Sept. 6, 1932. L. CAMMEN 1,875,560

PIPE MAKING MACHINERY

Filed Nov. 17, 1930 2 Sheets-Sheet 1

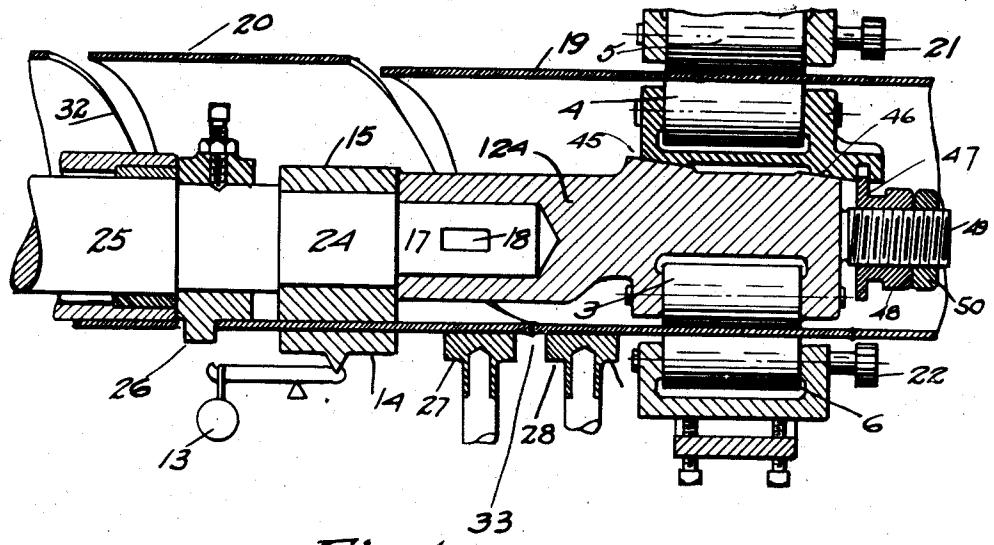


Fig. 1

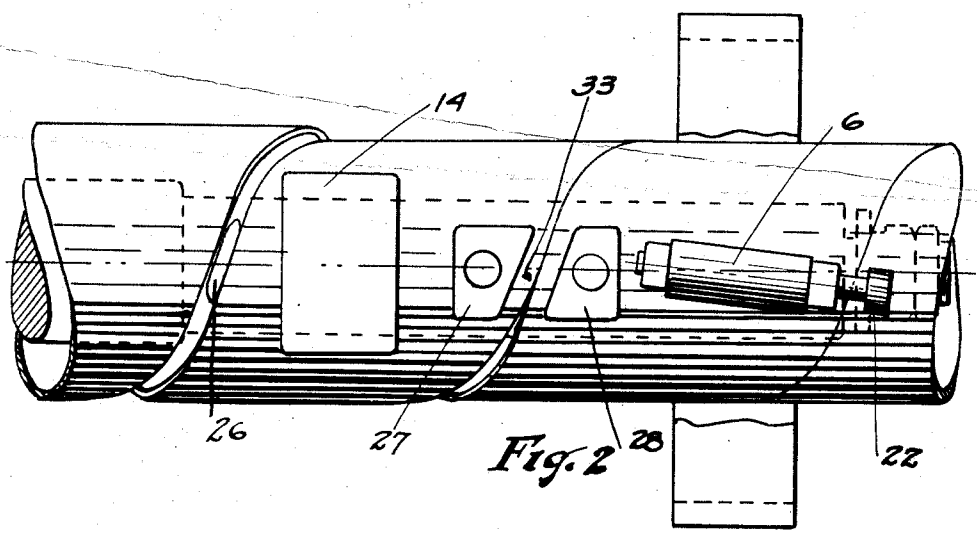


Fig. 2

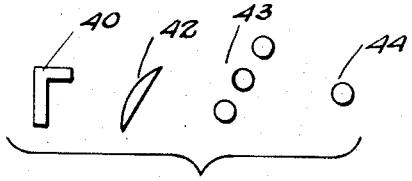


Fig. 3.

