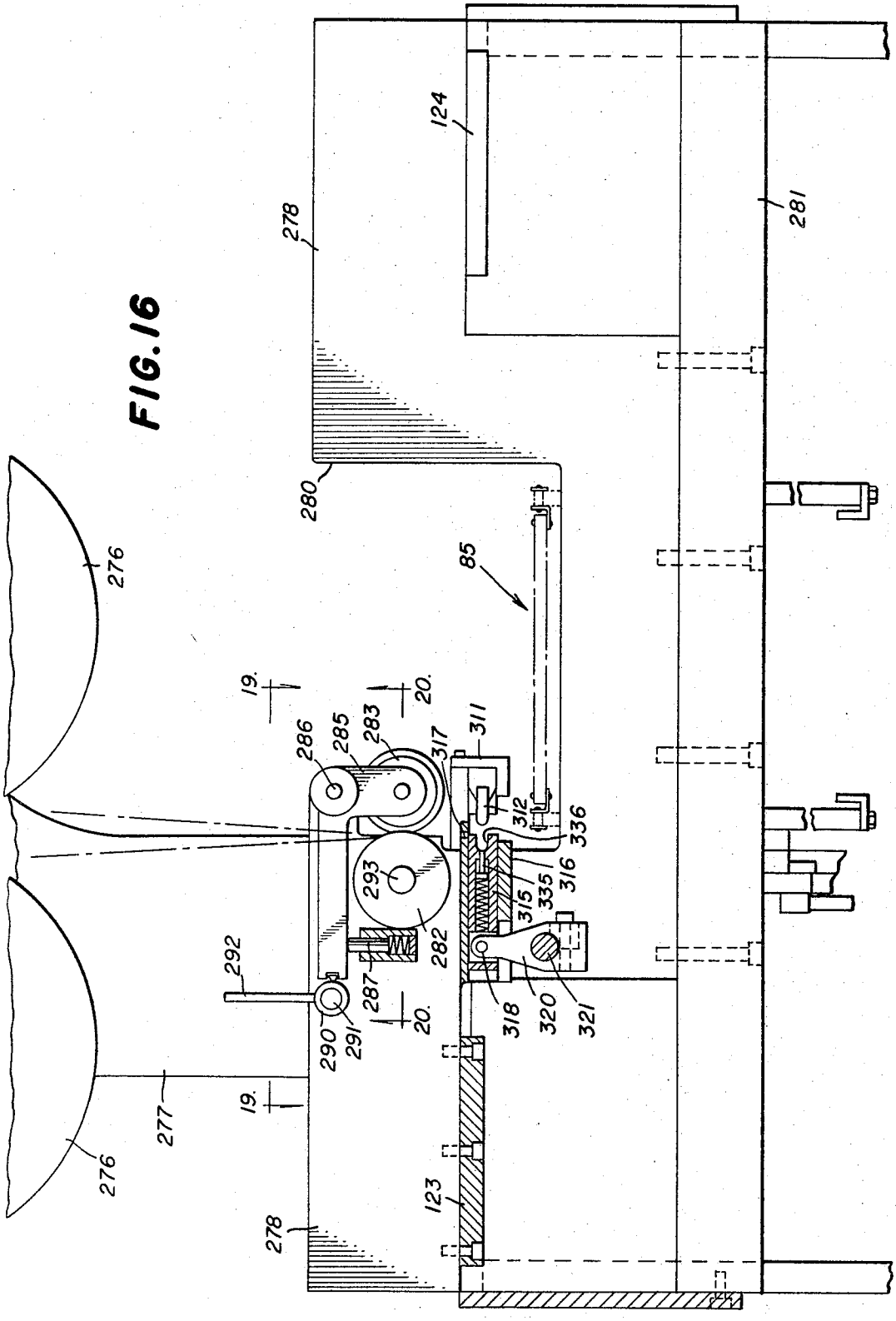
FIG. 16



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CONTINUOUS TUBE PACKAGING MACHINE

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FIG. 17

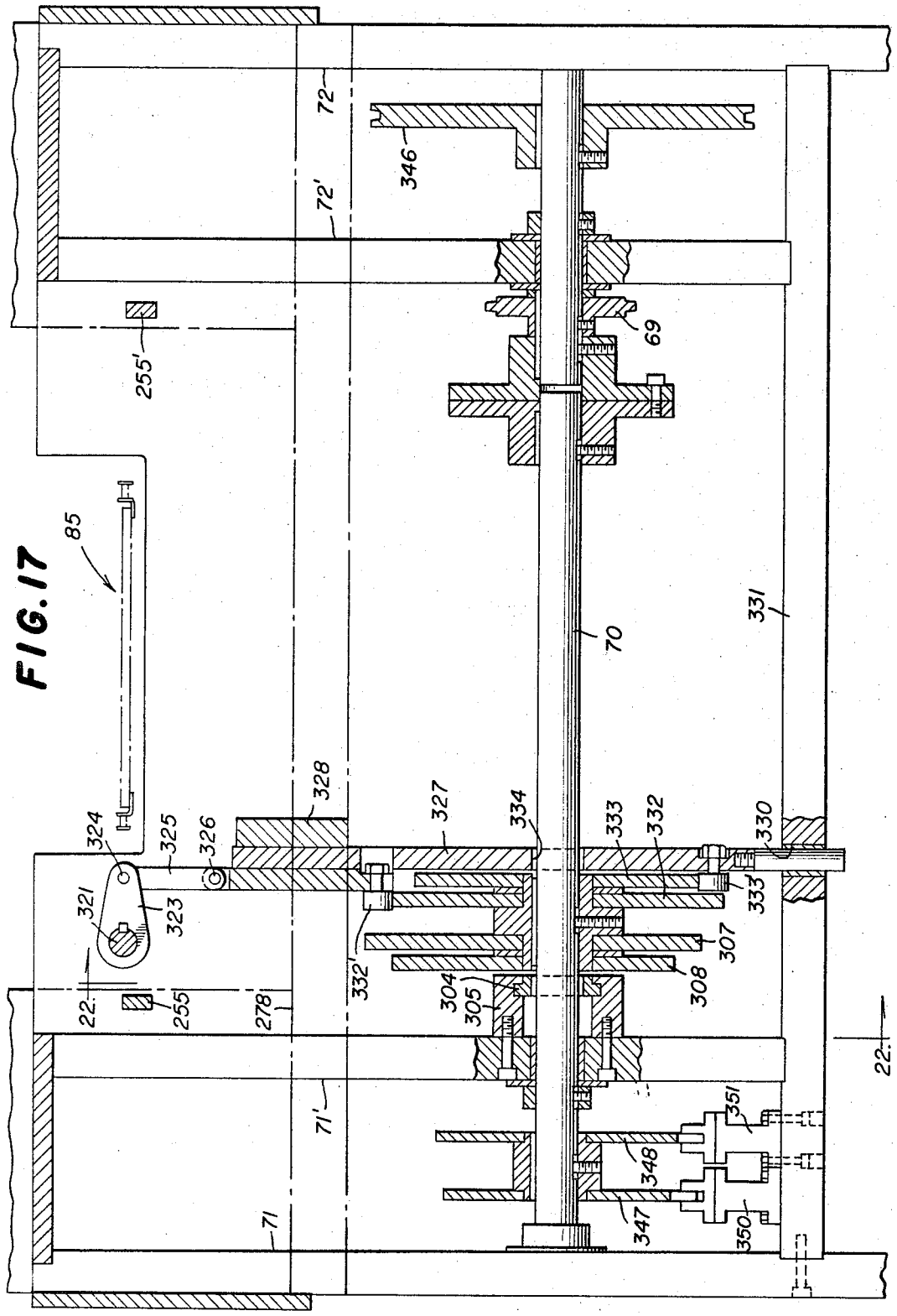

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FIG. 18

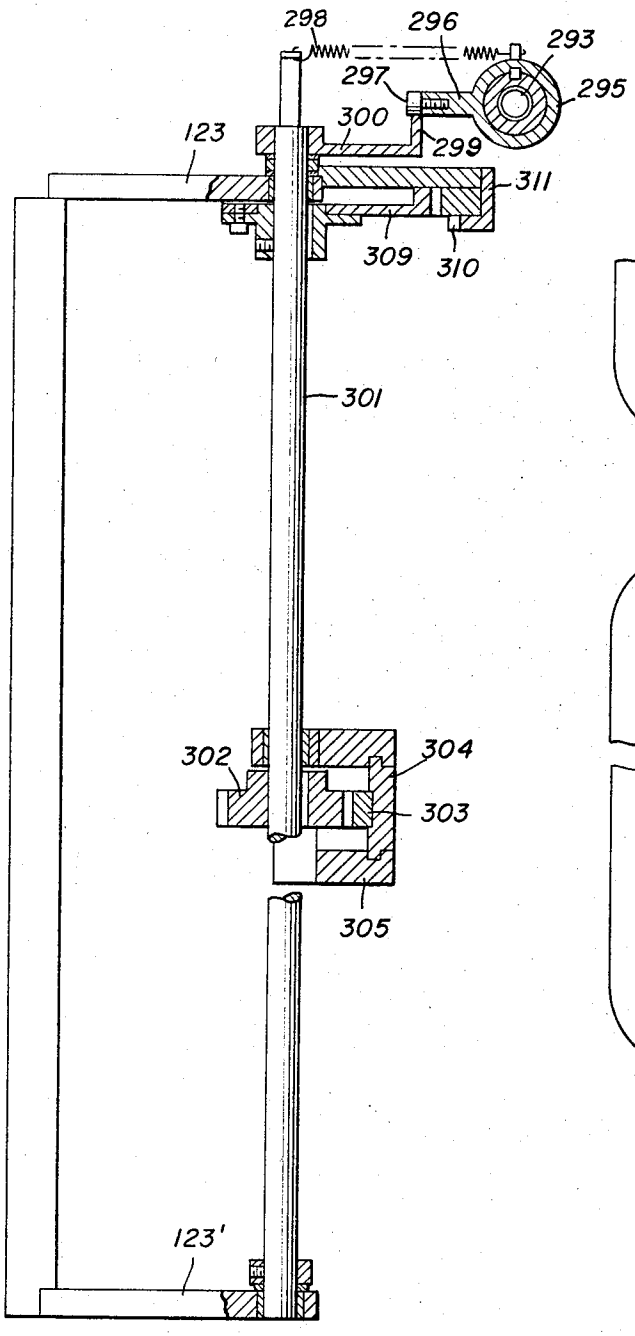
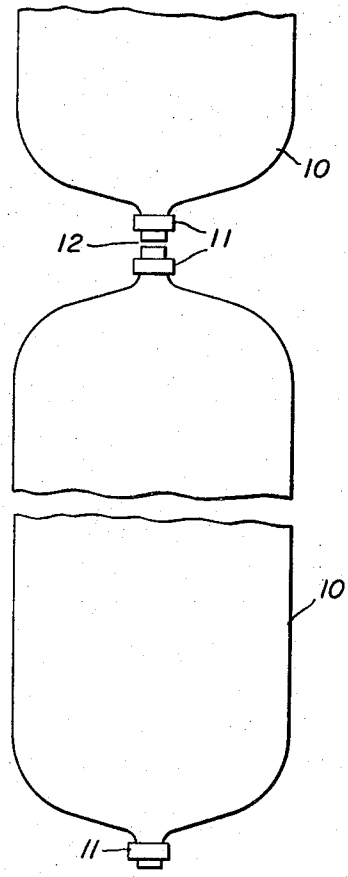


