Jan. 18, 1966 E. JENSEN 3,229,487

MACHINES FOR THE PRODUCTION OF TUBING

Filed Jan. 25, 1963 3 Sheets-Sheet 1

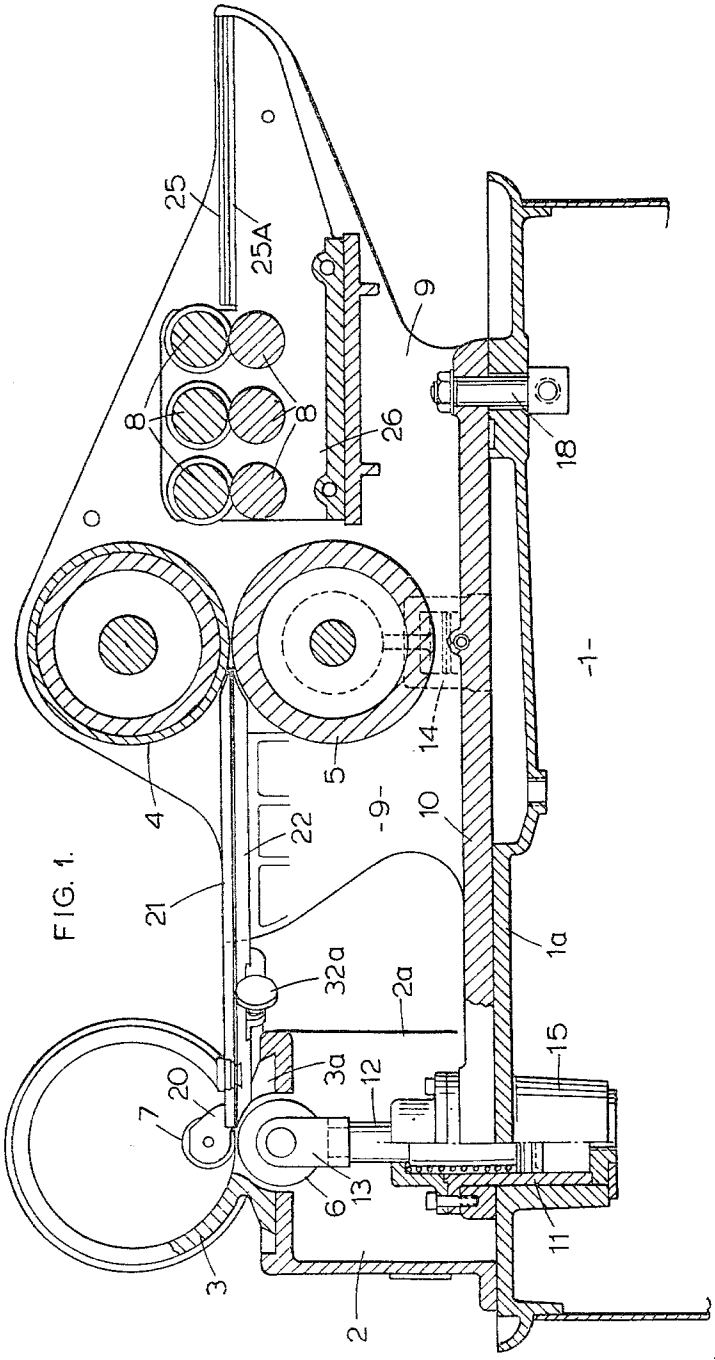

FIG. 1.

