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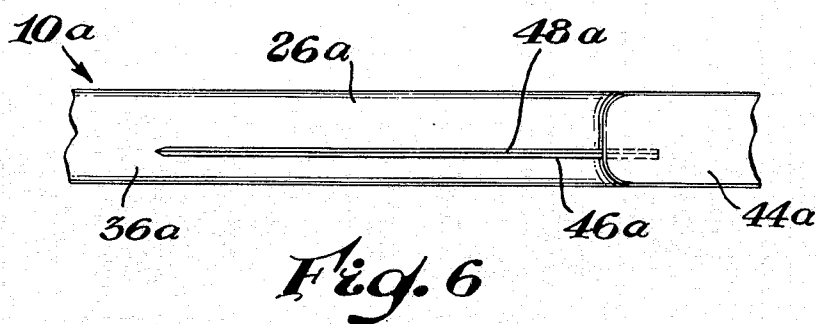
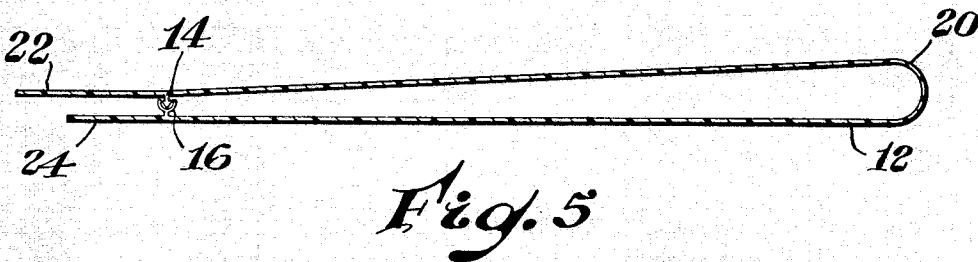
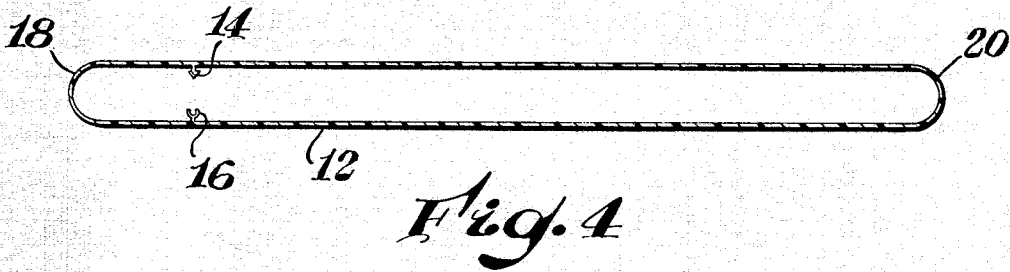
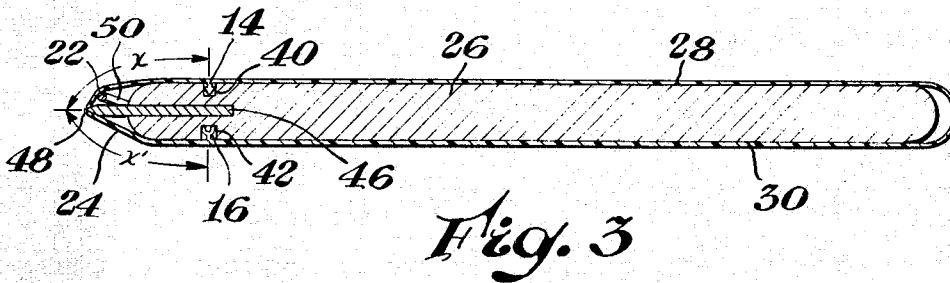
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3,500,727

APPARATUS FOR JOINING TOGETHER CLOSURE MEMBERS

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2 Sheets-Sheet 2



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above and extending parallel to the platform 40. As the web advances, the flying splitter holds the upper edges of the web spread apart as the latter passes between the blades 47 and 49 and through the gap between the splitters 25 and 26. During each dwell when the movable blade is swung through its cutting stroke, the splitter is rocked upwardly and out of the path of the blade by a crank 65 (FIG. 2) fastened to the lever 51 and connected by a link 66 to a crank 67 on the shaft 63.

