PATENT SPECIFICATION

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(54) METHOD OF AND AN APPARATUS FOR PRODUCING CONTAINERS

(71) AUTOMATION INDUSTRIELLE SA, of Route de Savoie, 1896 Vouvry, Switzerland, a Swiss Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a method of an apparatus for producing containers from sheet or strip material and more particularly collapsible containers from thermo plastic or fusible foil material.

It is known from U.S. Patent Specification 3388017 to form a web of material into an elongate tube and to weld the overlapping side edges of the material together to form a seam. The seamed tube is then cut into lengths to produce individual containers. In this known apparatus the raw web of material is continuously supported by a main feeder conveyor belt as it passes through a combined shaping and heating, i.e., welding, device. This composite device employs a pair of separately-driven endless belts which grip the overlapped edges and facilitate the welding process. The heat for welding the edges together is however conducted through the belts which is disadvantageous. The presence of the main conveyor belt supporting the material throughout its processing also involves a complex structure since the shaping and welding device needs to accommodate the passage of this belt. The tube of material is cooled after the welding process and the main conveyor belt is thus subjected to both heating and cooling steps and the belt is hence subjected to thermal stress as well as friction. It is also difficult with this known form of apparatus to maintain an exactly circular cross-section for the containers.

Another known type of apparatus for producing containers is described in U.S. Patent Specification 3778321. In this apparatus a foil strip is wound spirally around one of a series of spindles carried by a rotatable turntable. These spindles are then moved through various working stations for performing successive processes on the material. This apparatus also suffers from a number of disadvantages.

A general object of the present invention is to provide an improved method of and apparatus for producing containers.

In accordance with the invention there is provided an apparatus for producing containers from sheet or strip material; said apparatus comprising shaping means, at least including a shaping tube and a mandrel at least partly within said tube, for imparting a tubular profile to the material by directing the material laterally around the mandrel as the material is moved longitudinally of the mandrel, the tubular structure thus-formed having over-lapping longitudinal edges, drive means for drawing the material through the shaping means, said drive means being composed of a pair of endless belts in frictional contact with the tubular structure, welding means spaced and separate from the shaping means for heating and bonding the overlapping edges of the tubular structure together to form a continuous bonded seam, means for severing the resultant bonded tubular structure at intervals to produce separate tubular bodies and means for applying a preformed end piece to one end of each tubular body. A series of successive devices carried by a frame may perform the shaping, welding, severing and end piece applying tasks at different locations and constitute the respective recited means. Preferably the lengths of the tubular bodies can be adjusted inter alia to conform with any printing carried by the material.

The welding means preferably heats the material directly and resistance heating, high-frequency induction heating or ultrasonic heating can be utilized. To facilitate the creation of the bonded seam at least one spring-biased squeeze roller may compress the overlapping edges after heating to their fusible state. It is desirable to inject air onto the tubular structure to effect cooling after the seam has been produced and it is advantageous to supply air also or simultaneously to reduce friction particularly in the shaping means.

To assist in the severing process the apparatus may also employ deforming means which deforms the tubular structure to an oval shape whereby cutters can engage the deformed structure over its widest faces. The resulting ovalness of the tubular bodies can then be corrected with further shaping means conveniently in the form of a pair of endless belts contacting the tubular bodies in a converging relationship and supporting the tubular structure while severing occurs.

It is useful to employ a stationary mandrel which extends through both the shaping and welding means and to provide a series of rollers contacting the tubular structure opposite the belts and supporting the mandrel. The belts can be mounted to the mandrel and to a welding device or unit constituting the welding means. In addition to these endless belts in the region where welding occurs which draw the material through the shaping means, a further adjustable drive means also composed of a pair of further belts may contact the tubular structure between the welding and severing regions. These further belts preferably extend in a plane perpendicular to the belts in the region where welding occurs.

The end pieces may be threaded to receive detachable caps and the applying means associated therewith may include a transfer mechanism for presenting the tubular bodies to respective spindles of a rotatable turntable, the spindles being moved through working stations as the turntable rotates.

In another aspect, the invention provides an apparatus for producing collapsible containers from deformable sheet or strip material; said apparatus comprising shaping means comprising a slotted shaping tube and a mandrel partly within said shaping tube, the shaping means serving to directly support the material while imparting a tubular profile to the material by directing the side edges of the material laterally together into an overlapping relationship around the mandrel as the material is moved longitudinally of the mandrel, welding means downstream from the shaping means for directly heating and bonding the overlapping edges together to form a tubular structure with a continuous seam, means for severing the tubular structure laterally at intervals to produce individual tubular bodies, means for applying preformed end pieces to the tubular bodies and drive means for moving the material longitudinally and for causing the material to pass successively through the shaping means, the welding means and the severing means, said drive means including a first endless belt positioned in the mandrel and a second endless driven belt outside the mandrel, said endless belts frictionally engaging on the tubular structure over a portion of its length downstream of the shaping means and operable to draw the material through the shaping means.