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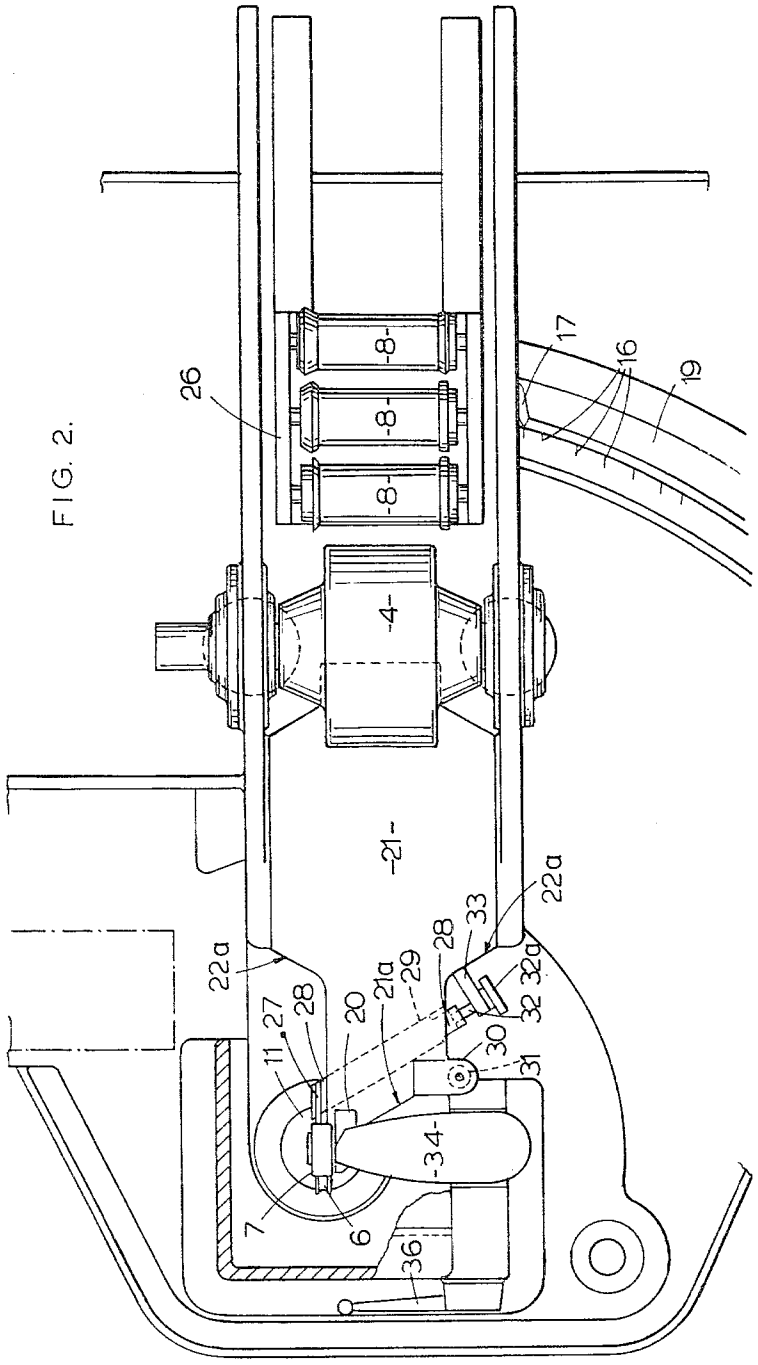
FIG. 2.



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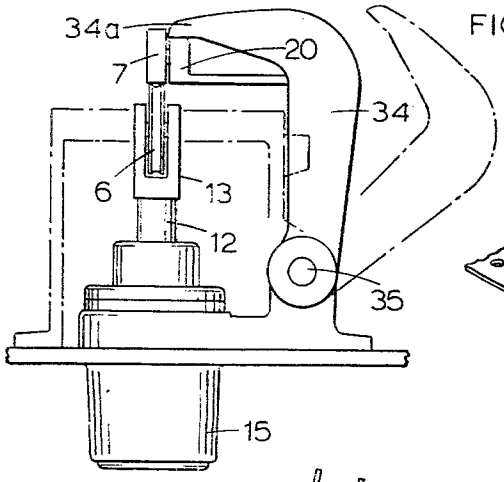

FIG. 3.

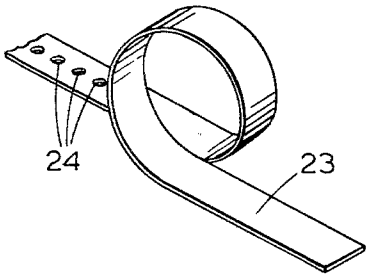

FIG. 4.