FIG. 25



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May 14, 1968 H. A. JENSEN 3,382,641

CONTINUOUS TUBE PACKAGING MACHINE

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FIG. 22

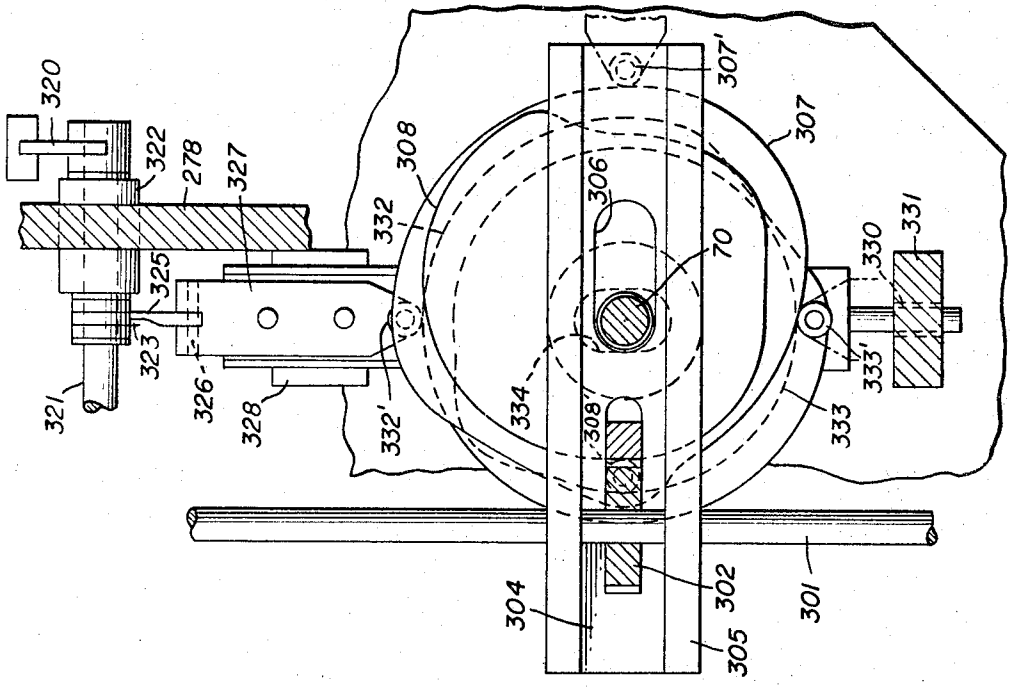


FIG. 19

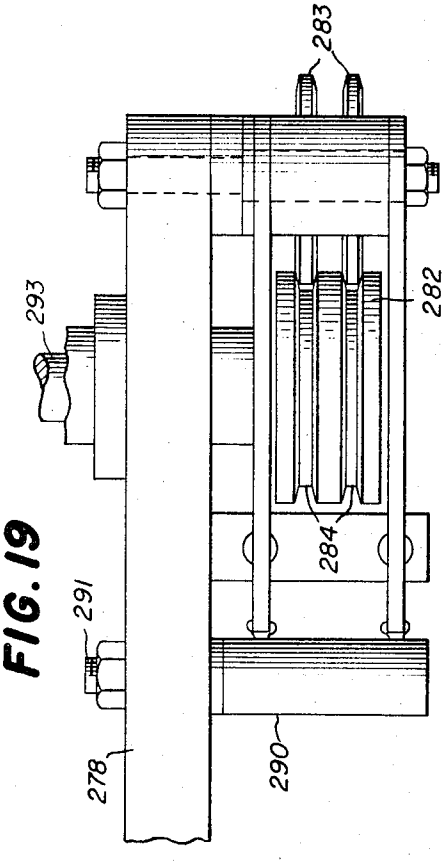
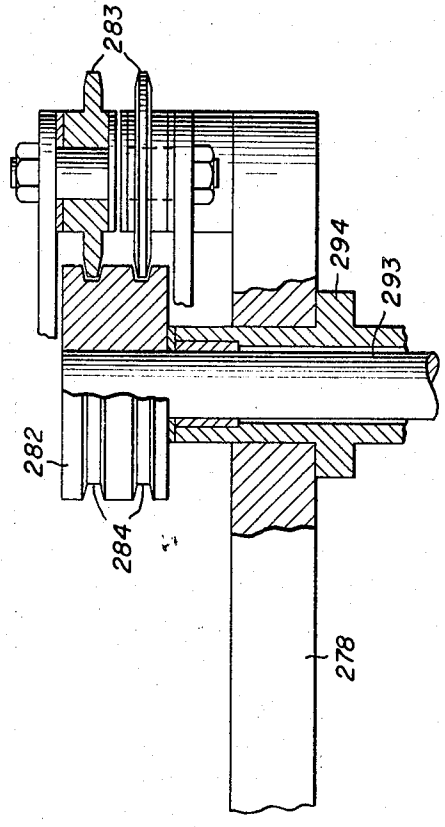


FIG. 20



CONTINUOUS TUBE PACKAGING MACHINE

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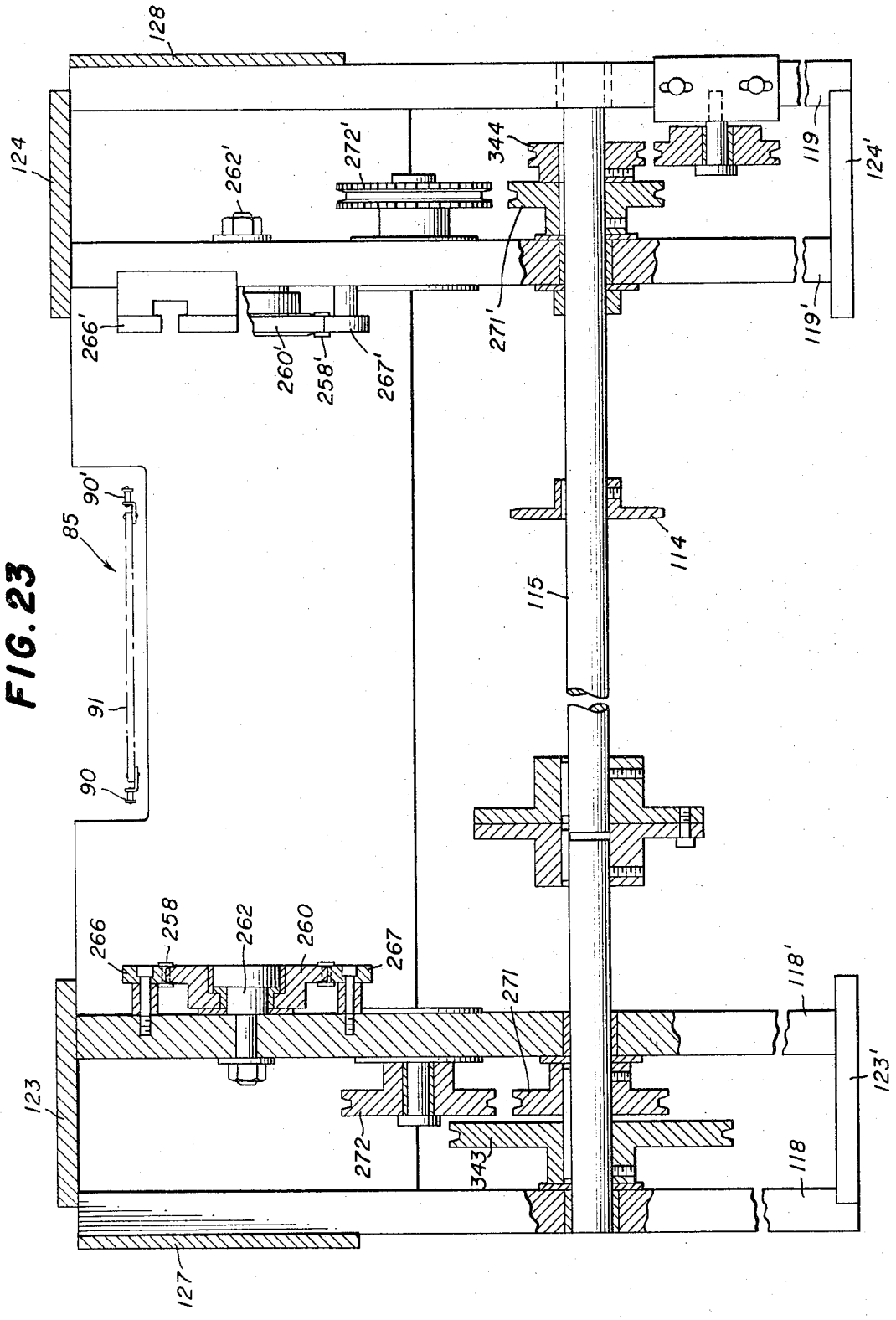
FIG. 23



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CONTINUOUS TUBE PACKAGING MACHINE

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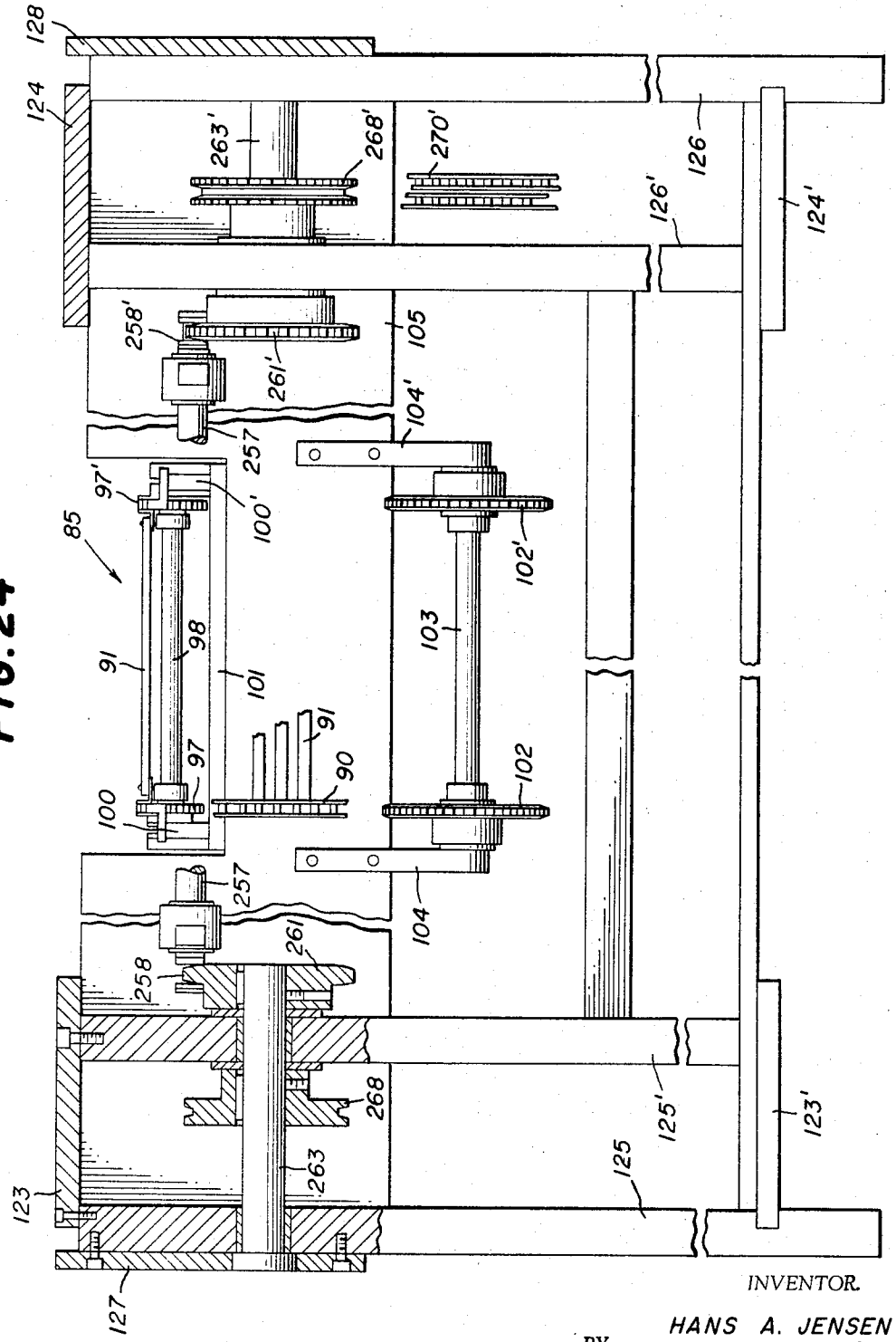
FIG. 24