INVENTOR.

Leon Cammen

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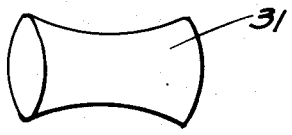


Fig. 7.

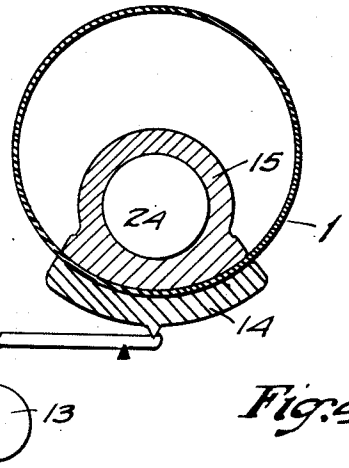


Fig. 4

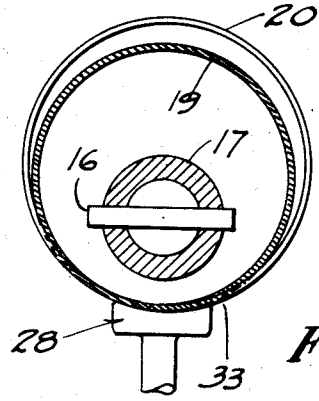


Fig. 5

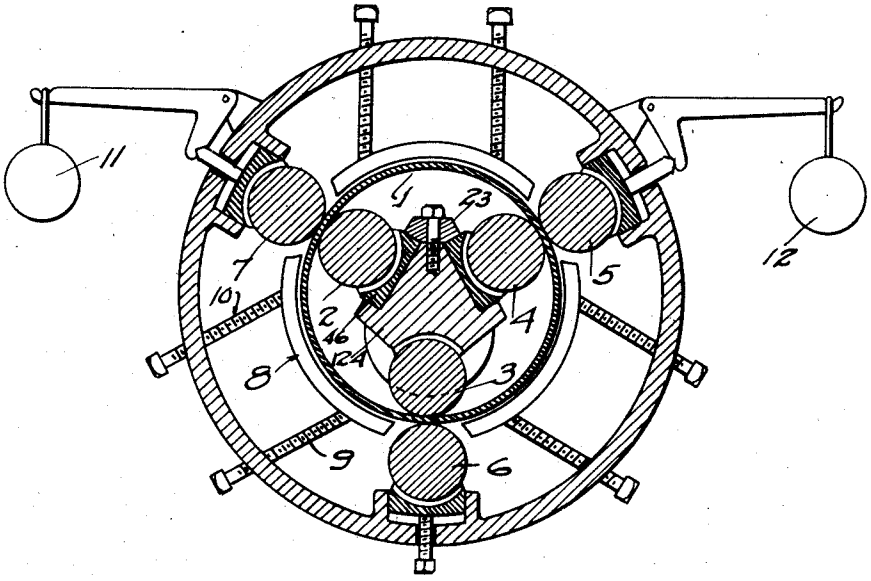


Fig. 6

INVENTOR.

Lew Cammen

Patented Sept. 6, 1932 1,875,560

UNITED STATES PATENT OFFICE

LEON CAMMEN, OF NEW YORK, N. Y.

PIPE MAKING MACHINERY

Application filed November 17, 1930. Serial No. 496,212.

The present invention relates to apparatus for making spiral pipe from a strip of sheet material. Spiral pipe is made by forming a strip of sheet metal into a helix and securing the meeting edges of successive turns of the helix as, for example, by welding.

The present invention has for an object to provide an improved method of and means for forming a strip of metal into a helix to make a pipe therefrom.

Another object is to provide an improved method and means for holding the successive turns of the helix in close engagement while uniting the same.