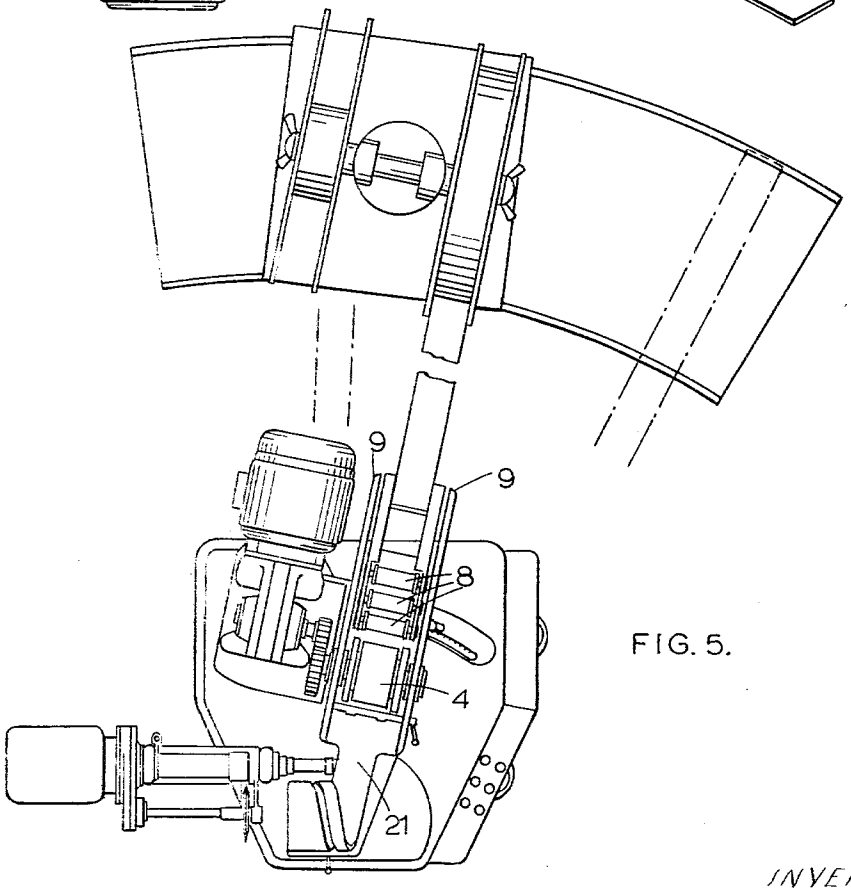

FIG. 5.

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3,229,487

MACHINES FOR THE PRODUCTION OF TUBING

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Claims priority, application Great Britain, Jan. 26, 1962, 3,130/62
10 Claims. (Cl. 72—50)

This invention relates to machines for producing from continuous strip material, helical seam tubes and in which the strip material is push-fed from between feeding rollers through a head having a surface along which the material travels and which defines the curvature radius of the path of travel of the strip material. Normally the strip material is strip metal, e.g. sheet aluminum or steel having a thickness which will ensure it adapting itself to being coiled into helical form and also, where a helical lock seam is required, have imparted to it prior to negotiating the head, marginal interengaging parts which, during the passage of the strip metal into the head, will be pinched together by pinching rollers. Hereinafter, the strip material will be referred to as strip metal. An example of such a machine is described in British Patents Nos. 830,504 and 830,505 as well as in copending British patent application No. 20,985/59.

The present invention has for its object to provide a simplified or improved form of machine of the first mentioned type.

