

[54] **PLANT FOR THE SELECTIVE PRODUCTION OF EITHER TWO ONE-SEAM TUBES OR ONE TWO SEAM-TUBE**

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[58] Field of Search**29/471.1, 475, 482; 228/17, 228/18, 44, 4, 5, 6, 15**

[56] **References Cited**

UNITED STATES PATENTS

2,084,889 6/1937 Blevins228/17 X

2,329,938	9/1943	Ortiz.....	29/482 X
2,748,734	6/1956	Kennedy	228/17
3,361,320	1/1968	Bofrowski	228/17
3,362,056	1/1968	Preller et al.	29/471.1 X
3,434,198	3/1969	Bergantini	228/17 X
3,535,768	10/1970	Pruitt et al.....	29/471.1

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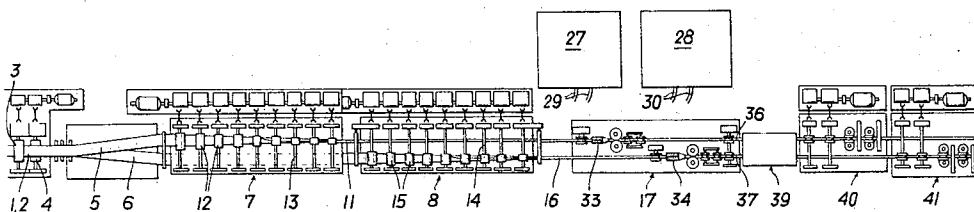
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[57] **ABSTRACT**

The disclosure relates to a plant for the selective production of either two one-seam tubes or one two-seam tube comprising two roll forming machines arranged one behind the other for the formation of two slotted tubes or component sections from strips, and a welding apparatus with two welding stations, wherein the improvement resides in that at least one roll forming machine is vertically displaceable relative to the other roll forming machine and at least the forming rolls of one roll forming machine are horizontally displaceable relative to the forming rolls of the other roll forming machine and the positions of the two welding stations are likewise changeable relative to each other. This plant is highly economical and versatile as regards tube shapes and dimensions.