Another object is to provide an improved method of and means for progressively contacting the meeting edges of successive turns with substantial pressure and welding them at the point of pressure.

Another object is to provide an improved arrangement for bending the sheet metal between bending rolls.

Another object is to provide means for first bending the sheet metal to form a helix of a size approximating that required for the final form of the pipe and thereafter further bending the sheet metal to final form.

The present invention provides an improved arangement comprising bending rolls for forming a strip of sheet metal into the form of a helix of slightly different size than that finally required for forming the pipe and progressively closing the joint with substantial pressure at the point of closing and securing the contacting edges as by welding.

The arrangement which comprises first forming the sheet metal into a preliminary helix and thereafter bending it to the final form offers features of general advantage and is especially desirable when forming pipe from relatively heavy metal or from metal which is difficult to bend by merely winding the same upon a mandrel.

The nature and objects of the invention will be better understood from a description of a particular illustrative embodiment for the purpose of which description reference should be had to the accompanying drawings forming a part hereof and in which—

Figure 1 is a sectional view of pipe forming apparatus embodying the invention;

Fig. 2 is the same device as seen from below in outside view.

Fig. 3 shows several modifications of the guide 26 of Fig. 2;

Fig. 4 is a sectional view of the brake shown at 14 and 15 in Fig. 1

Fig. 5 is an end view of the pipe including the point where the welding action takes place.

Fig. 6 shows a more detailed sectional view of the rollers 4, 5, 3 and 6 of Fig. 1

Fig. 7 shows a modification in the design of the rollers which may be also used to take place of the brake shown in Fig. 4.

None of the machines for making spirally welded pipe built hitherto have means for producing pressure between the edges of the skelp meeting in the seam where the weld takes place otherwise than between the outside bending rolls. In the case of resistance welding, in particular, quite a powerful pressure, of the order of 6,000 to 8,000 lb. per sq. in. is required. Moreover, for resistance welding this pressure must be carefully localized and extend only from the place previously welded to the place where the metal is made plastic by the heat produced by the flow of the current. If there is rigid abutment ahead of that place, the weld will not occur or will be poor. There is no machine for making spirally welded pipe where this has been provided.

In this invention there is provided a mandrel 24 which is preferably stationary, together with a roller or system of rollers preferably supported from mandrel 24. These are shown as 2, 3 and 4 in Fig. 6, and also, in another view, in Fig. 1. There is also made provision for an outside roller or system of rolls, such as 5, 6 and 7, with skelp 1 between the inside and outside rolls. Further a guide, such as 26, Fig. 1, is provided, located within one of the seams of the coiled pipe.

When the power driven rolls 5, 6 and 7 start going, the following happens. In the first place the skelp 1 is given a motion of rotation, really winding, about rolls 2, 3 and 4. If no other machinery had been provided, the action would have been that of a coiler, there

being nothing to create a side motion. Because, however, of the presence of guide 26, the skelp has not only to turn around, but must move past the guide. The force that makes the skelp slide sidewise is a component of the force produced between the outside and inside rolls. The magnitude of this component depends entirely on the amount of friction produced between the edge of the skelp and guide 26, and for obvious reasons it is impractical to make this friction large; on the contrary, there is an advantage in having it as small as possible, and yet a very large pressure is needed at the point of welding, 33, Figs. 1 and 2. When roll 6 is running and there is a resistance to the motion of the skelp at 26, the tendency will be, first, to close up the seam at 33, and, next, to move the skelp past 26. If the section of the skelp under 14 offered some resistance to motion, more force would have to be provided by the rolls, such as 6, to cause the skelp to move at all, and hence there would be more pressure at 33. This is accomplished by the provision of brake 13—14, Fig. 4. This brake may consist of an inside roll or system of rolls, such as shown for another purpose in Fig. 6, but may also consist of a working part of a roll, such as 15 in Fig. 4 on the inside, and any of these structures on the outside, such as 14, with provision to vary the grip on the skelp 1 moving therebetween, which may be done by counterweight 13, or similar means well known to engineers.