According to the present invention, a machine for producing helical lock seam tubing from continuous strip metal comprises a machine frame; a head having a surface defining the curvature radius and helix pitch of the path of travel of the strip metal; an inner and an outer pinching roller between which preformed interengageable marginal parts of the strip metal are pinched into a helical lock seam when the strip material has negotiated a single turn of a helix in the head; a piston and cylinder device which constitutes a hydraulically loaded support for said outer roller; a pair of feed rollers adapted to feed the strip metal through said head and pinching rollers; a set of forming rollers between which the strip metal is drawn from a supply source by said feed rollers, said forming rollers deforming the marginal parts of the strip material into complementary interengageable lock seam forming parts; a carriage carrying feed rollers into said head, one of said pinching rollers being carried by one of said guide plates; a carriage carrying said push-feed rollers and forming rollers and adjustable angularly about said support for the outer pinching roller; means to secure said carriage in selected position of its adjustment.

In order that the invention may be clearly understood and readily carried into effect, drawings are appended hereto illustrating embodiments thereof, and wherein:

FIGURE 1 is a sectional side elevation view of the upper part of the machine, the base of which is shown broken away;

FIGURE 2 is a plan view of FIGURE 1;

FIGURE 3 is a detail end elevation view showing means for retaining in operative position, the upper pinching roller;

FIGURE 4 is a detail perspective view showing a modified form of the forming head; and

FIGURE 5 is a somewhat diagrammatic plan view of the machine.

Referring to the drawings, the base of the machine is indicated generally by the reference numeral **1** and may be regarded as a housing accommodating a switch gear and oil circulating pump for the machine respectively. Mounted on a top plate **1***a* of the frame **1** is a hollow

pedestal **2**, open on its inner side as at **2***a*, and on the top of which is supported a forming head **3** through which the continuous strip metal is push-fed by a pair of feed rollers **4** and **5** which are motor-driven.

The forming head **3** is of known construction, and in one embodiment of the present invention is a steel casting, having a flanged base **3***a*, by which it is readily detachably secured in the said pedestal **2**, and having a shape defining substantially a complete helix, the internal surface of which has a highly polished finish or is lined with gunmetal or other suitable metal and against which the strip metal slides to negotiate a helical path, an axial cross-section through any part of the polished or lined surface of the helix of the head being less than the width of the strip metal, so that marginal parts of the strip metal which are preformed into complementary parts adapted to mate together, e.g. a narrow flange at one edge and a channel along the other edge will overlap the edges of the guiding surface of the head. The arrangement is such that when the strip metal with its preformed marginal edges has negotiated a substantially complete helix, its marginal parts are brought into mating relationship immediately prior to being pushed between a pair of pinching rollers **6** and **7** which pinch the said mating marginal parts into a helical lock seam.

In rear of the feed rollers **4** and **5** is provided a set of pairs of rollers **8** with their ends shaped in a complementary manner to produce along the strip metal the marginal flange and a marginal channel to receive the flange, and between these preforming rollers **8** is drawn the continuous strip metal by the traction of the positively driven feed rollers **4** and **5**, the rollers **8** being idler rollers.

The push-feed rollers **4** and **5** are pressed one against the other to grip tightly upon the strip metal. The preformed marginal parts of the strip metal are wider apart than the axial dimension of the peripheries of the rollers **4** and **5**.

An important feature of the present invention is that the push-feed rollers **4** and **5** and the preforming rollers **8**, are housed in a common carriage **9** which has a flat base plate **10** resting upon the top plate **1***a*, of the machine frame **1**. The base plate **10** at one end is located within the pedestal **2**, and is bored to receive cylinder **11** of a hydraulic jack, piston rod **12** of which at its upper end carries a fork **13** in which rotates the lower or outer pinching roller **6** whose axis of rotation intersects the axis of the piston rod. The pinching roller **6** has opposed thereto the cooperating pinching roller **7** towards which the roller **6** is urged by hydraulic fluid pressure in the cylinder **11** which is connected by a conduit (not shown) to a pump inside the housing **1**. This pump also serves a small hydraulic jack **14**, carried by the base plate **10** of the carriage **9**, and adapted to load the lower push-feed roller **5** upwards against the roller **4**.