As shown most clearly in FIGS. 1, 2 and 6, the feed rolls 30 and 31 are located on the upstream side of the cutter 27 and are journaled for rotation at their upper ends in bearings (not shown) mounted on the same top plate 64 which carries the flying splitter 61. At their lower ends, both rolls are journaled in bearings 70 (FIG. 6) on the platform 40, the lower ends of the rolls including extended shafts 71 (FIG. 7) projecting downwardly through holes 73 (FIG. 8) in the platform and operably connected to drive gearing 74 housed within the case 56.

The feed rolls 30 and 31 are spaced upstream from the cutter 27 a distance b (FIG. 9) which is only far enough to establish sufficient clearance between the two to allow manual threading of the web 13 through the rolls and the blades 47 and 49 at the start of a run, the spacing b herein being approximately $1\frac{1}{2}$ inches. With the feed rolls located closely adjacent the cutter, the roll 31 provides effective lateral support for the web as the blade 47 swings through its cutting stroke and into engagement with the web to cut off each bag 11. Accordingly, lateral deflection of the web under the force of the blade 47 is reduced thereby resulting in fewer ruined bags and in more trouble-free operation of the machine with less down time caused by a fouled web. Since the feed rolls are mounted on the platform 40 and are adjusted along the path with the cutter when the position of the latter is changed, the spacing between the rolls and the cutter always remains fixed at the optimum value b thereby utilizing with maximum effectiveness the lateral support provided by the rolls regardless of the position of the cutter and regardless of the width of the bags being formed.

Quick and simple adjustment of the position of the platform 40, the cutter 27 and the feed rolls 30 and 31 is facilitated by an actuator in the form of a lead screw 76 (FIGS. 2 and 7) which is threaded into a nut 77 fastened to the forward side wall of the case 56. The screw extends through and is mounted rotatably in the front end wall of the cabinet and is adapted to be turned by a hand crank 79 (FIG. 9) on one end of the screw. Rotation of the crank causes the nut to translate along the screw thereby sliding the platform 40 endwise on the cabinet 43. A pointer 80 (FIG. 2) preferably is carried on the platform near the forward side edge thereof and runs along a scale on the top of the cabinet 43 to indicate the position of the cutter 27 along the path.

Intermittent and unidirectional rotative drive for the feed rolls 30 and 31 is produced by a power module housed within the cabinet 43 and including an electric motor 81 (FIG. 6) connected by an endless belt 83 to a gear box 84 having an output shaft 85 which mounts a variable-throw crank 86. The latter is coupled by a pitman 88 to a second crank 89 which is fast on a rotatable motion-transmitting connection 90. Advantageously, the latter is formed by two relatively adjustable parts, namely, an internally splined sleeve 91 (FIGS. 6 and 7) and an externally splined shaft 93 slidably telescoped into the sleeve. The splined sleeve 91 is journaled in the front end wall of the cabinet 43 and mounts the crank 89. The splined shaft 93 is rotatably driven by but axially adjustable relative to the sleeve 91 and is coupled to a shaft 93a by means of an electro-magnetic clutch 94, the shaft 93a being connected to the gearing in the case 56 to drive the feed rolls 30 and 31. Both the clutch 94 and the shafts 93 and 93a are supported

from the underside of the platform 40 and are adjustable with the platform. The sliding fit between the splined sleeve 91 and the splined shaft 93 enables quick and easy adjustment of the feed rolls along the path with the platform 40 while still maintaining a driving connection from the motor 81 and the sleeve to the shaft and the feed rolls.

With the foregoing arrangement, the pitman 88 reciprocates up and down through one cycle in response to rotation of the output shaft 85 and the crank 86 through one revolution and acts through the crank 89 to oscillate the sleeve 91 and the shaft 93 back and forth about their axes. On the downstroke of the pitman, the direction of rotation of the shaft 93 corresponds to that necessary to rotate the feed rolls 30 and 31 in a direction advancing the web 13 and, during the downstroke, the clutch 94 is energized to transmit the movement of the shaft 93 to feed the rolls to rotate the latter. Before the output shaft 85 completes one half revolution to start the pitman 88 through its upstroke, the clutch is de-energized to prevent the shaft 93 from driving the feed rolls reversely.