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United States Patent Office 3,382,641 Patented May 14, 1968

3,382,641

CONTINUOUS TUBE PACKAGING MACHINE

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Filed Sept. 17, 1965, Ser. No. 487,977
35 Claims. (Cl. 53—14)

ABSTRACT OF THE DISCLOSURE

A machine for continuously forming and stuffing with a product, such as a sausage batter, a relatively large diameter, tube-like casing of thin pliable film material and dividing the same at intervals into individual packages which machine includes a horizontally disposed, hollow, tube forming and filling mandrel with associated means to fold a continuous strip of film material into a tube about the same, means to feed a flowable product to the hollow mandrel which includes apparatus for withdrawing portions of the product from the filling line at intervals so as to provide for partial filling of the tube in the areas where the tube is to be divided, drive means for positively advancing the tube, mechanism carried on a reciprocating head for constricting the tube at intervals to divide the same into separate package forming sections, a traveling conveyor having a horizontally disposed top run for supporting the filled tube while it is advanced and divided, with control means for varying the rate of advance so as to slow down the advance of the tube while constricting of the tube is accomplished in order to compensate for the reduction in the length of the tube which occurs when the tube is constricted, and mechanism for forming and applying to the constricted portions of the tube pairs of metal fastener clips which are axially spaced so as to close the top of one package section and the bottom of the adjoining package section.

This invention relates to packaging machines and is more particularly concerned with improvements in a machine of the type which feeds material to be packaged through a hollow tubular mandrel and into a continuous tube of relatively thin pliable film which is advanced on the mandrel and which divides the filled tube into a plurality of separate individual packages by gathering the tube at predetermined spaced intervals so as to form therein a constricted area within which axially spaced seal formations are applied for closing the top end of one package and the bottom end of the next succeeding package.

Machines have heretofore been provided for continuously feeding along a hollow mandrel a tube of relatively thin, pliable sheet material, such as a plastic film, for filling the tube continuously through the hollow mandrel and for dividing the filled tube at predetermined spaced intervals by gathering the tube material and forming a constricted area within which axially spaced seal formations are applied, and for severing the constricted portion of the tube between the seal formations so as to provide separate, successively formed packages. One such machine of this character is disclosed in Patent No. 2,831,302, dated Apr. 22, 1958. Machines of this type have been successfully used for packaging a variety of products, generally in a package of comparatively small diameter and length. However, difficulties have been encountered in attempting to adapt this type of machine to the formation of a tubular package of relatively large size, that is, of relatively large diameter and length, such as, for example, large bologna or similar meat-type packages which contain a relatively large amount of the product and have substantial weight.

It is a general object of the present invention to provide a packaging machine of the continuous tube filling type for producing relatively large packages filled with a flowable material, for example, bologna or a similar meat product wherein the feeding of the product is controlled to provide at intervals for slightly filled portions of the tube or casing which may be readily constricted by clamping members without rupturing the casing so as to provide for the application of end closure members in the constricted casing areas.

It is a more specific object of the invention to provide a machine for continuously forming a tube from a web of thin pliable material, for filling the tube with a flowable product from a continuous supply thereof while withdrawing portions of the product from the filling line at predetermined intervals so as to provide spaced sections of the tube which are only partly filled and which may be constricted without danger of rupture by reciprocating clamping members carried on a reciprocating head, the head being advanced in timed relation with the filled tube and the tube being supported on a traveling conveyor, the speed of which is varied to slow down the advance of the filled tube while the constricting of the tube is accomplished and having mechanism for applying to the constricted portion of the tube a pair of closure fasteners which are axially spaced and which close the top of one package and the bottom of the next succeeding package.

It is another object of the invention to provide in a package forming machine of the type described a hollow casing stuffing mandrel having a tubular body and a tubular nozzle with an axial connecting passageway and also a passageway around the periphery of the base thereof between the nozzle and the body, with a means incorporated therein for controlling the size of the passageway around the base of the nozzle in timed relation to a reduction in the flow of the product through the mandrel so as to maintain a nearly constant pressure against the wall of the casing and prevent the flow of air into the portion of the casing into which the product is being delivered.

It is still another object of the invention to provide an apparatus for continuously forming a packaging tube, filling the tube with a product and applying closure fasteners in axially spaced relation at predetermined intervals so as to divide the filled tube into individual packages wherein a conveyor is provided for supporting the filled tube beyond the filling area which conveyor has a mechanism permitting one portion thereof to operate at a variable speed while the remaining portion runs at a constant speed so as to vary the travel of predetermined sections of the filled tube to compensate for reduction in the length thereof which occurs when the tube is constricted and closure fasteners are applied to the constricted area.

It is a further object of the invention to provide a machine for continuously forming a series of individual packages wherein a tube of relatively thin, pliable, film material is continuously advanced along a horizontally disposed tubular mandrel and a product is forced through the mandrel and into the tube in a continuous stream, the flow of the product is controlled so as to provide at intervals for partial filling of the tube, a reciprocably mounted head having tube constricting and closure clip applying devices is mounted to advance with the tube while constricting each successive, partially filled portion of the tube and applying axially spaced closure clips for sealing the trailing end of one package and the leading end of the next succeeding package, and a conveyor is provided for supporting the filled tube as the packages are formed, which conveyor has associated mechanism, reciprocating with the head, for dividing the horizontally disposed conveyor run on which the filled tube is carried into two sections and

for varying the speed of the leading section so as to compensate for the reduction in tube length resulting from the infolding of the tube material to constrict the tube and form the package ends.

These and other objects and advantages of the invention will be apparent from a consideration of the package forming apparatus which is shown by way of illustration in the accompanying drawings wherein:

FIGURE 1 is a side elevation of a package forming machine which incorporates therein the principal features of the invention, the machine being shown with portions thereof omitted and other portions illustrated schematically;

FIGURE 2 is a top plan view of the machine with portions omitted or broken away, the view being taken on line 2—2 of FIGURE 1;

FIGURE 3 is a cross section taken on the line 3—3 of FIGURE 1, to an enlarged scale and with portions broken away;

FIGURE 4 is a vertical cross section taken on the line 4—4 of FIGURE 1, to an enlarged scale, and with portions broken away;

FIGURE 5 is a longitudinal vertical section taken on the line 5—5 of FIGURE 2, to an enlarged scale and with portions broken away;

FIGURE 6 is a vertical cross section taken on the line 6—6 of FIGURE 1, to an enlarged scale and with portions broken away;

FIGURES 7 and 7A constitute a vertical cross section taken on the line 7—7 of FIGURE 1, to an enlarged scale and with portions broken away;

FIGURE 8 is a fragmentary horizontal section taken on the line 8—8 of FIGURE 7, to a still larger scale;

FIGURE 9 is a fragmentary horizontal section taken on the line 9—9 of FIGURE 7A to a larger scale;

FIGURE 10 is a fragmentary vertical section taken on the line 10—10 of FIGURE 9;

FIGURE 11 is a fragmentary horizontal section taken on the line 11—11 of FIGURE 7;

FIGURE 12 is a fragmentary vertical section taken on the line 12—12 of FIGURE 7;

FIGURE 13 is a fragmentary plan view taken on the line 13—13 of FIGURE 1, to an enlarged scale, showing the cam tracks at one side of the machine;

FIGURE 14 is an elevational view taken on the line 14—14 of FIGURE 13;

FIGURE 15 is a fragmentary plan view taken on the line 13—13 of FIGURE 1, to an enlarged scale, the view showing the cam tracks on the other side of the machine;

FIGURE 16 is a cross section taken on the line 16—16 of FIGURE 1, to an enlarged scale and with portions broken away;

FIGURE 17 is a cross section taken on the line 17—17 of FIGURE 1, to an enlarged scale and with portions broken away;

FIGURE 18 is a fragmentary vertical cross section taken on the line 18—18 of FIGURE 1, to an enlarged scale;

FIGURE 19 is a fragmentary plan view taken on the line 19—19 of FIGURE 16, with portions broken away;

FIGURE 20 is a fragmentary section taken on the line 20—20 of FIGURE 16, to a larger scale;

FIGURE 21 is a fragmentary section, to an enlarged scale, taken on the line 21—21 of FIGURE 1;

FIGURE 22 is a fragmentary vertical section taken on the line 22—22 of FIGURE 17;

FIGURE 23 is a vertical section taken on the line 23—23 of FIGURE 1, to an enlarged scale and with portions broken away;

FIGURE 24 is a vertical cross section taken on the line 24—24 of FIGURE 1, to an enlarged scale and with portions broken away; and

FIGURE 25 is an elevation of the package produced by the machine, with portions broken away.

Referring first to FIGURES 1, 2 and 24, there is illustrated a machine having embodied therein the principal features of the invention which is particularly adapted to fabricate, for example, a relatively large bologna package 10 (FIGURE 25). The package 10 which is of generally tubular shape, has a relatively large diameter and length, and its opposite ends are gathered and closed by encircling metal bands or closure clips 11. The packages 10 are formed by the machine in a continuous string or series of uniform size and length. Preferably, the individual packages are separated by severing between the end closure bands 11 on the line indicated at 12 simultaneously with the gathering of the tubular casing and the application of the closure bands 11.

The material for forming the casing or tube T for the package 10 preferably is a continuous plastic web or film. A film such as Saran, Pliofilm, polyethylene or similar material which will form a thin pliant skin-like casing is suitable. The illustrated machine is adapted to use Saran film, particularly, since it has properties especially desirable in the packaging of meat and similar products, where it is important to retain the flavor of the product in the package.

The machine of FIGURES 1 and 2 is supported on a generally rectangular upstanding frame which for convenience in assembly may be made in two sections 14 and 15 which are connected together in longitudinal alignment by bolts or other suitable fastening means. The top of the two connected frame sections 14 and 15 may be horizontal but in the form shown it is inclined downwardly towards the forward or leading end thereof so that the path of travel of the tube as it is formed, filled and divided into packages is inclined slightly in the direction of the discharge end of the machine. This enables the relatively long package to be delivered at the end of the supporting conveyor into a water tank and be made to float, thereby eliminating distortion in heavy packages.