The top plate **1***a* of the frame **1**, is formed with a hollow boss **15** in which is journalled the jack cylinder **11**. By this means the carriage **9** is adjustable through the desired angle about the support for the lower pinching roller, i.e. about the axis of the piston rod **12**. Thus the angle of approach of the strip metal into the head **3** can be adjusted to suit any changes in the helix pitch angle of the work-guiding surface in the head. It is of course advisable in dependence on changes in the helix pitch of the lock seam which may be necessary, with some changes in diameter and/or thickness of the strip metal of the finished tubing, to change the angle of approach of the strip metal into the head so that the strip metal and the means guiding it into the head are in proper continuity with the curvilinear guide surface inside the head.

The top plate 1*a* of the machine frame is graduated as at 16 to indicate the pitch angle by registration with a pointer 17 on the carriage 9. The carriage 9 is locked in selected position by a clamping bolt 18 carried thereby, and passed through an arcuate slot 19 in the top plate 1*a*.

The periphery of the lower or outer pinching roller is grooved as shown in FIGURE 3, and it will be found that it will adjust itself about the axis of the piston rod 12 to track the helical seam truly circumferentially. In this connection the fork 13 may be rotatable freely on top of the piston rod.

The upper or inner pinching roller 7 is so supported that it will maintain a constant alignment with the direction of feed of the strip metal into the head. For this purpose the centre pin of roller 7 rotates in a forked bracket 20 fixed to the forward end of the upper one of two flat parallel guide plates 21 and 22, fixed in relation to the carriage 9, and between which the strip metal passes from between the push-feed rollers towards the forming head 3. The opposed surfaces of these two guide plates are supplied with lubricant from the aforesaid pump or other suitable source, the interior surface of the head likewise being lubricated to ensure a smooth travel of the strip metal.

The guide plates 21 and 22 have their ends which are close to and alongside the rollers 6 and 7, cut diagonally (as shown at 21*a* in FIGURE 2) to match with the like parallel edge at the start end of the head 3.

The head need not be a rigid casting as shown in FIGURE 1. As shown in FIGURE 4, the head may comprise a flexible steel band 23 bowed into a helix between its ends, one end being fixed to the top of the pedestal and the other to the lower guide plate 22 so as to extend in coplanar continuity with such plate. By varying the length of the part of the band to be formed into a helical loop, the diameter of the head may be varied. For example, one end of the band 23 may be secured to the pedestal 2, a sucession of holes 24 being engageable selectively over retaining pins carried by the pedestal. Alternatively, such pins may project slightly through the lower guide plate 22 depending upon which end it is more convenient to employ in adjusting the effective length of the band which forms the helical head.

Additional guide plates 25 and 25A may be provided at the rear end of the carriage 9 to align the strip metal with the preforming rollers 8 and to prevent bowing of the strip metal before it is about to enter between such rollers.

The set of preforming rolers 8, and if desired, the guide plates 25 and 25A, are carried by a removable housing 26 to enable these rollers to be substituted by others when a change in width in the strip metal is made. Likewise, the rollers 4 and 5 may be readily exchanged to enable different widths of peripheries of rollers to be used.

Desirably the said pair of guide plates 21 and 22 have provided alongside their lateral edges abutments against which the edges of the preformed marginal parts of the strip metal ride, one of these abutments being adjustable to ensure a proper location of the strip metal at one marginal part with the two pinching rollers.

The latter mentioned abutment comprises a short narrow longitudinal guide bar or finger 27, parallel with and slightly spaced from one edge of the guide plates. The front end of the finger 27 is close to the cylindrical periphery of the upper or inner pinching roller 7 so as to guide the flanged marginal part of the strip metal into register with the channeled marginal part of the strip metal where the two marginal parts mate one with the other. The guide bar or finger 27 is disposed diagonally across one end of a straight flat gauge bar 28, slideable in a channeled guide 29 extending across the lower guide plate 22 parallel with the diagonal front edges 21*a* of the two guide plates. The foremost corner of the upper plate 21 carries the bracket 20 for the inner pinching roller 7. The other corner of the plate 21 is provided

with a lateral lug 30 in which is journalled a peripherally grooved or inverted coned roller 31, over which is guided the marginal channel of the strip metal. The end of the gauge bar 28 remote from the finger 27 extends just in rear of this lug and receives a feed screw 32 having a knurled head 32*a* and carried by a bracket 33 on one of the guide plates where they widen out as at 22*a* bilaterally, into wider parts reaching to the exit nip of the said push-feed rollers 4 and 5.