In setting up the machine, the throw of the crank 86 is adjusted to cause rotation of the feed rolls 30 and 31 through arcs somewhat greater than are necessary to advance the web 13 through steps equal in length to the width of the bags to be run. As the pitman 88 starts through its downstroke, the clutch 94 is energized to cause rotation of the feed rolls and advancement of the web. Each time the web moves through a step of desired length, a photo-electric scanner 95 (FIG. 6) supported alongside the path on the top plate 64 detects one of a series of targets 96 (FIG. 9) pre-printed on the web and spaced from each other in accordance with the width of the bags. In response to such detection, the scanner produces an electric signal to energize an electro-magnetic brake 97 (FIGS. 6 and 7) which acts on the shaft 93a to arrest further rotation of the feed rolls and to stop movement of the web precisely upon completion of a step of desired length. The clutch slips for a short time while the brake is energized and then both the clutch and the brake are de-energized simultaneously before the pitman 88 starts on its upstroke to turn the shaft 94 in the opposite direction. As the web dwells, a one-way clutch 99 (FIG. 6) connected to the feed rolls positively prevents any reverse rotation of the rolls tending to result from the force exerted by the tensioned web.

In addition to rotating the feed rolls 30 and 31, the electric motor 81 drives a rotatable cycle shaft 100 (FIG. 6) which is operable both to advance the conveyor 33 and to actuate many operating mechanisms in the bag-filling section 14. As shown in FIG. 6, the cycle shaft is coupled to a second output shaft 101 of the gear box 84 and is driven in timed relation with the output shaft 85 thus synchronizing the cycle shaft with the advance of the web. Rotatable with the cycle shaft 100 and housed within the cabinet 43 are two cams 103 which sequentially open and close limit switches 104 at timed intervals as the cycle shaft rotates. One of the switches controls the energization and de-energization of the clutch 94 while the other switch controls the flow of air to the pneumatic rams 23 for the side sealing bars 20. Through a chain 105, the cycle shaft synchronously rotates a sequence shaft 106 (FIGS. 1 and 6) that carries a large number of cams 107 which operate switches (not shown) for controlling the cutter actuator 57 and various operating mechanisms in the bag-filling section 14.

From the foregoing, it will be apparent that the feed rolls 30 and 31 support the web 13 with equal effectiveness irrespective of the position of the cutter 27 and the width of the bags 11. The drive module including the motor 81 is compactly housed within the same cabinet 43 upon which the supporting platform 40 is adjustable, and is advantageously located beneath the feed rolls near the downstream end of the bag-making section 10 so that

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APPARATUS FOR JOINING TOGETHER CLOSURE MEMBERS

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12 Claims

ABSTRACT OF THE DISCLOSURE

The present invention relates to apparatus for joining together male and female locking members of the kind extending longitudinally on the interior surface of flexible tube. The apparatus described herein combines high speed efficiency in joining the locking members together with other beneficial features as, for example, slitting means to part the tube longitudinally as the members are being joined. Further beneficial aspects of the present invention include means to guide particular portions of the tube to the slitting means such that a cut offset from the locking members can be obtained or alternately, an off center blade arrangement wherein the same purpose is realized in a somewhat different manner.

DESCRIPTION OF THE INVENTION

Locking members of the type illustrated in U.S. Patent No. 3,291,177 are frequently employed for usage as closures on cooking bags, storage bags, industrial bags and the like. These locking members are usually in the form of male and female beads which mate together to form the desired closure arrangement. Usually the beads are extruded directly with tubular material and extend continuously on the inner surface of the tube. Prior to forming bags from these tubes, it is usually necessary to join together the locking members such that the members are mated during sealing operations.

In the past, the joining step has been accomplished by using a floating core which is supported inside the tube and which usually includes a pair of grooves to align the two locking members one over the other. External pressure is then applied to force the two locking members together.

While this type joining operation is usually satisfactory in low speed fabricating processes, difficulties are encountered on high speed runs. Particularly, the core is often carried by the rapidly moving tube into contact with the external means applying pressure such that the tube becomes pinched between the core and pressure means. This frequently results in bruising and damage to the tubular material such that it is unsatisfactory for the formation of bags and consequently must be scrapped.