A film supply roll 16 (FIGURE 1) is supported on forwardly directed brackets 17 which are attached to a vertical cross member 18 at the rear or trailing end of the rearward frame section 14. The film web W passes over and under guide rollers 20 and 21 which are supported on brackets 22 and 23 depending from a top frame portion 24. From the guide roller 21 the web W passes upwardly and over a curved forming plate 25 mounted at the rear or trailing end of a tube or casing forming and filling mandrel assembly 26. An electronic web sealing or seam forming device 27 is associated with the mandrel assembly 26 for continuously sealing the overlapping edges of the tube T which is formed by the web as it passes over the plate 25. One electrode (not shown) of the seam forming device 27 is in the wall of the mandrel 26. The other electrode of the sealing device 27 is mounted on the arm 28 which is pivoted at 30 to the bracket 31, which is upstanding from the frame portion 24, so that the arm may be moved to a non-operative position when desired.

The filling or stuffing mandrel assembly 26 (FIGURE 5) comprises a tubular body portion 32 and a nozzle 33 at the forward end thereof. The body portion 32 comprises an outer sleeve 34 which is connected at its trailing end to a T-shaped conduit member 35 (FIGURES 2 and 5) and at its leading end terminates at a sizing ring 36, the latter determining the size of the tube T into which the web W is formed and also forming a seal to prevent the sausage batter from leaking back along the body portion 32 of the mandrel. The mandrel body portion 32 has an inside sleeve 37 which is slidably mounted in the outer tube 34 with O-rings or other suitable seals at opposite ends so as to prevent leakage of material. At the leading end the edge 38 of the sleeve 37 is normally spaced a relatively small distance from the tapered or outwardly and forwardly slanted circumferential end wall 39 surrounding the entrance or opening 40 to the discharge nozzle 33, as indicated in phantom line in FIGURE 5. The opening 40 forms a passageway of smaller diameter than the internal diameter of the sleeve 37 and

of the tube 41 which extends forwardly from the nozzle body and some batter flows between the sleeve edge 38 and wall 39 and around the periphery of the nozzle base into the tube T. This helps maintain a seal against the ring 36 and prevents passage of air into the portion of the tube around the nozzle. During the part of the filling cycle or interval when a partially filled section is required in the tube, as hereinafter described, the sleeve 37 is retracted so as to enlarge the opening between the leading edge 38 thereof and the wall 39 of the nozzle, as indicated in solid line in FIGURE 5. This results in a larger amount of batter being diverted into the cavity or passageway between the wall 39 and the sleeve edge 38 so as to maintain a nearly constant pressure in this area and prevent air from entering the tube with the batter. The inside sleeve 37 is reciprocated in the direction of the longitudinal axis thereof by a pair of rocker arms 42 extending upwardly from a rock shaft 43 (FIGURES 1 and 5) and connected at their upper ends to the sleeve 37. The transverse rock shaft 43 is mounted on the frame 14 and actuated as hereinafter described.

The machine is designed to produce relatively large size packages, for example, large bologna packages which require a tube or casing T of relatively large diameter. When the casing T is constricted or voided preparatory to the application of closure members, it is desirable to compensate for the reduction in the available space for the product and the reduction in the length of the casing resulting from the infolding of portions of the casing material. Therefore, at intervals, predetermined sections of the tubing or casing T are only partially filled so as to facilitate constriction thereof to avoid bursting of the casing by stretching due to the action of clamping members which effect the constriction or voiding of the casing. The apparatus has special provision for controlling the volume of batter flowing through the T-shaped supply member 35 which delivers the batter to the stuffing mandrel 26 at the trailing end of the rear frame section 14. The batter is supplied to a Moyno pump 44 (FIGURES 1 and 3) which is mounted in the frame 14 and has its outlet end connected to a tubular fitting 45 forming part of the supply member 35. The Moyno pump 44 carries a sprocket 46 at its lower end which is connected by the chain 47 (FIGURE 1) to the output sprocket 48 of a drive motor unit 50. The Moyno pump 44 is of conventional construction and delivers a constant flow of batter to the T-shaped member 35 through the fitting 45 from which it passes into the stuffing mandrel 26. Two oppositely disposed piston members 51 and 51' are reciprocably mounted in the tubular portion of member 35 so that the flow of batter from the Moyno pump 44 is confined between the opposed inner faces of the pistons 51 and 51'. The pistons 51 and 51' are pivotally connected at 52 and 52' to the inner ends of pitman forming members 53 and 53'. The pitman members or connecting rods 53 and 53' are mounted in guideways 54 and 54' at the upper ends of the frame 14 opposite the open ends of the cylindrical portion of member 35. The connecting rods 53 and 53' each carry on their lower faces a pair of spaced cam rollers 55 and 55' which straddle the cam track forming ribs 56 and 56' extending about the periphery of barrel cams 57 and 57'. Cams 57 and 57' are carried on relatively short, axially aligned shafts 58 and 58' which are journaled in pairs of parallel spaced wall forming plates 59 and 59' in the frame section 14. The one shaft 58 is provided with a cam plate 60 which engages a cam roller 61 on the end of a rock arm 62 extending from the rock shaft 42 so as to rock the latter in timed relation to the operation of the pistons 51 and 51'. The shafts 58 and 58' carry sprockets 63 and 63' which are connected by chains 64 and 64' with sprockets 65 and 65' on a cross drive shaft 66 at the bottom of the frame section 14. The cross drive shaft 66 carries a sprocket 67 which is driven by the chain 68 (FIGURE 1) and sprocket 69 on the cross shaft 70 (FIGURE 17). The shaft 70 is journaled in the opposite ends in vertically disposed side frame members 71, 71' and 72, 72' forming part of the forward frame section 15. The aforementioned drive mechanism for the cumulator pistons 51 and 51' is operated to separate the pistons, periodically, and allow the batter to accumulate in the tubular portion of member 35 so as to reduce the flow into the stuffing mandrel 26 for a predetermined interval during each filling cycle. In this manner, a smaller amount of the batter is delivered in the area of the tube which is to be constricted and which receives the closure forming clips. The cams 57 and 57' are constructed so that the swept volume of the pistons 51 and 51' equals the volume of batter which would normally be displaced from the casing by action of the casing constricting members. The normal flow of batter delivered by the pump through the member 35 to the stuffing mandrel 26 is adjusted to fill the continuously formed tube or casing T almost to desired tightness and the pistons 51 and 51' are retracted to reduce this flow for an interval sufficient to cut down the desired amount of batter delivered to the casing in the area in which the closure clips are to be applied. On the return stroke of the pistons 51 and 51' the accumulated batter is slowly added to the batter which is being supplied to the casing by the batter pump 44, the total amount of batter being sufficient to fill the casing to the desired tightness. The outward movement of the pistons is at a fairly rapid rate for a short period and during this outward movement a portion of the main batter supply is diverted into the area vacated by the pistons, thus producing a slightly filled portion in the casing.

The tubular casing T is drawn along the stuffing mandrel 26 (FIGURES 2 and 4) by two pairs of co-operating feed rollers 73, 73' and 74, 74', the rollers of each pair thereof being arranged in vertically disposed planes along opposite sides of the path of the tube T adjacent the end of the stuffing mandrel 26. The pairs of feed rollers 73, 74 and 73', 74' are mounted on upper and lower cross shafts 75 and 76, respectively, which cross shafts are journaled in vertically disposed frame plates 77 and 78 on the forward end of the frame section 14. The upper shaft 75 is connected directly to a Graham drive unit 80 which is mounted on a supporting bracket 81 by a suitable coupling. The shaft 75 has a gear 82 which engages a gear 83 on the lower shaft 76 so as to drive the latter. The feed rollers or wheels 73, 73' and 74, 74', which are preferably rubber tired, are spaced on the shafts 75 and 76 so that they co-operate to pinch the partially filled tube along opposite sides (FIGURES 2 and 5) and to advance the same at a speed which is adjusted according to the speed of other elements of the machine.

The tube T is supported and advanced beyond the end of the filling or stuffing mandrel 26 by the conveyor 85 (FIGURES 1, 2, 6, 16, 17, 23 and 24). The conveyor 85 is supported on the forward frame section 15 with an upper run thereof extending along the top of the frame and inclined slightly in the direction away from the end of the stuffing mandrel 26. The conveyor 85 has associated mechanism 86 which divides the top run thereof into two sections 87 and 88 of varying length and which varies the speed of the leading section 87 while the trailing section 88 which is immediately in advance of the product discharge end of the stuffing mandrel 26 is maintained at a constant speed. The speed of the leading section 87 which extends to the discharge end of the machine is varied during a portion of the package forming cycle. The relative length of the trailing section 88 and the leading section 87 depends upon the location of the mechanism 86 which is movable longitudinally of the machine as hereinafter described. This arrangement of the conveyor 85 is provided so as to compensate for the shortening of the tube which results from constricting or infolding the portions of the casing which are adapted to receive the closure clips and to form the ends of the packages. The conveyor 85 comprises a pair of laterally spaced chains 90 and 90' and a plurality of connecting cross bars 91 which are spaced lengthwise of the conveyor

85. The cross bars 91 are secured at opposite ends to the chains 90 and 90' by brackets 92 and 92' which are integral with the inside link plates of the two chains 90 and 90'. The conveyor chains 90 and 90' are supported at the two ends of the frame section 15 (FIGURE 1) so that the conveyor upper run extends along the top of the frame 15. At the trailing end of the frame 15 the chains 90 and 90' are supported on sprockets 93 and 93' (FIGURE 6) on a cross support bar 94 journaled at its ends in the upstanding end members 95 and 95' mounted in an upwardly opening recess formed by a cut-out portion in the top margin of a vertically disposed cross frame plate 96 at the end of frame section 15. The top run of conveyor 85 is supported at the leading or discharge end of the machine (FIGURE 24) on a pair of sprockets 97 and 97' mounted at opposite ends of a cross shaft 98 which is journaled at its ends in upstanding end plates 100 and 100' constituting part of a small, upwardly opening, U-shaped cross frame 101. The return run of conveyor 85 is supported at the leading end of the frame section 15 on a pair of sprockets 102 and 102' mounted on a cross shaft 103 journaled at its opposite ends in the lower end of depending bearing forming brackets 104 and 104' which are mounted on an end cross plate 105 at the end of the frame section 15, which plate 105 has a cut-out portion at the upper margin in which the cross frame 101 is supported. The return run of the conveyor 85 is supported at the other end of the frame section 15 on sprockets 106 and 106' (FIGURE 6) on a cross shaft 107 journaled at its opposite ends in laterally spaced frame members 108 and 108' depending in parallel relation from the vertically disposed cross frame plate 96. Tension adjusting sprockets 109 and 109' are mounted on a cross shaft 110 which is supported at its opposite ends in adjustably mounted brackets 111 and 111' carried on the depending frame members 108 and 108' above the cross shaft 107. The conveyor 85 is driven through the cross shaft 107 which carries a sprocket 112 (FIGURES 1 and 6) connected by the chain 113 with the sprocket 114 (FIGURE 23) carried on the main drive shaft 115. The chain 113 engages a tension adjusting sprocket 116 (FIGURES 1 and 6) mounted on a bracket 117 (FIGURE 6) extending from the depending frame member 108'. The drive shaft 115 is journaled in laterally spaced pairs of vertically disposed, parallel frame members 118, 118' and 119, 119' which depend from horizontally disposed, laterally spaced top frame plates 123, 124 and which are connected in paired relation at the bottom by frame plates 123' and 124' disposed parallel with top plates 123, 124. The top plates 123, 124 extend the full length of the frame section 15 while the bottom plates 123', 124' extend from the vertical side mebers 71, 71' and 72, 72' (FIGURE 17) to the end corner post members 125, 125' and 126, 126' (FIGURE 24). The outermost vertical frame members 71, 125 and 72, 126 are connected by vertically disposed side plates 127 and 128 which extend the full length of frame section 15.