The invention also provides a method of producing containers from strip or sheet material comprising utilizing a pair of endless belts in frictional contact with the material to draw the material through shaping means which has a shaping tube and a mandrel at least partly in said tube, the shaping tube and the mandrel co-operating to support and guide the material to impart a tubular profile thereto by directing the material laterally around the mandrel so as to cause the edges of the material to become wrapped around the mandrel and to overlap passing the tubular structure formed by the shaping means through welding means spaced from and separate the shaping means which heats and bonds the overlapped edges of the tubular structure together to form a continuous longitudinal seam, passing the bonded tubular structure through severing means which severs the structure at intervals to produce separate tubular bodes and applying preformed end pieces to the individual tubular bodies.

An apparatus made in accordance with the invention can produce circular cross-section collapsible containers with neat welded seams automatically and continuously at high speed for subsequent filling.

The invention may be understood more readily, and various other features of the invention may become apparent, from consideration of the following description.

An embodiment of the invention will now be described, by way of example only, with reference to the accompanying drawings, wherein:—

Figure 1 is an elevation of apparatus made in accordance with the invention;

Figure 2 is a plan view of the apparatus shown in Fig. 1;

Figure 3 is an enlarged sectional side view of part of the apparatus more particularly showing the shaping, welding and cooling devices thereof;

Figure 4 is a plan view of the shaping device of Fig. 3;

Figure 5 is a sectional end view of the shaping device the view being taken along the line V—V of Figure 4;

Figure 6 is a sectional plan view of the part of the apparatus depicted in Figure 3;

Figure 7 is a sectional end view of the entry to the welding device, the view being taken along the line VII—VII of Figure 6;

Figure 8 is an enlarged side view of part of the apparatus, more particularly showing the cutting and further shaping devices thereof;

Figure 9 is a plan view of the part of the apparatus shown in Figure 8;

Figure 10 is a side view of part of the apparatus and more particularly showing the heading device;

Figure 11 is an end view of the heading device of Figure 10;

Figure 12 is an end view of a modified transfer mechanism of the heading device; and

Figure 13 is a diagrammatic representation of the various process steps performed at the working stations of the heading device.

Referring initially to Figure 1, an apparatus 1 made in accordance with the invention has a frame commonly supporting, inter alia, a first shaping device 6, 5, a welding device 9, a cooling device 14, a cutting device 18, a second device 24 and a heading device 30.

A sheet or web of suitable flexible, preferably a resilient, thermoplastic material is passed through these devices continuously or in incremental fashion in succession and processed to produce containers automatically. The material is here in the form of a composite foil strip 3, for example composed of aluminium foil coated on both sides with polyethylene. The strip material 3 is stored on a reel 2 and is passed over guiding and equalizing rollers 4 into the first shaping device 5, 6. One of these rollers 4 is driven by drive means 22 to move the strip material 3. As shown in Figs. 3—6, the shaping device 5, 6, is essentially in the form of a shaped tube 5 containing an elongate stationary mandrel 8 and supported by a surrounding mounting structure of the frame of the apparatus. The mandrel 8 extends through both the shaping device 5, 6 and the welding device 9. The tube 5 has a bore with a frusto-conical or trumpet shaped inlet 6 communicating with a longitudinal slot 7 in its wall. The arrangement is such that the passage of the strip material 3 longitudinally through the tube 5 causes the strip material 3 to be directed laterally to adopt a tubular hose-like profile as the side edges of the material 3 are wrapped around the mandrel 8 and brought together to overlap within the vicinity of the slot 7. The outlet part of the bore of the tube 5 and the corresponding portion of the mandrel 8 are enlarged so that the cross-section of the tube of material is increased more-or-less to its final size. This two-stage, i.e., reduction and expansion, shaping process is shown particularly in Figure 6. The tube of material is supported solely by the mandrel 8, as it is drawn therealong in a sliding relationship.