2 Claims, 6 Drawing Figures



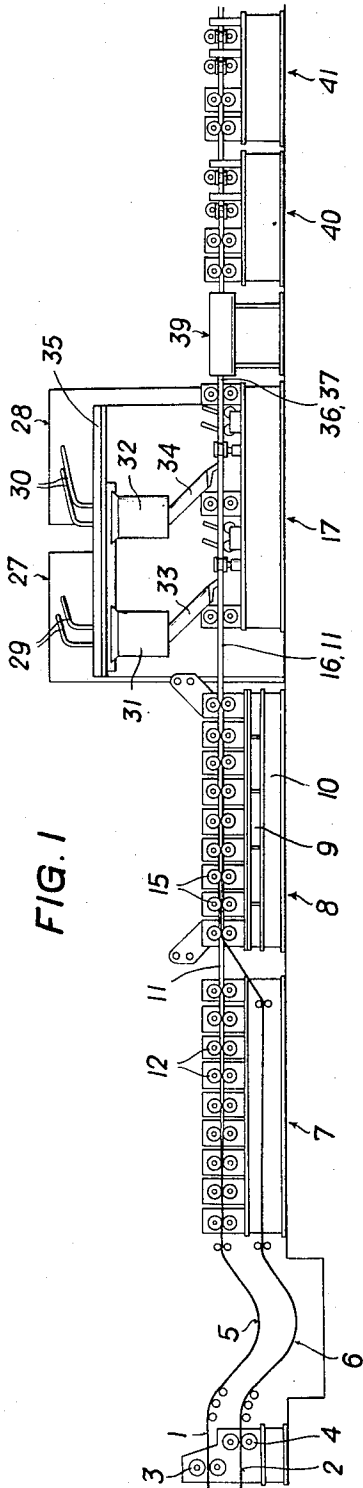


FIG. 1

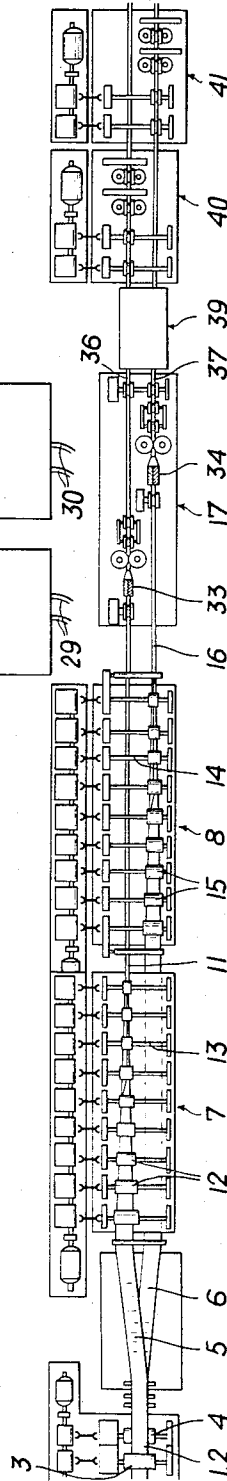


FIG. 2

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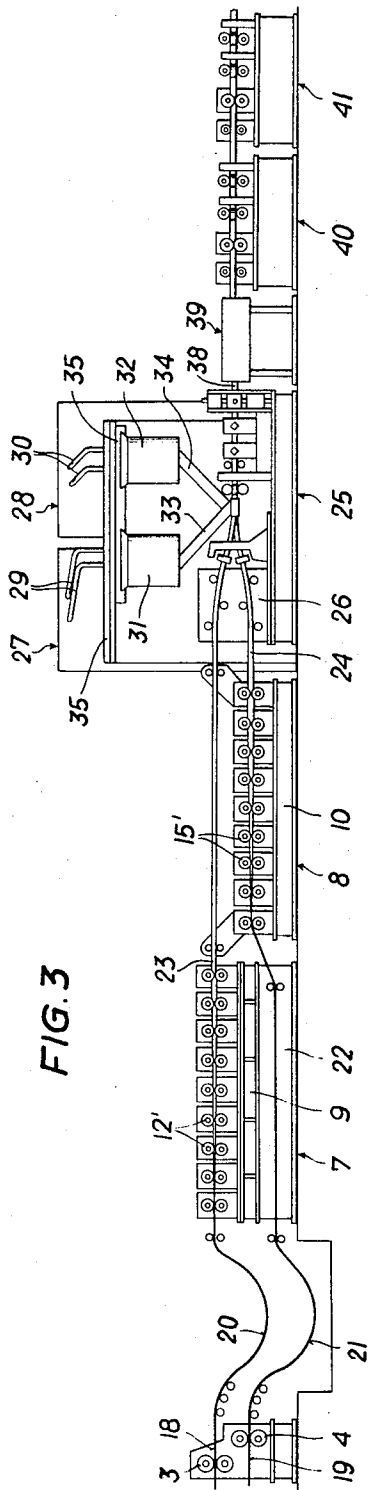