The top run of the conveyor 85 is divided into the two sections 87 and 88 by the associated speed control mechanism 86 and the latter is carried on a cross frame 130 depending from the reciprocably mounted tube constricting head unit indicated at 135 (FIGURES 1, 2, 7 and 7A). The chain speed mechanism 86 travels with the reciprocating head 135 and varies the length of the conveyor sections 87 and 88 in accordance with the movement of the reciprocating head so that as the constricting head 135 moves forward in advance of the stuffing mandrel 26 the forward or leading conveyor section 87 is shortened and the rearward or trailing conveyor section 88 is lengthened. As the head unit 135 returns to a position near the end of the stuffing mandrel 26, the conveyor section 87 is lengthened and the section 88 is shortened. The top run of the conveyor, on which the filled tube is carried, is interrupted beneath the constricting mechanism in the head 135 by the conveyor speed control mechanism 86 and the latter is operated in a manner hereinafter described so as to vary the speed with which the leading portion of the filled tube is advanced and to allow for the reduction in over-all length of the filled tube which results when the constricting head operates to constrict the tube within the area required for the application of the closure clips.

The conveyor speed control mechanism 86 (FIGURES 1, 7 and 7A) which serves to vary the speed of the leading conveyor section 87 while maintaining constant the speed of the trailing section 88 is supported on the cross frame 130 which comprises parallel end plates 132 and 132' arranged in spaced, vertically disposed, longitudinal planes and a connecting structure which carries the chains 90 and 90' of the conveyor 85. The uppermost corners of the plates 132 and 132' are connected by parallel, longitudinally spaced cross shafts 133 and 134. The shafts 133 and 134 carry axially spaced pairs of sprockets 136, 136' and 137, 137' over which the upper runs of the conveyor chains 90 and 90' are trained so as to extend downwardly and around a pair of sprockets 138 and 138' supported on a cross shaft 140. The shaft 140 extends between a pair of carriage forming slide members 141 and 141' slidably supported in track forming, vertically extending slots 142 and 142' in the frame end plates 132 and 132', respectively. At the lower corners the plates 132 and 132' are connected by parallel, longitudinally spaced cross shafts 143 and 144 on which are mounted pairs of sprockets 145, 145' and 146, 146' over which the chains 90 and 90' on the lower run of the conveyor 85 are trained and extend around a pair of sprockets 147 and 147' on a cross shaft 148 which is parallel with and vertically aligned below the cross shaft 140 and extends between the carriage forming end members 141 and 141'. The carriage members 141 and 141' are arranged to be raised and lowered in accordance with movements of the constricting members on the head 135. They carry cam plates 150 and 150' extending laterally outwardly of the carriage members 141 and 141' and having cam slots 151 and 151' which receive cam rollers 152 and 152' on bracket supports 153 and 153' depending from slide members in the bottom of the head 135 which are hereinafter described.

The constricting head 135 (FIGURES 1, 7, 7A and 8 to 11) comprises a supporting frame formed by parallel top and bottom cross bar assemblies 155 and 156 which are vertically aligned and connected by two piece end plate forming bracket assemblies 157, 158 and 157', 158' arranged in transversely spaced, vertically disposed, longitudinal planes. The top and bottom bar assemblies 155 and 156 extend outside of the end brackets 157, 158 and 157', 158' at each end of the unit 135 and are adapted to straddle the top frame plates 123 and 124, and the associated cam plates 160, 160' and 161, 161' which are arranged on the top and bottom faces of the frame plates 123 and 124. The head unit 135 and associated mechanism is supported on the frame plates 123 and 124 for longitudinal reciprocating movement by pairs of top and bottom rollers 162, 163 and 162', 163' arranged on the outside faces of the end plate brackets 157, 158 and 157', 158'. The supporting rollers 162, 163 and 162', 163' ride on the innermost edges of cam plates 160, 161 and 160', 161'. The end brackets 157, 158 and 157', 158' are also provided with pairs of rollers 164 and 164' which ride on the oppositely disposed inner edges of the cam plates 161 and 161' so as to hold the head 135 in a longitudinal path as it reciprocates.

The head assembly or unit 135 is provided with reciprocating block assemblies 165 and 166 which are slidably mounted at opposite ends of the unit and which carry co-operating interleaved casing constricting plates 167 and 168 together with a pair of closure clip applying punches 170, a cut-off knife 171 and associated members. The constricting plates 167, which are carried on the block assembly 165, are each formed with an inwardly open-

ing, generally V-shaped slot **172** having the edges of the V terminating at a small rectangular pocket forming slot **173** with a rounded, semi-circular bottom which is adapted to receive the constricted casing. The plates **167** are supported in parallel, vertically disposed, spaced relation, as shown in FIGURE 8, on the inner edge of a slide block **174** forming part of the slide assembly **165**. The block **174** which is of rectangular outline is provided with two vertically spaced, inwardly projecting ear formations **175** which are slotted or recessed to receive the outer edges of the plates **167**, the latter being secured in position by bolt members **176**. A rectangular slot is cut in the slide block **174** at **177** so as to straddle the horizontally disposed frame plate **123** and the associated cam plates **160** and **161** as shown in FIGURE 7. A cam roller **178** is mounted on the bottom edge of the cutout slot **177** for rotation on a vertical axis and rides in a cam track **180** in the lower cam plate **161** so as to control the reciprocating movement of the slide block **174** in a direction transvesely of the machine. A pair of clip applying punch members **170** are located between the two outermost pairs of plates **167**, as shown in FIGURE 8, and are mounted for sliding movement between the plates **167**. The punch plate members **170** are connected by pivot pin **181** to the ends of the short legs of a pair of L-shaped outer plate members **182** and **182'** which are mounted for limited sliding movement on the outer faces of the topmost portion of the slide block **174**. The pin **181** extends through an elongate slot **183** in the inner end of the block **174** which limits the movement of the punches **170** and their supporting elements. The punch supporting plates **182** and **182'** are connected at the top and bottom edges by track forming **184** and **185**. The topmost track member **184** (FIGURES 7 and 12) is U-shaped in cross section and rides in a slot **186** provided in the topmost edges of the slide block **174**. In a similar manner, the bottom track forming member **185** is U-shaped in cross section and rides on a track provided in the upper edges of the cut out slot **177** in the slide block **174** so that the two plates **182** and **182'** straddle the upper marginal portion of the slide block **174** and have a relatively small sliding movement thereon in the direction transversely of the machine. The slide block **174** is provided with elongate recesses or slots on opposite vertical faces thereof **187** and **187'** (FIGURES 8 and 12) which house tension springs **188** and **188'**. The springs **188** and **188'** are anchored at one end to the slide block **174** and at the other end to pins **190** and **190'** extending inwardly of the outer plates **182** and **182'**. The springs **188** and **188'** normally hold the punch members **170** in retracted position as shown in FIGURES 7 and 8. The bottom bar member **185** carries a cam roller **191** rotating on a vertical axis which rides in a track **192** in the top cam plate **160** so as to control the movement of the punch members **170** relative to the slide block **174** and provide for positive ejection of the closure clip from the slot **173**. Pairs of punch guide fingers **193** and **193'** are arranged on the top and bottom sides of each of the punch members **170** and connected by the pivot pins **194** and **194'** to the inner end of the slide block **174**. Guide buttons **195** and **195'** between the plates **167** hold the guide fingers **193** and **193'** in alignment. The inner ends of the guide fingers **193** and **193'** are turned in toward each other and form a narrow guide channel for the reduced end portion of the punch plates **170** and provide a pocket when the punch plates **170** are retracted to receive the U-shaped closure clips. The end portion of each punch plate **170** has a sliding tongue and groove contact with the opposed faces of the ends of the punch guide fingers **193** and **193'**. The slide block **174** and the associated mechanism is adapted to reciprocate towards and from the path of the filled tube and it is also mounted for a slight movement in the direction longitudinally of the path of the tube as it moves inwardly and outwardly relative to the same. The movement in the longitudinal direction is accomplished by a special mounting of the block assembly **165** between the ends of the top and bottom frame members **155** and **156**. The slide block **174** and the associated members are provided at the top and bottom edges of the assembly with slide plates **196** and **196'** which bear against the opposed faces of the bottom and top frame members **156** and **155**, respectively, and the assembly is also provided with pairs of cam rollers **197**, **198** and **197'**, **198'**, the rollers of each pair thereof being spaced as shown in FIGURE 7. The top frame bar **155** is provided with downwardly opening shallow cam slots **200** and **201** in which the cam rollers **197'** and **198'** are operative. The bottom frame bar **156** (FIGURE 11) is provided on its uppermost face witha shallow cam slot **202** which is identical with the upper cam slot **200** and which receives the cam rollers **197** on the bottom edge of the slide block **174**. The bottom bar **156** has a slot **203** which extends all the way through the bar for receiving the roller **198** and this slot is vertically aligned with the slot **201** in the top frame bar **155**. The cam roller **198** is mounted on a stub shaft which has an extension on which a roller **204** is mounted. The roller **204** is received in a transverse slot **205** in a slide bar **206** which is slidingly mounted by means of track forming members **207** on the bottom face of the frame bar **156**, and which carries the depending bracket forming plates **153** on which the cam roller **152** is mounted. Inward movement of the slide block **174** for constricting the tube and applying the closure clips carries the slide bar **206** and the cam roller **152** with it so as to control the vertical reciprocation of the carriage **141** for the conveyor chain supporting sprockets **138**, **138'** and **147**, **147'** on the conveyor speed adjusting mechanism **86**.

At the other side of the head unit **135** (FIGURES 7A, 9 and 10) the slide block assembly **166** includes slide block member **210** which is of generally rectangular outline and which is mounted between the extended ends of the top and bottom frame members **155** and **156**, the block member **210** being similar to the slide block member **174**. The constricting plates **168** have inwardly opening, V-shaped edge slots **211** for co-operation with the slots **172** in the constricting plates **167** and are attached by means of cross pin **212** to the short inner legs **213** of a pair of L-shaped plates **214** which are secured on the outer faces of the upper portion of the slide block **210** in the same manner as the plates **182** are secured on the slide block **174**. The slide block **210** is provided with a slot **215** corresponding to the slot **177** in the slide block **174** which accommodates the top frame plate **124** and associated cam plates **160'** and **161'**. A pair of anvil supporting plates **216** of generally rectangular outline are mounted on the inner end of the slide block **210** by means of vertically spaced bolts **217**. Each of the anvil plates **216** has a slot **218** in its inner edge in which an anvil member **220** is seated for co-operation with the punch plates **170** in the opposite side of the head unit. The inner end of the anvil plate carrier **216** is cut away at **221** to receive the ends of the punch guide fingers **193** and **193'** when the punch is advanced at the end of the closing movement of the plates **167** and **168**. The anvil carrier plates **216** are slotted at **222** to accommodate movement of the pin **212**. The inward movement of the anvil support plates **216** is controlled by cam track **223** in the bottom cam plate **161'** which receives the cam roller **224** on the bottom edge of the slot **215** in the slide member **210**. The movement of the constricting plates **168** is controlled by the cam track **225** in the upper cam plate **160'** which receives cam roller **226** depending from the bottom edge of the carrier plates **214** on which the constricting plates **168** are mounted. The knife blade **171** is secured on a holder **227** by means of clamp plate **228** and the holder **227** has an outer base or flange portion **229** which extends into vertical slots **230** in the anvil support plates **216**. The knife blade **171** is clamped between the anvil support plates **216** and moves with the latter so that there is no relative movement between the

anvil for clinching the closure clips and the cut-off knife blade 171. The slide block assembly 166 is mounted between the top and bottom frame bars 155 and 156 for sliding movement transversely and longitudinally of the machine, in the same manner as described with reference to the slide block assembly 165. The slide block member 210 is provided with cam rollers mounted in the top and bottom edges which are operative in downwardly and upwardly opening cam track forming slots in the top and bottom frame bars 155 and 156, respectively, in the same manner as described with reference to slide block member 174 at the other end of the frame. Also, the slide block member 210 carries on its lowermost edge a slide bar 206' on which depending bracket plates 153' are mounted for carrying the cam roller 152 which controls the vertical movement of the carriage 141' on the conveyor adjusting mechanism 86 at that side of the machine.