The tube of material emerging from the outlet of the device 5, 6 is next passed through the welding device 9 where the overlapping edges of the material are welded together. As shown in Fig. 3, the device 9 also embodies drive means in the form of two endless belts 10, 11 which run side-by-side trapping the overlapped edges therebetween. These belts 10, 11 serve to draw the material through the shaping device 5, 6. The heating of the overlapped edges may be effected directly by high-frequency electric energy or by ultrasonic energy provided by a unit 15. In the case of composite or laminated materials high-frequency induction heating is preferred whilst a unitary material may be best heated by ultrasonic energy. Other forms of heating can be used but the heating of the overlapped edges is preferably effected directly without the need of special transfer means. The belt 10 is mounted within the mandrel 8 and is entrained around freely rotatably rollers 12 disposed within pockets in the mandrel 8. The exterior of the mandrel 8 has a longitudinal slot 13 so that the upper run of the belt 10 extends substantially co-planar with the adjoining exterior periphery region of the mandrel 8 and the tubular structure, i.e., the tube of material, is smoothly guided along the mandrel 8. The other belt 11 is entrained around rollers 12^1 one or more of which is driven to circulate the belt 11. The lower run of this belt 11 is closely adjacent the upper external run of the belt 10 with the overlapped edges of the tube of material pressed between these adjacent runs of the belts 10, 11.

As shown in Fig. 7, the lower run of the belt 11 is located within a groove of the welding or heating unit 15 providing the energy for heating and welding the overlapped edges.

The driven belt 11 is in frictional engagement with the overlapped edges of the tube of material and the longitudinal movement of the latter serves to propel the belt 10 which is also in frictional engagement with the edges.

As a result there is synchronous movement of the two belts 10, 11 and the edges to be welded are gripped and guided without slippage thereby also ensuring the tubular profile is maintained. The belt 10 extends beyond the welding device 9 and into a cooling device 14 to additionally guide and stabilize the tubular profile. The frame of the apparatus also rotatably mounts a series of rollers 17 which support and guide the lower side of the tubular material and support the mandrel 8. The welding device 9 also employs a spring-biased roller 16 which squeezes the heated overlapped edges by acting on the lower run of the driven belt 11. As the overlapped edges of the tubular material proceeds along the unit 15 a progressively rising temperature gradient is encountered. This temperature gradient is so designed that at or near the terminal end of the unit 15, relative to the direction of movement of the tubular material, the material of the overlapped edges melts and the pressure produced by the roller 16 then ensures the edges are bonded together. The temperature gradient experienced by the overlapped edges would be selected and pre-determined for the material in question and conventional probes or sensors and regulating means are preferably provided for control purposes.

The tube of material now having a bonded seam is passed into the cooling device 14 and as mentioned previously the tube of material is here still supported by the mandrel 8 and guided by the moving belt 10 as it progresses through the cooling device 14. The cooling device 14 serves primarily to cool the tube of material but also cools the belt 10 and the mandrel 8 to improve the sliding properties of the tube of the material. The cooling device 14 has a plurality of nozzles or openings which direct jets of cooling air onto the tube of material. It is also possible to provide further nozzles or openings in the shaping device 5, 6 and in part of the welding device 9 to additionally cool the tube of material. Alternatively one or more blower units can be provided for cooling purposes. These ancilliary cooling devices may additionally or alternatively serve to reduce friction between the mandrel 8 and the material 3. In certain circumstances, it may be sufficient to allow the tube of material to cool naturally in ambient air after welding.

The tube of material is next treated by the cutting or severing device 18 designed to separate the continuous tube into individual tubular bodies designated 23. Between the cooling and cutting devices 14, 18 there is a further drive means 21 for propelling the tube of material.

As shown in Figures 1 and 2, this drive means 21 again employs two endless belts in frictional engagement with the tube of material. The belts of the drive means 21 lie in a plane perpendicular to the belts 10, 11 thus to contact the sides of the tube of material and the belts of the drive means 21 are entrained around rollers one or more of which is driven. Preferably the speed of the belts of the drive means 21 is controllable in a sepless manner, for example with gearing having a large ratio such as 1: 343 and the control function can co-operate with the preliminary drive means 22.

Referring now to Figures 8 and 9, the cutting device 18 essentially consists of two counter-rotating wheels carrying cutting blades 19 designed to meet and sever the tube of material once per revolution of the wheels. It is preferable to make the peripheral speed of the wheels substantially the same as the speed at which the tube of material is travelling and some form of control can be provided for adjustment purposes. To enhance the cutting action performed by the bladed wheels a pre-shaping or deforming device composed of grooved rollers 20 imparts ovalness to the tube of material before the severing thereof. The thus-flattened tube of material then has its upper and lower widened faces substantially parallel to the cutting edges of the blades 19. The speed of motion of the tube of material and the rotary speed of the bladed wheels determines the length of the tubular bodies 23 produced and this length can be controlled-primarily by the drive means 21. It is possible to produce up to 80 or more tubular bodies 23 per minute according to the desired length. It is preferable to set the apparatus to cut the tubular bodies 23 slightly oversize to allow for tolerances etc.

Thus if it is desired to produce bodies 23 with a length 120 mm then an allowance of typically 0.2mm is given and the overall cutting length is 120.2mm. The allowance would usually be larger than the prevailing tolerances. If variations occur they would normally then tend only to be significant if they increase the length still further. During use, therefore, correct action can be made by adjustment of the drive means in one sense.