FIG. 3

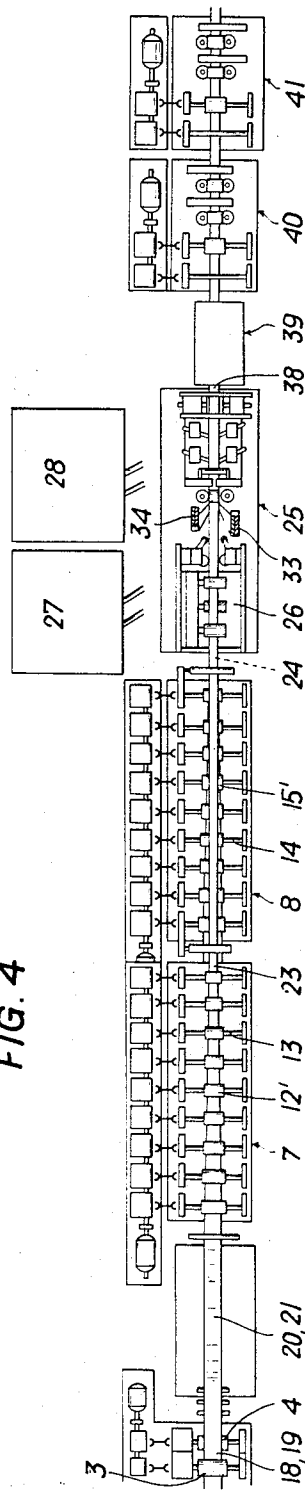


FIG. 4

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FIG. 5

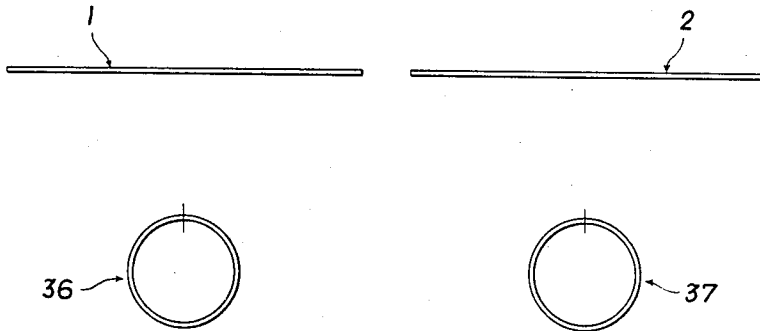
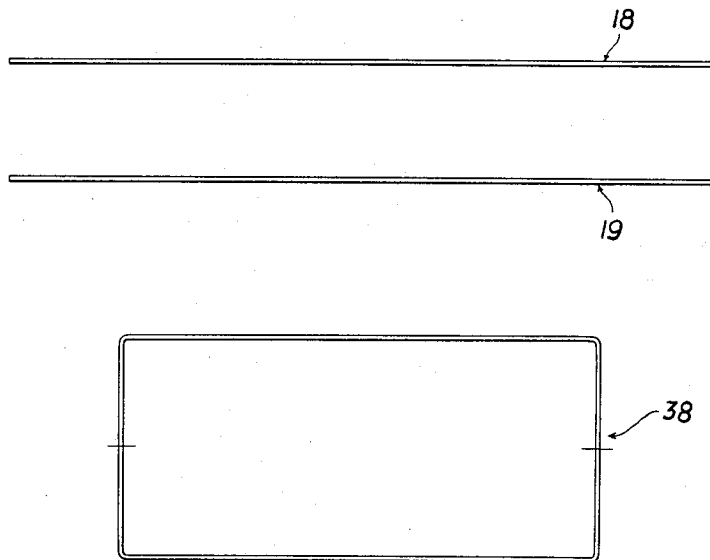


FIG. 6



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PLANT FOR THE SELECTIVE PRODUCTION OF EITHER TWO ONE-SEAM TUBES OR ONE TWO SEAM-TUBE

The invention relates to a plant for the selective production of either two one-seam tubes or one two-seam tube comprising two roll forming machines arranged one behind the other for the formation of two slotted tubes or component sections and a welding apparatus with two welding stations; and to a method for operating such plant.

Numerous plants and methods for the production of tubes from strips have become known. Thus it is possible to produce one-seam tubes by shaping a strip to become a slotted tube by means of pairs of forming rolls arranged one behind the other in rolling stands and welding it to become a one-seam tube, usually a round section tube, by applying a longitudinal seam. Tubes produced in this manner may be calibrated in further rolling stands and/or be re-shaped to become simple shaped tubes, e.g., tubes of a square cross section.

Also plants and methods are known in which shaped tubes, preferably tubes having a complicated cross section, such as fold flange tubes or shaped tubes with bent-in edges are produced from two strips. The two strips are shaped e.g., on rolling stands arranged one behind the other along the respective conveying line to become two component sections with equidistant legs, the leg ends are guided towards each other so that pairs are opposite each other and butt-welded under formation of two longitudinal seams.