The cam plates 160, 160' and 161, 161' (FIGURES 13 and 15) which control lateral movement of the casing constricting plates 167, 168 and the closure clip applying and clinching punches 170 together with the cut-off knife 171 are provided with cam track forming portions or sections 180, 192 and 223, 225 which are straight and which hold the tube engaging elements in retracted or open position and also with branch tracks 180', 192' and 223', 225' which close the same and thereafter return them to open position. Associated mechanism is provided for guiding the cam rollers 178 and 224 on the bottom of the frame plates 123 and 124 and the cam rollers 191 and 226 on the top thereof into the straight track sections or the branch tracks according to the direction of movement of the head unit 135. The cam tracks provide for closing and opening the tube constricting and clip applying members on the head during the advancing movement of the head unit 135 and for holding these members in open position during the reverse or return movement of the head unit 135. The cam tracks 180, 192 and 223, 225 extend in straight parallel lines along the outside margins of the respective cam plates 160, 161 and 160', 161', the straight tracks in the top and bottom plates being in alignment. Each cam plate has a branch track indicated at 180' and 192' in FIGURE 13 and at 223' and 225' in FIGURE 15 into which the respective cam rollers are guided for travel during the forward movement of the head unit 135. These track sections or branch tracks are not aligned in the top and bottom plates but differ so as to provide for movement of the casing constricting plates 167 and 168 to first constrict the casing followed by movement of the punches 170 and anvils 220 to apply the closure clips and a further punch movement to knock the clips out of the clinching pockets and insure that the completed package is free to advance relative to the head unit 135.

The associated mechanism for guiding the cam rollers into the proper cam tracks at the beginning of advance and return movements of the head unit 135 comprises a set of cam rollers on the head unit 135 and co-operating cam track forming members mounted along the outside edges of the frame plates 123 and 124. The slide block 174 (FIGURE 7) at one end of the head unit 135 carries cam roller 230 at its outer edge and slide block 210 (FIGURE 7A) at the other end thereof carries a like cam roller 23. The frame formed by the punch carrying plates 182 on the slide block 174 has a cam roller 232 at the outer end of the bottom bar 185. The constricting plate supporting members 214 on the slide block 210 are provided with a like cam roller 233 at the outer end thereof. Cam roller engaging members 234 and 234' are provided at the trailing ends of the branch cam slot sections 180', 192', and 223', 225', as shown in FIGURES 13 to 15, which are pivotally mounted at 235 and 235' on support forming marginal portions 236 and 236' of the frame plates 123 and 124, the latter being cut away or slotted at 237 and 237' to permit inward swinging movement of the guide members 234 and 234'. The guide members 234 and 234' have tail end portions 238 and 238' adapted to engage the outer edges of the cam plates 160, 161 and 160', 161' so as to limit their outward movements to the positions shown in FIGURES 13 and 15. The cam roller guides 234 and 234' are normally held in the position shown in FIGURES 13 to 15 by pull rods 239 and 239' which are pivotally connected at 240 and 240' to the guide members 234 and 234'. The pull rods 239 and 239' extend through apertures in brackets 241 and 241' mounted on the plate portions 236 and 236' and carry tension springs 242 and 242' confined on their free ends between end locking nuts and the brackets 241 and 241'. The cam roller guides 234 and 234' have curved track forming portions 243 and 243' which extend below and above, respectively, of the working faces of the cam plates 161 and 160' so as to be disposed in the path of the cam rollers 230 and 233. At the start of advancing movement of the head unit 135 the cam rollers 230 and 233 are forced inwardly by the guide members 234 and 234' towards the longitudinal center of the machine so that the cam rollers 178 and 226 on the slide block assemblies 165 and 166 are directed into the cam tracks 180' and 225'. On the return movement of the head unit 135 the cam rollers 230 and 233 pass along the outside of the track forming portions 243 and 243' of the guide members 234 and 234'. At the forward ends of the branch tracks 180', 192' and 225', 223' cam roller guides 244 and 244' are provided which are pivotally mounted at 245 and 245' on the forward ends of the bracket forming plate portions 236 and 236' and normally lie in cut away portions 246 and 246' of the frame plates 123 and 124. The guide brackets 244 and 244' are spring pressed against the edges of the plates 123 and 124 by compression springs 247 and 247' carried on rods 248 and 248' which are pivotally connected to the ends of the short arms of the L-shaped brackets 244 and 244' at 249 and 249' and which are slidingly supported in apertures in brackets 250 and 250' extending from the support members 236, 236'. The guide brackets 244 and 244' have track forming cam roller engaging top and bottom flanges 251, 252 and 251', 252' which extend above and below the cam plates 160, 160' and 161, 161' and which are located opposite the forward ends of the branch cam tracks 180', 192' and 223', 225'. The track members 251, 252 and 251', 252' are adapted to be engaged on their outside faces by the cam rollers 230, 232 and 231, 233 so as to guide the cam rollers 178, 191 and 224, 226 into the straight sections of the cam tracks 180, 192 and 223, 225 during the return movement of the head unit 125 which holds the casing constricting plates and associated members in open position, as shown in FIGURES 7 and 7A.

The head unit 135 is reciprocated in the longitudinal direction of the machine by means of a pair of link bars 255 and 255' (FIGURES 1 and 2) which have one end pivotally connected at 256 and 256' to the end brackets 158 and 158' on the head 135. At the other ends thereof the link bars 255 and 255' are pivotally mounted on a cross rod 257 which extends between a pair of endless chains 258 and 258'. The chains 258 and 258' are carried on pairs of sprockets 260, 260' and 261, 261' (FIGURES 23 and 24). The sprockets 260 and 260' are carried in axially spaced relation on transversely aligned short shafts 262 and 262' which are mounted on the upright, laterally spaced frame members 118' and 119', (FIGURE 23). The sprockets 261 and 261' are mounted on the inner ends of axially aligned shafts 263 and 263' which are journaled in the laterally spaced upright side frame members 125, 125' and 126, 126'. Pairs of top and bottom guide bars 266, 267 and 266', 267' are mounted on the frame members so as to hold the top and bottom runs of the chains 258 and 258' in parallel planes. The chains 258 and 258' are driven by connection with the

drive shaft 115. The shafts 263 and 263' carry sprockets 268 and 268' which are connected by chains 270 and 270' with sprockets 271, 271' on the shaft 115 and suitable tension adjusting sprockets 272 and 272' are provided for controlling the tension in the chains 270 and 270'.

The closure clips 11 for closing the ends of the packages are formed on a clip forming mechanism indicated at 275 in FIGURE 1. A pair of reels 276 are supported on an upright bracket 277 (FIGURES 1 and 16) which extends upwardly from a cross support plate 278 on which the clip forming mechanism is mounted. The cross plate 278 is supported in a vertical plane at its ends on the top frame plates 123 and 124 with the center portion cut out at 280 to accommodate the conveyor 85 and supported at its lower edge on a cross frame bar 281. Two strips of flat wire-like clip forming material are drawn from the reels 276 between a pair of feed rollers 282 and 283. The roller 282 has axially spaced, peripheral grooves 284 (FIGURES 19 and 20) in which the clip wire travels. The co-operating feed roller 283 is in the form of two discs which engage in the peripheral slots 284 so as to clamp the clip forming wire between the two rollers for downward feeding movement. The pressure roller 283 is rotatably mounted on the short leg of an L-shaped bracket 285 which is pivotally supported at 286 on the vertical plate 278 with its long leg extending laterally and urged in a clockwise direction about the pivot 286 by a spring pressed pin 287 mounted near the outer end of the same and engaging beneath the bracket arm. A pressure release device 290 is pivotally mounted at 291 with a handle 292 for manually releasing the pressure exerted by the roller 283 and to move the same away from the roller 282 so as to facilitate threading of the clip forming material. The grooved roller 282 is mounted on a short shaft 293 which is journalled in a bearing member 294 secured on the upstanding support plate 278. The shaft 293 (FIGURES 18 and 19) carries a one way clutch 295 with an operating arm 296 on the outer end of which there is a cam roller 297 which is held by spring 298 in engagement with an upstanding track forming flange 299 on a plate cam 300 which is mounted at the top end of a vertical rock shaft 301. The shaft 301 is journaled at its upper end in the top frame plate 123 and at its bottom end in the bottom frame plate 123'. The vertical shaft 301 is rocked by means of a pinion 302 mounted thereon which is engaged by a rack 303 mounted on a longitudinally extending slide 304 carried in a track forming frame 305 secured on the upright frame members 71' and 121' (FIGURES 17 and 21). The slide 304 is slotted at 306 to clear the cross shaft 70 and is reciprocated by plate cams 307 and 308 carried on the cross shaft 70 and engaging with cam rollers 307' and 308' on the inner face of the slide 304.

The shaft 301 also carries at its uppermost end a segmental pinion 309 (FIGURES 18 and 21) which engages with a rack 310 mounted in a slide forming housing 311 secured on the inner edge of the top frame plate 123 and extending to a point beneath the feed rolls 282 and 283. The rack 310 extends in a diagonal path relative to the longitudinal path of the conveyor and carries on its end a double anvil 312 on which U-shaped clips are formed by operation of a reciprocating punch 315 (FIGURE 16) mounted in a transversely extending guideway forming housing 316 beneath the feed roller 282. The top wall of the housing 316 is extended and provided with guide slots 317 for guiding the leading ends of the clip forming wire. The punch 315 co-operates with the slots 317 for cutting the proper lengths of clip wire to form successive pairs of clips 11. It is reciprocated by connecting the same at 318 with the upper end of an arm 320 mounted on a small rock shaft 321 which is journaled in a bearing 322 mounted in the vertical support plate 278 and carries an arm 323 (FIGURES 17 and 21) which has its free end pivotally connected at 324 to the upper end of a link 325, the lower end of which is pivoted at 326 to a vertically extending slide 327 mounted in a housing 328 extending from the cross plate 278. The lower end of the slide 327 is slidingly received in a bearing 330 in the bottom cross frame member 331. The slide 327 is reciprocated by plate cams 332 and 333 carried on the cam shaft 70 and engaging cam rollers 332' and 333' on the slide. The slide 327 is slotted at 334 to accommodate the shaft 70. The punch member 315 is provided with spring backed pins 335 to strip the U-shaped clips from the forming slots 336 in the end of the punch which engages with the anvil 312. The clips are formed on the anvil 312 and the latter is thereafter advanced to carry the clips rearwardly of the machine and into position for stripping them from the anvil 312 and depositing them in the pockets at the ends of the applying punches 170 in the head unit 135.