The separate bodies discharging from the cutting device 18 still have an oval profile and the circular cross-section is restored by the shaping devices 24.

As shown in Figures 8 and 9, this shaping device 24 is also composed of two endless belts 26 entrained around differentially sized rollers 25 and contacting the sides of the tubular bodies. The belts 26 extend in the same plane as the belts of the drive means 21; however the inner runs of the belts 26 which frictionally engage the apices of the oval bodies converge in the direction of movement of the bodies as shown in Figure 9 to gradually conform the bodies 23 back to the desired circular profile. The device 24 is preferably adjustable so as to hold the end portion of the tube of material while cutting occurs. The distance between the belts 26 at the periphery of the larger rollers 25 can be made somewhat less than the desired diameter of the tubular bodies 23 to impart a slight oval shape thereto in the vertical sense, i.e., perpendicularly to the ovalness imparted by the rollers 20 thereby to fully correct the ovalness imparted by the rollers 20. As the bodies 23 are released by the belts 26, the desired circular profile is then established automatically by the inherent resilience of the material assuming this property is present.

In the final stage of processing the individual bodies 23 are taken up by the heading device 30. This device 30 has a transfer mechanism composed of endless belts 27, 28. The belt 27 conveys the bodies 23 longitudinally and the bodies 23 are then transferred sideways to the further belt 28 which is provided with location troughs or grooves 29 each receiving one of the bodies 23. The heading device employs a vertical turntable 31 carrying rotatable spindles 32 projecting towards the belt 28 and co-operating with various mechanisms described hereinafter. The spindles 32 lie on a common circle and are spaced apart evenly around this circle. The turntable 31 is rotatably indexed to bring the spindles 32 into alignment with the bodies 23 in the grooves 29 in a successive manner and the spindles 32 are pre-loaded with tube end pieces or heads 33 for attachment to the bodies 23. The bodies 23 can thus be picked up by the spindles 32 and then processed as described hereinafter to provide a screw-threaded end piece 33 on each body 23. An alternative feed mechanism for presenting the bodies 23 to the turntable 31 is shown in Figure 12. Here the belt 27 discharges the bodies 23 onto a grooved roller 28^1 so that each body 23 is received in one of the grooves. The grooved roller 28^1 then passes the bodies 23 to a vacuum drum 29^1 which is also grooved and presents the bodies 23 to the spindles 32 of the turntable 31. A hinged shaped sheet-metal guide 29a engages partly around the roller 28^1. Although this guide 29a can assist in the transfer of the bodies 23 between the roller 28^1 and the drum 29^1 it is advantageous to use the guide 29a to inhibit the transfer process where a spindle 32 does not carry a cap head 33. In general, before each of the spindles 32 comes to a pick-up position aligned with one of the bodies 23 one of the end pieces 33 is placed onto the end of the spindle 32. Sensing means, such as a feeler or a photoelectric detector, then senses whether each spindle 32 actually carries an end piece 33. If an end piece 33 is sensed then the associated body 23 is picked up and the subsequent processing steps are carried out but if an end piece 33 is not sensed the body 23 associated with that spindle 32 is ejected. In the case of the arrangement shown in Figure 12, the guide 29a can be actuated in dependence on the sensing means to inhibit the transfer and to eject the body 23 in question. In the case of the arrangement shown in Figure 11, a similar ejection can occur if the body 23 is allowed to remain in its groove 29, after alignment with the spindle 32 not carrying an end piece 33, and thereafter the body 23 can be released as the belt 28 changes its direction of movement.

Referring now to Figure 13, the various processing steps performed at the working stations of the turntable 31 will now be described. Each spindle 32 moves through working stations *I–X* as the turntable 31 indixes. At working station I each spindle 32 receives one of the end pieces 33 stored in a magazine and pushed onto the spindle 32 with some form of thrust mechanism. The spindle 32 then progresses to working stations II whereat it becomes aligned with one of the bodies 23. Assuming the sensing means detects the end piece 33 on the spindle 32 the body 23 becomes pushed onto the spindle 32 by another thrust mechanism as shown at working station III with the body 23 projecting slightly beyond a frusto-conical shoulder 34 of the end piece 33 as shown at station IV. The spindles 32 now carry both the body 23 and the end piece 33 therefor. At working station IV the shoulder 24 of the end piece and the outwardly projecting lip of the end piece 33 and the outwardly projecting lip of the body 23 are both subjected to a pre-heating treatment by means of heated air discharged by a nozzle. The spindle 32 is here preferably rotated to ensure adequate heating is achieved. At the next working station V a rod 35 carrying a shaping piece or die is thrust against the projecting lip of the body 23 to cause the lip to become bent inwardly into close contact with the shoulder 34 of the end piece 33. Here again the spindle 32 is preferably rotated. At working station VI a welding unit, preferably an induction welding unit, engages with its working head onto the shaped end of the body 23 and imparts a slight pressure thereto while the shaped end is heated. The end piece 33 then becomes bonded to the body 23. A further nozzle next subjects the now-capped body 23 to cooling air when the spindle 32 moves to working station VII. At working stations VIII and IX a closure cap 36 is screwed onto the end piece 33 of the body with the aid of a rotatable rod working in combination with magazine storing the caps 36. Finally at working station X the finished container designated 37 is removed from the spindle 32 for example by passing pressurized air through the spindle 32. The containers 37 can be supplied to a filling machine where they are filled with material and sealed off at their open ends.