Accordingly, it is an object of the present invention to provide an improved joiner for fitting together male and female locking members of the type wherein the locking members extend longitudinally on the interior surface of a flexible tube and wherein the joiner can efficiently fit these members together in high speed fabricating processes, as, for example, at speeds of 150 feet per minute.

It is a further object of the present invention to provide such a joiner wherein there is additionally incorporated a slitting means such that after passage of the film through the joining apparatus, the slit tube need only be intermittently sealed in the transverse direction to form a plurality of connected bag elements.

Another object of the present invention is to provide such a joiner wherein an offset parting or cutting of the

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tubular material can be efficiently obtained such that the distance from the two parted edges of the tube to the locking members is unequal to provide for an easy grasp opening.

Still a further object of the present invention is to provide a joiner of the above-mentioned attributes wherein there is additionally provided means to readily adapt the joiner to tubes of different diameters and with different lateral spacing between the locking members.

Briefly then, the present invention contemplates an improved joiner for fitting together bead-like locking members of the kind extending continuously on the inner surface of a flexible tube. In a specific embodiment the joiner includes a relatively flat rectangular shaped mandrel about which the tube is fed, which mandrel is rigidly fixed in position by a mounting arm extending outwardly from one side thereof. Grooves are located on the opposite flat surfaces of the mandrel which engage the two locking members and precisely line them up one over the other. Nip rollers then apply external pressure to fit the two locking members together. Simultaneously the tube is longitudinally parted by a blade fixed to the same side of the mandrel as the mounting arm and located upwardly therefrom. A cut offset from the two locking members can be obtained by employing an off-center blade, that is, a blade that is not centered on the side of the mandrel. Most beneficially, however, an offset cut is obtained by employing a guide means located in the vicinity of the cutting edge of the blade and directing the tube to the blade in such a manner that an offset cut results. With the tube cut and the locking members joined as described above, a bag construction can be completed by intermittently sealing of the tube in the transverse direction. The final product is a bag closed along its two sides by seams, across its bottom by a fold, and having across the fourth edge thereof a reclosable feature comprising the two locking members joined together. Lips extend from the two locking members with one of the lips offset above the other due the type cutting provided.

Yet additional objects and advantages of the present invention will be even more apparent from the ensuing description taken with the accompanying drawing in which wheresoever possible, like characters of reference designate corresponding material and parts through the several views thereof, in which:

FIGURE 1 is a top view of a joiner constructed according to the principles of the present invention and further shows a section of continuous tubing being operated on by the joiner;

FIGURE 2 is a side view of the joiner of FIGURE 1;

FIGURE 3 is a cross-sectional view of the joiner of FIGURE 1 taken along reference line 3—3 thereon;

FIGURE 4 is a cross-sectional view of the flexible tube of FIGURE 1 taken along reference line 4—4 thereon;

FIGURE 5 is a view like FIGURE 4 only showing the flexible tube subsequent to operations performed on it by the joiner; and

FIGURE 6 is an enlarged fragmentary side view of the joiner of FIGURE 1 only showing modifications thereof.

Referring more particularly to FIGURE 1, there is shown a joiner 10 adapted to efficiently fit together male and female locking members located on the interior surface of a flexible tube as, for example, the tube 12 illustrated in FIGURE 4.

Prior to tube 12 being received by joiner 10, the locking members 14 and 16 are first roughly aligned to the positions illustrated in FIGURE 4, and the tube 12 collapsed to form two outside edge portions 18 and 20. Tube 12 is then received by joiner 10 which locks together members 14 and 16 and simultaneously slits the tube 12 along edge portion 18. As tube 12 emerges from joiner

10, its appearance is like that shown in FIGURE 5 with the slit edge portion 18 now forming two parted edges or lips 22 and 24 which, in the finished bag, can be separately grasped to unlock members 14 and 16, thereby, opening the bag.