The machine is provided with a main drive motor 340 having an output sprocket 341 connected by a chain 342 with the sprocket 343 on the main drive shaft 115. The shaft 115 (FIGURE 23) carries a sprocket 344 which is connected by chain 345 with the sprocket 346 on the cam shaft 70. The cam shaft 70 carries two cam plates 347 and 348 which operate valves 350 and 351 to control vacuum and compressed air lines leading to small ports (not shown) in the clip receiving face of the anvil 312, the vacuum being applied at the proper time to assist in holding the U-shaped closure clips on the anvil during transfer of the clips from the forming area or station to the head unit 135 and the pressure being applied during the return stroke to remove any batter which may have entered the vacuum holes during the application of the previous clip.

In operating the machine, the product receiving tube T (FIGURE 1) is formed from the web material W by feeding the latter from the supply roll 16 over the forming plate 25 and onto the tubular mandrel 26 where a continuous longitudinal seal is formed by the electronic sealing mechanism 27. The formed tube T (FIGURE 4) is advanced by the two pairs of feed wheels 73, 73' and 74, 74' which grip collapsed opposite edges of the tube material as it travels along the mandrel 26. The product to be packaged, which may be a meat batter, for example, a bologna or sausage batter, or any similar flowable product, is fed to the Moyno pump 44 which delivers a continuous stream of the product through the feed control member 35 with the product normally passing between the inner ends of the pistons 51, 51'. The operation of the pistons 51 and 51' is timed so that they are retracted at predetermined intervals to slow down the feed of the product to the mandrel 26. The inner sleeve 37 of the mandrel 26 is reciprocated to control the flow of the product into the cavity or passageway between the end wall 39 of the nozzle and the edge 38 of the sleeve 37 so as to maintain more or less constant pressure on the tube wall at this point, sufficient to prevent flow of air past the ring 36 and into the portion of the tube being filled. The sleeve is retracted during the filling interval when reduced flow of the product occurs as a result of the retraction of the pistons 51 and 51'. The reduced flow of product occurs during a slack filling interval and a smaller volume of the product is delivered into the tube at the end of the nozzle 33 so as to provide a partially filled zone or area for constricting the tube to form the package ends and to compensate for the reduction in the space available for the product at the trailing end of the leading package and at the leading end of the next succeeding package which results from the constricting operation. The filled tube is advanced onto the conveyor 85 and through the constricting and seal applying head unit 135. The sealing head unit 135 is reciprocated at regular intervals along the axial path of advance of the filled tube or casing with the path of travel extending between a point immediately in front of the discharge end of the nozzle 33 and a clip forming

station which is spaced therefrom a distance corresponding to the length of the package being formed. As the head unit **135** advances from its fully retracted position at the end of the nozzle **33** the interleaved casing constricting plates **167** and **168** are moved inwardly toward each other to constrict the casing in the partially filled area thereof and at the end of the forward movement a pair of clips **11** are clinched around the constricted casing by operation of the punches **170** and the cooperating anvil members **220**, the U-shaped clips being formed on the mandrel **312** (FIGURES 16, 19 and 20) by operation of the wire feeding mechanism and the forming punch **315**. On application of the closure clips **11**, the knife **171** is reciprocated to sever the gathered portion of the casing between the pair of closure clips, and release the leading package.

The conveyor **85** is divided by the speed control mechanism **130** which is carried beneath the casing constricting and clip applying head **135** so as to provide a leading section **87** and a trailing section **88**. The filled casing is delivered onto the trailing section **88** as it leaves the mandrel nozzle **33** and this section of the conveyor **85** is held at a constant speed while the speed of the leading section **87** is varied. The speed control device **130** operates to slow down the speed of the leading section **87** by vertical movement of the chain carrying sprockets **138**, **138'** and **147**, **147'** (FIGURES 1, 7 and 7A). This slowdown in the speed of the leading conveyor section **87** coincides with the inward casing constricting movement of the plates **167** and **168** so as to compensate for the reduction in the length of the tube resulting from the infolding of the casing material. When the plates **167** and **168** are retracted or opened up the conveyor speed control mechanism **130** is operated to allow the conveyor section **87** to advance the completed package out of the machine at the same rate of travel as the rate of travel of the filled casing at the end of the nozzle **33**.

While the foregoing description of the illustrated machine refers to particular materials and specific details of construction, however, it will be understood that other materials and equivalent structural details may be resorted to within the spirit of the invention.

I claim:

1. Apparatus for stuffing a relatively large diameter sausage casing, constricting the casing at predetermined intervals and applying closure fasteners to the constricted casing portions, said apparatus comprising a conveyor having a generally horizontal run for supporting the filled casing, a horizontally disposed hollow mandrel having means for forming thereon a continuous casing, means for feeding a sausage batter in a continuous stream through the mandrel, means associated with the mandrel for feeding the filled casing from the mandrel onto said horizontal conveyor run, means for driving the conveyor at a predetermined speed corresponding to the speed of the filled casing, a casing constricting and closure fastener applying head mounted for reciprocating movement in a path generally parallel with and immediately above said horizontal conveyor run, means for reciprocating said head in predetermined relation to the movement of said casing, means on the head for constricting the casing and applying closure fasteners to the constricted portion thereof during the advancing movement of the head, and said conveyor having associated mechanism for dividing the casing supporting run thereof into two sections extending from the leading and trailing sides of the casing constricting and closure fastener applying head, and for varying the speed of the leading section of the conveyor to compensate for the reduction in the length of the filled casing which results from infolding the casing material to provide a constricted area for the application of the closure fasteners.

2. Apparatus for stuffing a sausage casing, constricting the casing at predetermined intervals and applying closure members to the constricted casing portions, said apparatus comprising a conveyor having a generally horizontal run for supporting the filled casing, a hollow mandrel disposed horizontally and having means for forming thereon a continuous casing, means for feeding a sausage batter through the mandrel, means associated with the mandrel for advancing the filled casing from the mandrel onto said horizontal conveyor run, means for driving the conveyor at a predetermined speed so as to advance the filled casing, a casing constricting and closure applying head mounted for reciprocating movement in a generally parallel path above said horizontal conveyor run, means for reciprocating said head in predetermined relation to the advancing movement of said casing, means on the head for constricting the casing and applying closure members to the constricted portion thereof during the advancing movement of the head, and said conveyor having associated mechanism for varying the speed of the leading section of the conveyor in advance of the constricting and closure applying head to compensate for the reduction in the length of the filled casing which results from infolding the casing material to provide a constricted area for the application of the closure members.

3. Apparatus for stuffing a relatively large diameter casing of thin pliable film material, constricting the casing at predetermined intervals and applying closure means to the constricted casing portions, said apparatus comprising a conveyor having a generally horizontal run for supporting the filled casing, a hollow mandrel having means for advancing thereon a continuous casing formed from a thin pliable film material, means for feeding a flowable product in a continuous stream through the mandrel, means associated with the mandrel for guiding the filled casing from the mandrel onto said horizontal conveyor run, means for driving the conveyor at a predetermined speed so as to advance the filled casing, a casing constricting and closure applying head mounted for reciprocating movement in a path generally parallel with said horizontal conveyor run, means for reciprocating said head in predetermined relation to the movement of said casing, means on the head for constricting the casing and applying closure means to the constricted portion thereof during the advancing movement of the head, and means associated with said conveyor for dividing the casing supporting run thereof into two sections extending from the leading and trailing sides of the casing constricting and closure applying head, and for varying the speed of the leading section of the conveyor to compensate for the reduction in the length of the filled casing which results from infolding the casing material to provide a constricted area for the application of the closure means.

4. Apparatus as recited in claim **3** and said means for feeding a product through the mandrel including a means for varying the volume of the product fed so as to provide partially filled areas at spaced intervals in the casing.

5. Apparatus as recited in claim **4** and said means for varying the volume of the product fed being operated in predetermined timed relation to the reciprocating movement of the casing constricting and closure applying head.

6. In an apparatus for filling with a flowable product a relatively large diameter casing which is formed of thin pliable packaging material, constricting the casing at predetermined intervals and applying closure forming means to the constricted casing portions so as to divide the same into a series of packages, a conveyor having a generally horizontal run for supporting the filled casing, a hollow mandrel having a horizontally disposed portion and means for applying thereto a continuous casing formed from thin pliable packaging material, means for feeding a flowable product in a stream to the mandrel and into the casing, means for controlling the quantity of the product fed to the mandrel, means associated with the mandrel

for delivering the filled casing from the mandrel onto said horizontal conveyor run, means for driving the conveyor at a predetermined speed, a casing constricting head mounted for reciprocating movement in a path generally parallel with and adjacent said horizontal conveyor run, means for reciprocating said head in predetermined relation to the movement of said casing, means on the head for constricting the casing to provide a constricted area for applying closures, means associated with said conveyor for dividing the casing supporting run thereof into two sections extending in advance of and trailing the casing constricting head, and means for varying the speed of the leading section of the conveyor to compensate for the reduction in the length of the casing which results from the constricting thereof by said head.

7. In an apparatus as recited in claim **6** and said casing constricting head having a supporting frame extending transversely of the path of advance of the casing and the casing constricting means on said head comprising casing engaging members supported on carriage forming members which are mounted in oppositely disposed relation in said supporting frame for movement toward each other to constrict the casing and for movement relative to the head in the direction of the path of advance of the casing.

8. In an apparatus as recited in claim **7** and cam means for moving said carriage forming members relative to said supporting frame during reciprocation of said casing constricting head.

9. In an apparatus for filling with a flowable product a relatively large diameter casing formed of thin pliable packaging material, constricting the casing at predetermined intervals and applying closure formations to the constricted casing portions, said apparatus comprising a conveyor having a generally horizontal run for supporting the filled casing, a hollow mandrel having a horizontally disposed portion and means for applying thereto a continuous casing formed of thin pliable packaging material, means for feeding a flowable product in a continuous stream to the mandrel and into the casing, means for advancing the filled casing from the mandrel onto said horizontal conveyor run, means for driving the conveyor at a predetermined speed corresponding to the speed of the filled casing, a casing constricting and closure applying head assembly including a supporting frame member extending transversely of the path of the casing and mounted for reciprocating movement in a path generally parallel with and immediately above said horizontal conveyor run, means for reciprocating said head assembly in predetermined relation to the movement of said casing, and means on said head for constricting the casing and applying closure formations to the constricted portion thereof during movement of the head which casing constricting and closure applying means is mounted for movement on said head supporting frame member into engagement with the casing and along the longitudinal path of said supporting frame member.

10. In an apparatus as recited in claim **9** and means associated with said hollow mandrel for varying the flow of the product so as to provide at intervals in the filled casing space for accommodating product which is forced out of the constricted area as a result of the casing constricting operation.

11. In an apparatus as recited in claim **9** and means associated with said hollow mandrel for reducing the flow of the product at the discharge end of the mandrel at intervals so as to provide space in the filled casing for accommodating product which is forced out of the constricted casing areas resulting from the casing constricting operation.

12. In an apparatus as recited in claim **9** and means for reducing the quantity of the product fed to the mandrel so as to provide at intervals space within the casing for accommodating product which is forced out of the constricted casing area as a result of the operation of the casing constricting means.