However, it is impossible to produce complicated shaped tubes by means of the mentioned plants for the production of one-seam tubes, because a rotating interior tool, such as a punch roll does not have access to the interior of the tube in all shaping stages. Such plants for producing one-seam tubes which are dimensioned for a particular maximum strip width or a particular maximum tube circumference, respectively, cannot economically produce tubes with dimensions far smaller than the predetermined ones, e.g., with a circumference smaller than half of the maximally possible circumference, which fact represents a further disadvantage of the known one-seam tube plants.

The known plants for producing two-seam tubes are well suited for complicated shaped tubes, but the production of simple round tubes would be uneconomical.

The invention is aimed at creating a plant for economically producing both one-seam tubes and two-seam tubes by changing the production program by simple means for the one or the other purpose.

In a plant of the characteristics defined in the introduction the invention resides in that at least one roll forming machine is vertically displaceable relative to the other roll forming machine and at least the forming rolls of one roll forming machine are horizontally displaceable relative to the forming rolls of the other roll forming machine and the positions of the two welding stations are likewise changeable relative to each other.

Preferably the length of the shafts of the two roll forming machines is sufficient for receiving side by side a finished slotted tube or component section and a flat strip to be shaped.

The method for producing two one-seam tubes by means of a plant according to the invention resides in

that two strips are continuously fed to the two roll forming machines and shaped in steps to become slotted tubes with preferably upwardly oriented slits, the two roll forming machines being adjusted to the same height level, while the forming rolls of the roll forming machines are adjusted horizontally corresponding to the lateral distance of the feed lines of the two slotted tubes and the welding stations are adjusted corresponding to the distance of the slits of the two one-seam tubes.

The method for producing one two-seam tube by means of the plant according to the invention, in which two strips are one above the other and one after the other shaped to component sections in the two roll forming machines arranged with vertical distance to each other, resides in that the forming rolls of the two roll forming machines are adjusted in horizontal direction on the shafts to occupy a central position corresponding to the feed lines of the component sections.

If two one-seam tubes are to be produced on the plant the run-through or feed lines of the two roll forming machines remain on the same level as the level of the whole runout section, particularly the two calibrating devices. Both the two slotted tubes and the welding tubes run parallel to each other through the plant. The two run-through lines lie in a common horizontal plane.

If one two-seam tube is produced on the plant, one of the two roll forming machines is adjusted to be higher, while the second may be lowered, and the forming rolls of at least one roll forming machine are horizontally shifted on their shafts into such a position that the two run-through lines are likewise parallel to each other but on a common vertical plane. In that case, the component sections leave the roll forming machines one above the other in the direction of the welding station where they are guided together so that their leg ends are opposite to each other whereupon these leg ends are butt-welded.

When two one-seam tubes are welded and when a two-seam tube is welded the two welding stations have to hold a different position relative to each other. The term "welding station" is understood to cover those parts of the welding machine with which the welding seam is applied. It is also possible to provide for two separate, exchangeable welding means; then, the position of the welding stations in one means will correspond to the one-seam program and the position of the welding stations in the other means will correspond to the two-seam program. Welding may be carried out according to any continuously operable butt-welding process. High frequency welding is preferred. When two tubes of simple cross section, e.g., round tubes, are welded together, the welding current may be transmitted inductively and conductively. When complicated shaped tubes are to be made using the two-seam method, conductive high frequency welding is preferred. Means are provided for turning on the welding current for each of the two welding seams both separately and jointly. Preferably two separate welding current sources, e.g., high frequency generators, are used for this purpose.

The plant according to the invention may also serve for producing a single one-seam tube in a manner known per se. In this case the run-through line may lie in the middle of both roll forming machines so that the production of larger tubes becomes possible.