It may be preferred to utilize a pre-printed material 3 to form the containers as described. In this case it may be necessary to adjust the cutting action to conform with the printing on the material and thereby ensure the correct legends are visible in the desired position on the finished containers.

The apparatus can be adapted to produce containers of different length and diameter. The length adjustment has been dealt with previously. To adjust the diameter of the tube formed by the apparatus the mandrel 8, the shaping device 5, 6 and the spindles 32 can all be replaceable items and appropriate adjustment can be made to the other devices.

WHAT WE CLAIM IS:—

1. An apparatus for producing containers from sheet or strip material; said apparatus comprising shaping means, at least including a shaping tube and a mandrel at least partly within said tube, for imparting a tubular profile to the material by directing the material laterally around the mandrel as the material is moved longitudinally of the mandrel, the tubular structure thus-formed having over-lapping longitudinal edges, drive means for drawing the material through the shaping means said drive means being composed of a pair of endless belts in frictional contact with the tubular structure, welding means spaced and separate from the shaping means for heating and bonding the overlapping edges of the tubular structure together to form a continuous bonded seam,

means for severing the resultant bonded tubular structure at intervals to produce separate tubular bodies and means for applying a preformed end piece to one end of each tubular body.

2. An apparatus according to claim 1, and further comprising a storage reel for the sheet or strip material, rollers for guiding the material into the shaping means and further drive means for driving one or more of said rollers to feed the material into the shaping means.

3. An apparatus according to claim 1 or 2 and further comprising means for supplying air to the shaping means to reduce friction.

4. An apparatus according to claim 1, 2 or 3, and further comprising means for cooling the bonded tubular structure prior to the severing treatment.

5. An apparatus according to any one of claims 1 to 4, and further comprising deforming means for imparting an oval shape to the tubular structure to facilitate the severing thereof and further shaping means for correcting the ovalness of the tubular bodies after severing to restore the circular cross-section.

6. An apparatus according to claim 5, wherein said deforming means comprises one or more grooved rollers.

7. An apparatus according to claim 5 or 6, wherein the further shaping means is in the form of a pair of endless belts contacting the tubular bodies in a converging relationship and supporting the tubular structure while severing occurs.

8. An apparatus according to any one of claims 1 to 7, wherein there is provided a further pair of endless belts in frictional contact with the tubular structure generally between the welding and severing means, said further pair of belts serving as a further drive means which is controllable to vary the speed of movement of the tubular structure.

9. An apparatus according to claim 8, wherein the further belts extend in a plane substantially perpendicularly to the first-mentioned belts.

10. An apparatus according to any one of claims 1 to 9, wherein the mandrel extends through both the shaping and welding means and one of the belts of the first-mentioned drive means is mounted in the mandrel to run along an exterior surface region thereof adjacent the other of the belts.

11. An apparatus according to claim 10, wherein the welding means comprises a welding unit which also carries the other of the belts of the first-mentioned drive means.

12. An apparatus according to claim 11, wherein a series of rollers is provided to support the tubular structure and the mandrel opposite the belts of the drive means.

13. An apparatus according to any one of claims 1 to 11, wherein there is provided a squeeze-roller for compressing the overlapping edges after heating to produce the bonded seam.

14. An apparatus according to any one of claims 1 to 13, wherein the means for applying the end pieces includes a transfer mechanism for presenting the tubular bodies to respective spindles of a rotatable turntable, the spindles being moved through working stations as the turntable rotates.

15. An apparatus according to claim 14, wherein the tubular bodies are inserted onto the spindles preloaded with end pieces and each end piece is bonded to one end of a respective associated tubular body.

16. An apparatus according to any one of claims 1 to 15, wherein the severing means takes the form of a pair of rotatable wheels carrying cutting blades.

17. An apparatus according to any one of claims 1 to 16, wherein the shaping tube has an inlet of frusto-conical configuration and a guide slot where the overlapped edges are guided.