Referring specifically to FIGURES 1 to 3, joiner 10 includes a relatively flat, rectangularly shaped mandrel 26 about which the tube 12 is fed. Mandrel 26 defines two flat major surfaces 28 and 30 located opposite each other and hereinafter referred to as the first major surface 28 and the second major surface 30. The first and second major surfaces 28 and 30 are peripherally bounded by first and second end portions 32 and 34 and first and second side portions 36 and 38. As is readily observed, the first and second end portions 32 and 34 transverse the direction of travel of tube 12 which direction is indicated by arrow 47.

First and second grooves or aligning means 40 and 42 extend from the first end portion 32 to the second end portion 34 parallel to the direction of travel of the tube 12. The first groove 40 is located on the first major surface 28. The second groove 42 is located on the second major surface 30 directly opposite the first groove 40. Grooves 40 and 42 receive the locking members 14 and 16 to precisely align them one over the other such that when the locking members 14 and 16 are later pressured together, the female member 14 will securely lock into the male member 16.

Joiner 10 further comprises a support or mounting arm 44 joined to the first side portion 36 of mandrel 26 and together with mandrel 26 forming a generally L-shaped configuration. Mounting arm 44 can be attached to a suitable support (not shown) to rigidly fix the position of mandrel 26 within the tube 12.

A slitting means or blade 46 is secured at one of its ends 41 to the first side portion 36 of mandrel 26 and at its other end 43 to the mounting arm 44. Specifically, the cutting edge 48 of blade 46 faces the oncoming tube 12 to slit the edge portion 18 thereof such that the two parted edges 22 and 24 of the tube 12 pass over and under mounting arm 44.

An elongated guide means or member such as a length of wire 50 is pivotally mounted in the first side portion 36 of mandrel 26 at a location intermediate of the first end portion 32 and the blade 46. Wire 50 passes over the cutting edge 48 of blade 46 with the free end 52 of the wire 50 resting on the surface 54 of the blade.

A pair of nip rollers 56 and 58 are located adjacent the first end portion 32 of mandrel 26 and extend parallel therewith such that the vertical plane through the two axis 60 and 62 of rollers 56 and 58 is substantially at right angles with the vertical plane through grooves 40 and 42. Rollers 56 and 58 assisted by the drive means pulling tube 12 through joiner 10 as for example, a windup roll or reel (not shown), pulls the locking members 14 and 16 of tube 12 into tight engagement with grooves 40 and 42, as is best illustrated in FIGURE 2. Tight engagement between the grooves 40 and 42 and the locking members 14 and 16 is desired to minimize the possibility of the locking members jumping from the grooves and disrupting the fabrication process. The degree of pull exerted by rollers 56 and 58 is largely determined by the closeness of their spacing to the first end portion 32 of mandrel 26. Thus, if jumping of the locking members from the grooves is experienced, correction can often be had by placing the rollers 56 and 58 still closer to mandrel 26.

As tube 12 passes from between rollers 56 and 58 to mandrel 26, the edge portion 18 of the tube engages the wire 50 located adjacent the cutting edge 48 of blade 46. The wire 50 serves to lift the edge portion 18 of tube 12 such that as it reaches the cutting edge 48 an offset cut will be obtained. Thus as illustrated in FIGURE 3, the lateral distance X, representing the distance from the cutting edge 48 to locking member 14, is greater than the distance X', representing the distance from the cut-

ting edge to the locking member 16. Accordingly, lip 22 extending from the locking member 14 in the slit tube 12 illustrated in FIGURE 5 is offset beyond the lip 24 extending from locking member 16.

Wire 50 performs a further beneficial function by holding the edge portion 18 taut as it approaches the cutting edge 48 of the blade 46. Without the wire 50 a certain amount of flapping of edge portion 18 has been experienced such that an uneven and irregular line of cutting results. Beneficially, the wire 50 can be readily bent outwardly or inwardly to adjust for edge portions 18 of greater lateral dimension. Furthermore, it has been found that, if desired, one can bend the wire 50 to obtain various different cutting actions as, for example, a serrated or undulating cut. The serrations, that is, the valleys and hills of the serrations, can be made uniform by this method such that a pleasant appearance results. These serrations as incorporated in offset lips 22 and 24 further facilitated separate grasping of the same for convenience in unlocking members 14 and 16.