In order that the invention may be more fully understood it shall now be explained with reference to the accompanying drawings. FIG. 1 is an elevation and FIG. 2 is a plan view of the plant according to the invention, illustrating the method when two one-seam tubes are produced simultaneously. FIG. 3 and FIG. 4 similarly show elevational view and plan view of the plant according to the invention when the method for producing a two-seam tube is carried out. The strips used as starting material and the finished product of the method according to FIGS. 1 and 2 are shown in FIG. 5, and the strips used as starting material and the finished product according to FIGS. 3 and 4 are shown in FIG. 6. In FIGS. 1 to 4 the material is fed from the left hand side to the right hand side. The plant is continuously supplied with two strips both when two one-seam tubes are simultaneously produced and when one two-seam tube is produced. For feeding the plant known devices may be used, e.g., a strip preparation plant with strip storing means. These plants do not form part of the invention and are therefore not illustrated in the drawing.

When two one-seam tubes (FIGS. 1 and 2) are simultaneously produced, strips 1 and 2 are conveyed to pairs of feed rollers 3 and 4 which are driven separately, the strips being paid on from a strip depositing means, not shown in the drawing. The pairs of feed rollers 3 and 4 feed the strips 1 and 2 under formation of loops 5 and 6 to the roll forming machines 7 and 8. The loops 5 and 6 make it possible to arrange the strips 1 and 2 side by side. The two roll forming machines 7, 8 are arranged on the same height level, the roll forming machine 8 being connected with the sole plate 10 via the removable floating plate 9. The strip 1 is formed to become a slotted tube 11 in the roll forming machine 7, the forming rolls 12 being fixed on the left hand side, when regarded in the run-through direction, on the shafts 13 being of adequate length. The strip 2 is guided through the bed of the roll forming machine 7 without being shaped and on to the roll forming machine 8 where it is formed to become a slotted tube 16 by means of forming rolls 15 which are arranged on the right hand side of the shafts 14, as viewed in run-through direction. The two slotted tubes 11 and 16 are on the same height level, i.e., their run-through lines lie in a common horizontal plane and are thus guided to the welding means 17. There the slit edges are butt-welded under formation of a longitudinal seam.

For the production of a two-seam tube (FIGS. 3 and 4), the strips 18 and 19 are guided to the pairs of feed rollers 3 and 4, the strips being paid on from a strip depositing means not shown in the drawing. The pairs of feed rollers 3 and 4 feed the strips 18 and 19 to the roll forming machines 7 and 8 under formation of loops 20 and 21. The loops 20 and 21 make it possible to arrange the strips 18 and 19 one above the other. The roll forming machine 7 is connected with the sole plate 22 via the removable floating plate 9 and is thus on a higher level than the roll forming machine 8. The floating plate 9, which serves as a support for the roll forming machine 8 when two one-seam tubes are simultaneously produced therefore has to be transferred from underneath the roll forming machine 8 to below the roll forming machine 7 when the plant is shifted from the one-seam program to the two-seam program. The vertical displacement of the roll forming machines 7 and 8

and of the floating plate 9 as well as the horizontal shift of the latter may be carried out by lifting and transporting means, such as hall cranes, lifting trucks and the like, not shown in the drawing. The roll forming machines 7, 8 are fixed in position relative to their sole plates 22, 10 and relative to the floating plate 9, and the sole plates 22, 10 are fixed in position relative to the floating plate by releasable means known per se such as releasable wedges or pins.

In the roll forming machine 7 the strip 18 is shaped to become the component section 23, while the strip 19 is conveyed through the bed of the roll forming machine 7 without being shaped to the roll forming machine 8 where it is formed to become component section 24. The shaping rolls 12', 15' are fixed on the shafts 13, 14 of the roll forming machines 7, 8 in a manner that the run-through lines of the strips 18, 19, and of the component sections 23, 24, respectively, are in a common vertical plane. The component sections 23, 24, running in parallel one above the other and having legs arranged at equal distances, are conveyed towards the welding means 25. The welding plant 25 comprises a means 26 for bringing together the component sections 23, 24. The component sections are juxtaposed with their leg ends and butt-welded under formation of two longitudinal seams.