18. An apparatus according to claim 17, wherein the first-mentioned shaping device is substantially as described with reference to, and as illustrated in, Figures 3, 4, 5 and 6 of the accompanying drawings.

19. An apparatus according to any one of claims 1 to 18, wherein the welding means and the first-mentioned drive means are substantially as described with reference to, and as illustrated in Figures 3 and 7 of the accompanying drawings.

20. An apparatus according to claim 5 or according to any one of claims 6 to 19, when appended to claim 5, wherein the deforming means, the severing means and the further shaping means are substantially as described with reference to, and as illustrated, in Figures 8 and 9 of the accompanying drawings.

21. An apparatus according to claim 14, or according to any one of claims 15 to 20, when appended to claims 14, wherein the means for applying the end pieces is substantially as described with reference to, and as illustrated in, Figures 10, 11 and 13 or Figures 10, 12 and 13 of the accompanying drawings.

22. Apparatus substantially as described with reference to, and as illustrated in, the accompanying drawings.

23. An apparatus for producing collapsible containers from deformable sheet or strip material; said apparatus comprising shaping means comprising a slotted shaping tub; and a mandrel partly within said shaping tube, the shaping means serving to directly support the material while imparting a tubular profile to the material by directing the side edges of the material laterally together into an overlapping relationship around the mandrel as the material is moved

longitudinally of the mandrel, welding means downstream from the shaping means for directly heating and bonding the overlapping edges together to form a tubular structure with a continuous seam, means for severing the tubular structure laterally at intervals to produce individual tubular bodies, means for applying preformed end pieces to the tubular bodies and drive means for moving the material longitudinally and for causing the material to pass successively through the shaping means, the welding means and the severing means, said drive means including a first endless belt positioned in the mandrel and a second endless driven belt outside the mandrel, said endless belts frictionally engaging on the tubular structure over a portion of its length downstream of the shaping means and operable to draw the material through the shaping means.

24. An apparatus according to claim 23, wherein sets of endless belts frictionally engage on the tubular structure at spaced locations.

25. An apparatus according to claim 23 or 24, wherein the material is supported solely by a mandrel during the shaping step.

26. A method of producing containers from strip or sheet material comprising utilizing a pair of endless belts in frictional contact with the material to draw the material through shaping means which has a shaping tube and a mandrel at least partly in said tube, the shaping tube and the mandrel cooperating to support and guide the material to impart a tubular profile thereto by directing the material laterally around the mandrel so as to cause the edges of the material to become wrapped around the mandrel and to overlap passing the tubular structure formed by the shaping means through welding means spaced from and separate the shaping means which heats and bonds the overlapped edges of the tubular structure together to form a continuous longitudinal seam, passing the bonded tubular structure through severing means which severs the structure at intervals to produce separate tubular bodies and applying preformed end pieces to the individual tubular bodies.

27. A method of producing containers from sheet or strip material substantially as described with reference to the accompanying drawings.

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1567696 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