To enable the upper or inner pinching roller 7 to be held firmly against the work and also to withstand the heavy load due to the fluid pressure applied to the lower or outer pinching roller 6, there is provided an inverted L-shaped clamping jaw 34 (see FIGURE 3). The jaw 34 is adapted by its upper limb to serve as a positive stop for the bracket 20 carrying the roller 7 and is displaceable about a pivot pin 35 at the lower end of its other limb away from said bracket, as shown in broken lines, to enable the leading end of the strip material to be guided between the pinching rollers 6 and 7 when starting a new run of strip metal. The free or nose end 34*a* of the jaw 34 is arranged to be forced very hard over the bracket 20. This may be effected by a lever 36 fixed in relation to the pivot end of the clamping jaw 34, or, alternatively, carried by a sleeve nut threaded on to the pivot pin 35 to lock the jaw in position, the jaw when freed being displaceable by hand.

I claim:

1. A machine for producing helical seam tubing from continuous strip metal comprising a machine frame; a head having a surface defining the curvature radius and helix pitch of the path of travel of the strip metal; an inner and an outer pinching roller between which preformed interengageable marginal parts of the strip metal are pinched into a helical lock seam when the strip metal has negotiated a single turn of a helix in the head; a piston and cylinder device which constitutes a hydraulically loaded support for said outer roller; feed rollers adapted to feed the strip metal through said head and pinching rollers; forming rollers between which the strip metal is drawn from a supply source by said feed rollers, said forming rollers deforming the marginal parts of the strip metal into complementary interengageable lock-seam forming parts; a carriage carrying said feed rollers and forming rollers, said carriage being adjustable angularly about said support for said outer pinching roller; and means to secure said carriage in the selected position of its adjustment.

2. A machine according to claim 1, wherein said support comprises a rod of said piston and said carriage is connected to said cylinder.

3. A machine according to claim 2, wherein said cylinder is fixed in the carriage and rotates in a housing carried by the machine frame.

4. A machine according to claim 1, wherein said inner pinching roller is carried by a bracket fixed relative to one of a pair of flat guide plates carried by said carriage and between which the strip metal is guided tangentially into the head.

5. A machine according to claim 4, including a rigid abutment member movable under pressure against said bracket to hold said inner pinching roller hard against the seam formation of the work.

6. A machine according to claim 5, wherein said abutment member is an angled bar having one limb mounted on a fixed pivot and the free end of its other limb adapted to be forced over and against said bracket.

7. A machine according to claim 4, wherein adjacent to one side edge of said guide plate is located a guide roller adapted to ride against a marginal part of the strip metal at a position close to the work-receiving end of the helical head.

8. A machine according to claim 4, wherein adjacent to one edge of the guide plates is provided a laterally adjustable guide bar adapted to engage and guide a marginal edge of the strip metal between the pinching rollers.

9. A machine according to claim 1, wherein said head is a flexible sheet metal band between its ends curled into a single helix and adjustable in effective length to change the diameter of the helical pitch circle of the curled path thereof.

10. A machine according to claim 9, wherein said band is secured at one end to one of said guide plates and at its other end to a part of the machine adjacent said pinching rollers, one end of the band being adjustable endwise relative to means anchoring it in position.

References Cited by the Examiner

UNITED STATES PATENTS

2,339,219	1/1944	Crowley	113—35
2,862,469	12/1958	Jensen	113—35
3,081,813	3/1963	Anderson et al.	113—35

FOREIGN PATENTS

794,299	4/1958	Great Britain.

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