No matter whether two one-seam tubes or one two-seam tube is produced it is advantageous to be able to control the welding performances for the two seams independently of each other. For this purpose two generators 27 and 28 for welding current are provided. These supply high frequency current via conduits 29 and 30 to the two welding transformers 31 and 32 which convey the current via the current rails 33 and 34 to the welding stations. When two one-seam tubes are welded, the welding stations are advantageously staggered in the run-through direction. Thus it has to be possible to displace the welding transformers 31, 32 in longitudinal and transverse directions; for this purpose they are suspended on a console 35 through cross supports. The finished welded tubes 36, 37, 38 are cooled in a cooling section 39 to room temperature. Finally the tubes get their finished shape and finished size in calibrating machines 40 and 41 which are driven separately.

When two one-seam tubes are produced, the tube 36 which, regarded in run-through direction, is conveyed on the left hand side, is finished in the calibrating machine 40 and the tube 37 running on the right hand side is finished in the calibrating machine 41. The two tube strings are thus independent of each other.

When a two-seam tube 38 is made it may be finished either in both or only in one calibrating machine. In the calibrating machines 40 and 41 it is possible to produce not only the desired tube size, but also fold flanges with the most narrow tolerances.

The necessary devices arranged in succession to the calibrating machines for shearing the tubes to length (e.g., flying punches, co-running saws) run-out roller tables, thrust-out machines etc. are not part of the invention and therefore are not illustrated.

The plant according to the invention affords a highly varying production program both with regard to the shape of the tubes and with regard to their dimensions.

Advantageously, the simultaneous production of two one-seam tubes is limited to simple cross section shapes. It is possible to manufacture e.g., round tubes, flat oval, square, rectangular or hexagonal tubes. When two one-seam tubes 36 and 37 are produced simultaneously, the maximum circumference of the individual tubes is limited to about half of the useful length of the shafts carrying the forming rolls as shown schematically in FIG. 5, this means that the width of the individual strips 1 and 2 corresponds to about half of the length of these shafts which is useful for fixing the forming rolls. When the plant according to the invention is used for the simultaneous production of two one-seam tubes the double production volume is achieved per time unit as compared to conventional plants.

When the plant according to the invention is used for manufacturing only one one-seam tube in a manner known per se, its maximum tube circumference may be equal to the whole useful length of the shafts carrying the forming rolls. Thus the production of one-seam tubes becomes possible with a diameter twice as large as the diameter of two one-seam tubes simultaneously produced on the same plant.

When the plant according to the invention is used for producing one two-seam tube, simple round tubes and angular tubes and tubes with complicated cross sections, e.g., fold flange tubes with eight fold flanges may be produced. With regard to the tube shape that may be produced, this method is most versatile. It permits

moreover the production of tubes with a maximum circumference which corresponds to the double useful length of the shafts bearing the forming rolls; e.g., FIG. 6 shows schematically a two-seam rectangular tube 38 whose circumference corresponds to the sum of the maximum widths of the strips 18 and 19 that may be processed.

What we claim is:

1. A plant for selectively producing two one-seam tubes and one two-seam tube from strips, comprising two roll forming machines arranged one after the other in the direction of travel of the strips, at least one roll forming machine vertically displaceable relative to the other roll forming machine, a plurality of forming rolls positioned in each of the roll forming machines, at least the plurality of forming rolls of one roll forming machine horizontally displaceable relative to the forming rolls of the other roll forming machine, and a welding apparatus with two welding stations, the two welding stations displaceable relative to each other, whereby the roll forming machines, forming rolls and welding apparatus are adaptable to produce two one-seam tubes or one two-seam tube.

2. A plant as set forth in claim 1, wherein the forming rolls of each roll forming machine are mounted on shafts, each of the shafts having a length sufficient for receiving side-by-side a flat strip to be shaped and a slotted tube or a component section.

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