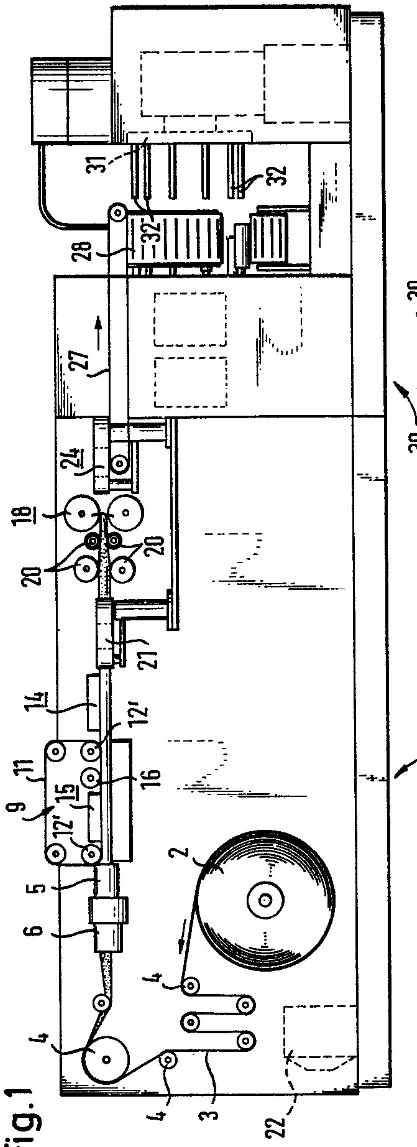

Fig.1

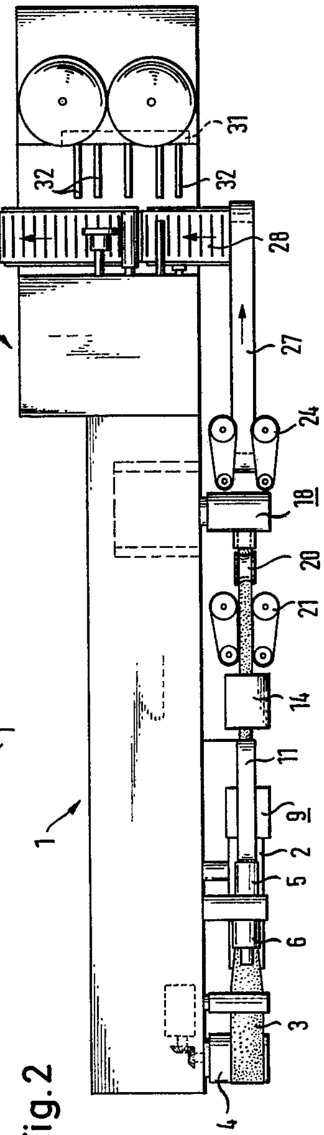

Fig.2

1567696 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

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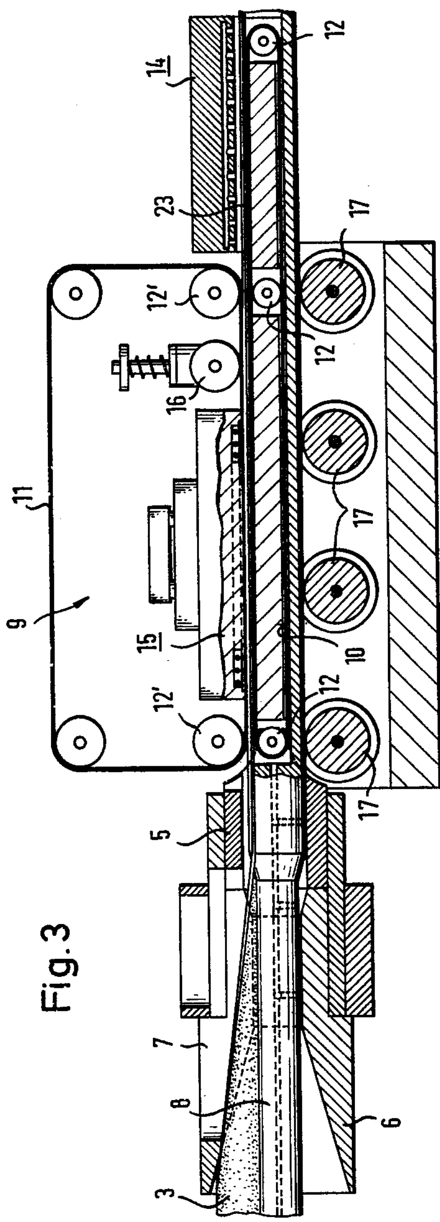