Located adjacent the second end 34 of mandrel 26 are a pair of nip rollers 64 and 66 aligned parallel to rollers 56 and 58 located at the first end 32. Rollers 64 and 66 similarly function to pull the locking members 14 and 16 tightly into grooves 40 and 42. Rollers 64 and 66 further function to apply external pressure to the locking members 14 and 16 as they emerge from grooves 40 and 42, thereby forcing them to lock together with each other.

FIGURE 6 illustrates a modified view of the invention wherein a blade 46a is located off-center such that it does not project from the center line of the first side portion 36a of mandrel 26a. Accordingly, the edge portion 18 of tube 12 will not be symmetrically parted as it passes by the cutting edge 48a of modified blade 46a, thereby achieving the desired offset cutting action in a somewhat different manner.

Joiners constructed according to the principles of this invention can be formed from metals such as aluminum, magnesium, steel, nickel, bronze, copper and the like. Particularly it is desired to form wire 46 of a ductile metal such that it can be readily bent to the shape desired. Blade 40 is preferably of a hard steel capable of retaining a sharp cutting edge through many hours of operation. Idler rollers 56 and 58 and 64 and 66 can be covered by hard rubber if desired. Presently, however, smooth steel rollers 56 and 58 and 64 and 66 are being utilized. Portions of the joiner can be coated with substances such as Teflon® (polytetrafluoroethylene) or like materials having exceedingly smooth surface qualities. Such a coating, for example, may be desired at the leading edge 72 of the first end portion 32 of mandrel 26.

While certain representative embodiments and details have been shown for the purpose of illustrating the invention, it will be apparent to those skilled in the art that various changes and modifications can be made therein without departing from the spirit and scope of the invention.

Accordingly, what is claimed as new is:

1. A joiner for continuously fitting together bead-like locking members extending longitudinally on the inner surface of a continuous flexible tube, said joiner comprising:

a mandrel about which said continuous tube is fed, said mandrel comprising first and second major surfaces located opposite each other and bounded by first and second end portions and first and second side portions, said first and second end portions transversing the direction of travel of said continuous tube,

a mounting arm attached to said mandrel and extending outwardly therefrom, said mounting arm adapted for rigidly supporting said mandrel within said tube, means to longitudinally part said tube as the tube approaches said mounting arm such that the two parted

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edges of said tube respectively pass around the mounting arm,

means to align said locking members to receive each other as the tube passes about said mandrel.

2. The joiner of claim 1 wherein said aligning means comprises first and second grooves extending from said first end portion to said second end portion along a line parallel the direction of travel of said continuous tube, said first groove defined in said first major surface, said second groove defined in said second major surface, said first and second grooves engaging said locking members to precisely line up said members to receive each other.

3. The joiner of claim 1 wherein said parting means comprises a blade located adjacent to said first side portion of said mandrel with the cutting edge of said blade facing the direction of travel of said continuous tube and longitudinally parting the same.

4. The joiner of claim 3 wherein said mounting arm is attached to the first side portion of said mandrel downwardly of the cutting edge of said blade as concerns the direction of travel of said tube, said mounting arm adapted for bisecting the two parted edges of said tube.

5. The joiner of claim 1 wherein there is additionally provided means engaging said tube as it approaches said parting means such that the tube is held taut adjacent the cutting edge of the blade.

6. The joiner of claim 5 wherein said means guides a particular portion of the tube to the cutting edge of said blade such that an offset cut can be obtained wherein the distance from the two parted edges of the tube to said locking members is unequal.

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7. The joiner of claim 6 wherein said guide means comprises a member fixed to said joiner, said member lifting a portion of said tube adjacent the cutting edge of said blade such that an offset cut can be obtained thereat.

8. The joiner of claim 7 wherein said member comprises a length of wire fixed to said mandrel and superposed with a portion of said blade.

9. The joiner of claim 1 wherein there is additionally provided means to tightly engage said locking members and said grooves.

10. The joiner of claim 9 wherein said continuous tube travels from said first end portion to said second end portion and wherein said engaging means comprises two nip rollers located adjacent said first end portion.

11. The joiner of claim 1 wherein means are provided to fit together said locking members subsequent to said continuous tube passing from said mandrel.

12. The joiner of claim 11 wherein said fitting means comprises nip rollers located adjacent said second end of said mandrel and pressuring together said locking members.

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