13. In an apparatus for filling a package forming tube of relatively large diameter, constricting the same at predetermined intervals and applying closure fasteners to the constricted portions, said apparatus comprising a horizontally disposed hollow mandrel, means for advancing a continuous package forming tube over said mandrel, means for supporting the filled tube after it leaves the mandrel, means for supplying in a steady stream a continuous flow of a product through the mandrel and into the tube, a tube constricting and closure fastener applying head mounted for horizontal reciprocation in advance of the discharge end of said mandrel, means in said head for constricting the tube while it is advancing and for applying a pair of closure fasteners on the constricted portion thereof, means for forming the closure fasteners and delivering the same to said head, means associated with said mandrel for temporarily reducing the flow of the product into the tube so as to compensate for the reduction in the space available for the product which results from the infolding of the tube material during the constricting thereof.

14. In an apparatus for filling a package forming tube of relatively large diameter with a flowable product, constricting the filled tube at predetermined intervals and applying closure fasteners to the constricted portions, said apparatus comprising a hollow mandrel having a horizontally disposed portion, means for advancing a continuous package forming tube over said mandrel, means for supplying a product through the mandrel and into the tube, a tube constricting and closure fastener applying head mounted for horizontal reciprocation in advance of the discharge end of said mandrel, means in said head for constricting the tube while it is advancing and for applying a pair of closure fasteners on the constricted portion thereof, means associated with said mandrel for temporarily reducing the flow of the product into the tube so as to compensate for the reduction in the space available for the product which results from the infolding of the tube material during the constricting thereof.

15. In an apparatus as recited in claim **14** and means for partially forming successive pairs of closure fasteners and delivering the partially formed fasteners to said head at the end of the advancing movement of said head for application by said head to the constricted portion of said tube.

16. An apparatus for stuffing a continuous casing formed of relatively thin pliant packaging material with a flowable product and dividing the casing into a series of package forming lengths, a stuffing mandrel, means for advancing a tubular package forming casing along the stuffing mandrel, supply means for delivering a flowable product in a continuous stream to the stuffing mandrel including a delivery line through which the product flows, and means associated with said product supply means for withdrawing a portion of the product temporarily from the product delivery line and for thereafter returning the withdrawn portion to said delivery line so as to provide at spaced intervals partially filled casing sections.

17. An apparatus for stuffing a continuous casing formed of pliable packaging film with a flowable product, dividing the casing into a series of package forming lengths and applying seals between the same, stuffing mandrel, means for advancing a tubular package forming casing along the stuffing mandrel, means forming a product supply line leading to said stuffing mandrel, means for delivering a flowable product in a continuous stream to the product supply line, means associated with said product supply line for temporarily storing a portion of the product in the supply line and thereafter delivering the stored portion to the mandrel so as to provide

at spaced intervals partially filled casing sections and means for dividing the casing and applying seals at said partially filled casing sections.

18. In an apparatus for packaging in a continuous tube a flowable material, a horizontally disposed tube supporting hollow filling mandrel having associated means for advancing over the same a continuous package forming tube, said mandrel having a hollow nozzle and a passageway for diverting a portion of the material around the periphery of the nozzle and into the tube, means co-operating with the mandrel for temporarily reducing the quantity of the product delivered to the mandrel, a reciprocable sleeve in the mandrel which is operable for increasing the size of said passageway, means for reciprocating said sleeve so as to increase the volume of the product diverted through said passageway.

19. In an apparatus for packaging in a continuous tube a flowable material, a horizontally disposed tube supporting hollow filling mandrel having associated means for advancing over the same a continuous package forming tube, means for delivering a product to the mandrel, means for operating said product delivery means so as to provide for temporarily reducing the quantity of product delivered to the mandrel, said mandrel having a tubular body and a hollow nozzle with a restricted axial passageway for accommodating the product, means forming a passageway between the mandrel body and the nozzle for diverting a portion of the product to the outer periphery of the nozzle so as to pass around the base of the nozzle and into the portion of the tube being filled, means for reciprocating the sleeve so as to vary the size of the passageway between the mandrel body and the nozzle in timed relation to the operation of the product delivery means for temporarily reducing the quantity of product delivered to the mandrel.

20. In an apparatus for feeding into a continuous tube of package forming material a flowable product and dividing the tube into a series of package forming lengths, a hollow mandrel, means for advancing a package forming tube along said mandrel, means for delivering a flowable product in a continuous stream to said product delivery line and into said mandrel, means connected with said product delivery line for withdrawing a portion of the product temporarily from said product delivery line so as to provide at intervals partially filled areas in the tube, and means for dividing the filled tube by collapsing the same at said partially filled areas.

21. In an apparatus as recited in claim 20 and said means for delivering the product comprising a product pump connected to said product delivery line which delivers the product at a uniform rate of flow.

22. In an apparatus as recited in claim 20, and said means for withdrawing a portion of the product from said product delivery line comprising a reciprocably mounted suction forming piston operable in a storage chamber which is in communication with said product delivery line.

23. An apparatus for stuffing a casing of relatively large diameter with a flowable product, constricting the casing at predetermined intervals to divide the same into package forming lengths and applying closure fasteners to the constricted portions, said apparatus comprising a hollow mandrel having a horizontally disposed portion, means for advancing a continuous package forming tubular casing over said mandrel portion, means for feeding a product through the mandrel and into the casing, a casing constricting and closure fastener applying head mounted for horizontal reciprocation along the path of advance of the filled casing at the discharge end of said mandrel, means in said head for constricting the casing while it is advancing and for applying a pair of closure fasteners in axially spaced relation on the constricted portion of the casing, conveyor means for supporting the filled casing and advancing the same, and means for operating said conveyor means to vary the speed of the portions thereof which extend on the leading and trailing sides of said constricting and closure applying head so as to compensate for the reduction in the axial dimension of the filled casing which results from the infolding of the casing material during the constricting thereof.

24. In an apparatus as recited in claim 23, and said conveyor means including an endless chain having a run thereof for supporting the filled casing mounted on fixed end supporting sprockets, an intermediate chain supporting frame carried on said casing constricting and closure applying head, chain engaging sprockets mounted on said supporting frame and means for moving certain of said chain engaging sprockets in a path normal to the path of travel of said conveyor run while said supporting frame is moving with said casing constricting and closure applying head.

25. In an apparatus as recited in claim 23 and said conveyor means including an endless chain having a run thereof for supporting the filled casing mounted on fixed end supporting sprockets, an intermediate chain supporting frame carried on said casing constricting and closure applying head, chain engaging sprockets on said supporting frame, certain of said chain engaging sprockets being mounted on carriages and cam means on said casing constricting and closure applying head for moving said carriages toward and from said casing supporting run in response to movement of said casing constricting means.

26. In an apparatus for filling a tubular casing with a flowable product, constricting the casing at predetermined intervals to divide the same into package forming lengths and applying spaced closure formations to the constricted portions, said apparatus comprising a hollow filling mandrel having a horizontally disposed portion, means for advancing a package forming tubular casing along said horizontal mandrel portion, means for feeding a product through the mandrel and into the casing, a casing constricting and closure applying head including a transversely extending frame mounted for horizontal reciprocation along the path of advance of the filled casing at the discharge end of said mandrel, means reciprocably mounted in said head for constricting the casing while it is advancing and for applying a pair of closure formations in axially spaced relation on the constricted portion of the casing, conveyor means for supporting the filled casing and advancing the same, and means for preforming and delivering successive pairs of generally U-shaped metal closure formations to said constricting and closure applying head at the end of the forward movement thereof.

27. In an apparatus as recited in claim 26 and said means for preforming and delivering said U-shaped closures comprising a pair of feed wheels for advancing closure forming metal strips, a reciprocating anvil and a co-operating reciprocating forming punch, and means for advancing said anvil into the path of said casing constricting and closure applying head to deliver successive pairs of U-shaped closures to said head.

28. In an apparatus for packaging material in a relatively large diameter tubular casing wherein a casing is filled with the material to be packaged and advanced along a generally horizontal path and a casing constricting and closure applying head is reciprocated along said path and operated to constrict the casing at intervals so as to divide the same into package forming lengths, an endless conveyor having a portion thereof extending along the path of the filled casing for supporting said filled casing, and means for dividing the casing supporting portion of said conveyor into two sections which extend on the leading and trailing sides of said head and for varying the speed of one section thereof in response to the movement of the casing constricting and closure applying head.

29. An endless chain conveyor having a horizontally disposed run for supporting thereon a continuously advancing package forming tube which is shortened at intervals by infolding sections of the tube while it is advancing to divide the tube into package forming lengths and

provide end walls in the packages, means to drive the conveyor at a uniform rate and means to separate the horizontal run thereof into the sections of varying length with the leading section extending in advance of each successive infolded tube section and to vary the speed of said leading conveyor section so as to compensate for the reduction in the rate of advance of the tube due to the infolding of the tube material to provide the package end walls.

30. An endless chain conveyor as recited in claim **29** and said means for separating the conveyor run into two sections and varying the speed of the leading section being reciprocated in a path extending parallel to the longitudinal axis of the tube and in timed relation to the infolding of the tube material.

31. In an apparatus for filling a continuous tube of packaging material and constricting the tube at intervals to divide the same into packaging forming lengths, conveyor means for supporting the tube while it is advancing in a horizontal path, a tube constricting head comprising a cross frame mounted for reciprocation along a path coinciding with the longitudinal axis of the tube, carriage forming members mounted at opposite ends of the cross frame, co-operating constricting plates having inwardly opening, generally V-shaped slots in the inner margins for receiving the tube and constricting the same when the carriage members are moved toward each other, cam rollers on said carriages and horizontally disposed cam plates extending along said conveyor means and having guideways for receiving said cam rollers so as to move said constricting plates toward and from the filled tube as said cross frame reciprocates.

32. In an apparatus as recited in claim **31** and said carriage members having pockets for receiving partially formed closure fasteners of relatively stiff bendable material and co-operating punch and anvil members for applying said closure fasteners and clinching the same on constricted portions of said tube.

33. A method of packaging which comprises advancing a continuous tube of package forming material on a hollow filling mandrel at a uniform rate, feeding a continuous stream of a flowable product through a conduit leading to the mandrel so as to normally fill the tube, and withdrawing a portion of the product from the conduit at intervals so as to reduce the quantity of the product delivered to the tube and provide areas at predetermined spacing in the tube which are incompletely filled.

34. A method of forming a series of packages which comprises forming a packaging tube of relatively large diameter from a thin pliable film, feeding a product in a continuous stream into the tube while advancing the tube in a horizontal path, supporting the filled tube on a continuously traveling endless conveyor, constricting the tube at successive spaced intervals and applying sealing members to the constricted area to divide the same into successive package forming sections, and reducing the speed of the portion of the traveling conveyor which supports the leading package forming section while the tube is being constricted so as to compensate for the reduction in the length of the tube resulting from infolding the tube material during the constriction thereof.

35. In a method of packaging which includes forming a packaging tube of relatively thin pliable film, filling the tube with a flowable product, constricting the tube at intervals to divide the same into package forming lengths and applying successive pairs of bendable closure fasteners to the constricted tube portions, the improvement which comprises supporting the portions of the filled tube adjoining the constricted portions on an endless conveyor which is divided into two sections with the leading section operated at a reduced speed so as to compensate for the reduction in length of the filled tube resulting from the infolding of the material at the ends of each package forming length.

References Cited

UNITED STATES PATENTS

2,831,302	4/1958	Jensen et al.	53—182 XR
3,324,621	6/1967	Runge	53—182 XR

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