Fig.3

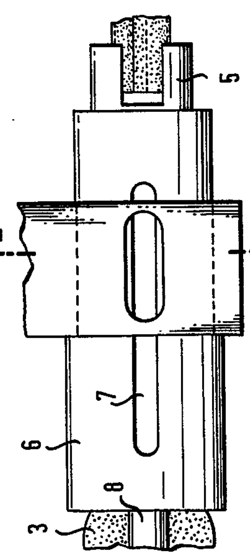

Fig.4

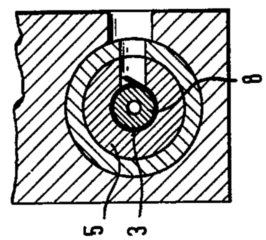

Fig.5

1567696 COMPLETE SPECIFICATION

6 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 3

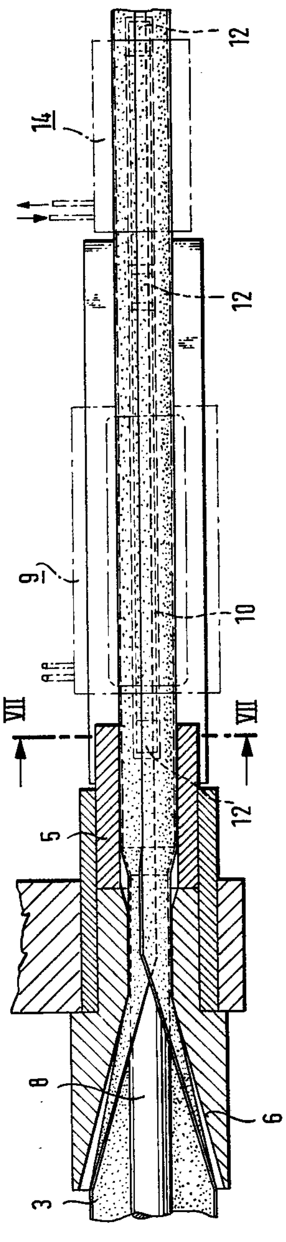

Fig.6

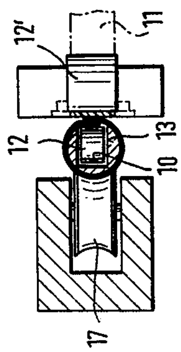

Fig.7

Fig. 8

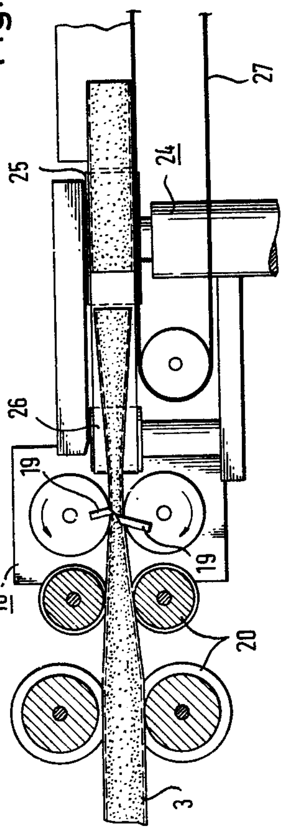

Fig. 9

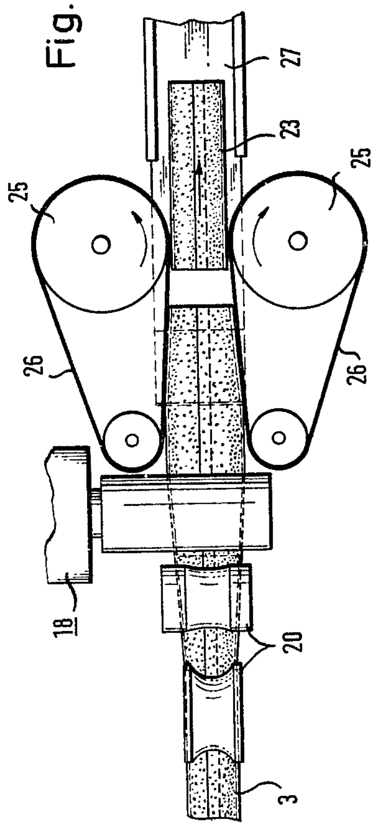

Fig. 10

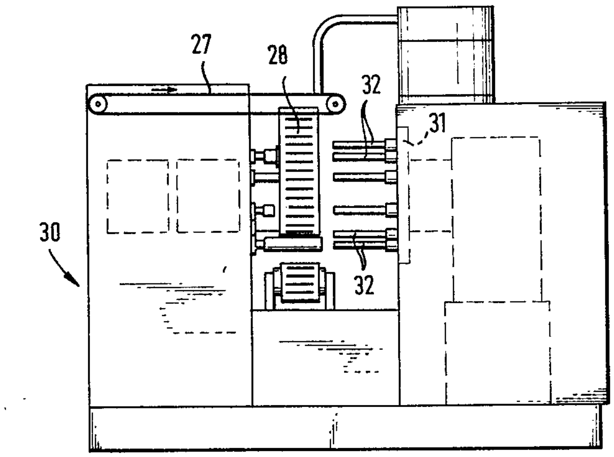

Fig.11

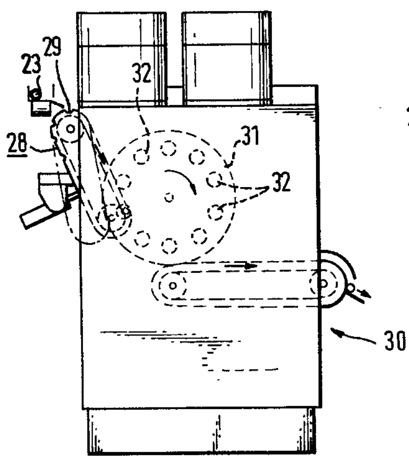

Fig.12

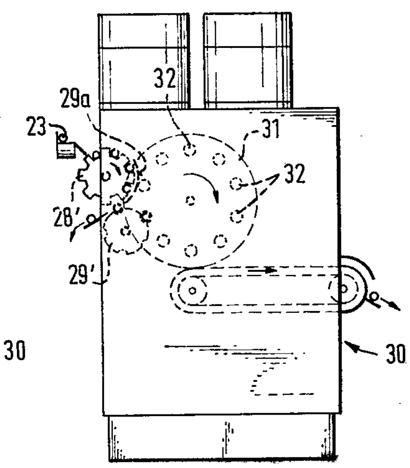

Fig. 13