The mandrel 24 is supported here from the inside bending roll 25. It is preferable to have it so centered that skelp 1 of Fig. 4, or 20 of Fig. 1 on roll 25 and on brake 15 lays in a straight line of contact at or in the neighborhood of the place where the seam is welded. This is not true for the rest of the circumference, however. The location of rolls 2, 3 and 4 is so selected that the same should be true for the part of the skelp passing thereover. Here again, as will be more fully explained hereafter, this does not hold good for the entire periphery.

If the diameter of the coiled pipe in contact with mandrel 24 were the same as the diameter of the part of the pipe within the live rolls 5, 6 and 7, and the brakes 14 were in action, pressure at the seam 33 would have been produced, but that pressure would have quite uniformly distributed over the entire seam, and with such a distribution of pressure the welding would have been unsatisfactory. What is needed is a pressure for only a little distance beyond the place which has been already welded, and this is accomplished by making the diameter of the circumscribing circle of the rolls 5, 6 and 7 of somewhat smaller than the diameter over the mandrel 24. This is indicated in Fig. 1 by the respective positions of skelp at 19 and at 20, and is still better shown by Fig. 5. With this arrangement, the contact is as shown at 33, Fig. 2 where the upper part of the seam is already welded, contact is made at 33, and there is no contact further down, not because the seam is spaced in that part, but because the skelp to the right of the seam is inside the skelp to the left of the seam, as shown in Fig. 5.

Rolls 2, 3 and 4 may have to be adjusted from time to time, both to make pipe of different diameters and also to compensate for wear. This can be done by changing their relative positions, i. e. spreading them further apart or bringing them closer together. To make this possible, the rolls are held in tapered frames 46 sliding against an invertedly tapered inner mandrel 45. The motion is effected by nut 48 (equipped with engaging disc 47) working on screw 49, and held in position by locknut 50. The system of rolls 2, 3 and 4 is carried on the body 124 which in turn is supported from pin 17 provided with slot 18 to take bar 16 (Fig. 5). The outer rolls 5, 6 and 7 are driven by means not shown, as through gears 21 and 22, and the pressure is regulated by some means such as counterweights 11 and 12, or the like. The electric current may be supplied by contact shoes 27 and 28.

The drawings, Fig. 6, show three rolls, 2, 3 and 4. There may be more or less of them, and as a matter of fact, a single roll may be used instead. The disadvantage of such an arrangement is its lack of flexibility and adjustability for various sizes of pipe.

Instead of straight rolls, such as 4 and 5, concave rolls on the outside and corresponding convex rolls on the inside, set diagonally, may be used. The former type is shown in 31, Fig. 7.

As there may be a tendency for the skelp to bulge out while going through the rolls 2, 3, and 4, and their outside counterparts, guards 8 have been provided, held in position by such means as screws 9 and 10.

The guide 26 can be executed in the form of a rib 40, Fig. 3, possibly with an overhang as shown, to prevent the skelp from crowding out, or a rib without such an overhang as 42, or in the form of a series of rollers or wheels 43, or finally as a pin 44.

In ordinary resistance welding the current is applied intermittently, and the making and breaking of the large currents used places a very heavy burden upon the generating station, as well as line surges. In this case, only a small area is involved at any one time and the work is done at constant pressure which permits to carry on welding if desired with a current of constant amperage.

The matter of drive of any of the outside rollers such as 5, 6 or 7, or all of them if that has been elected is a serious one because their speed has to be closely synchronized in a given ratio with the speed of the bending and

twisting rolls, and also because the speed in revolutions per minute of these rolls is low, 6 to perhaps 10 r. p. m., while the most economical drive is from an electric motor running at say 600 to 1200 r. p. m. The method selected here is to drive the twist rolls from an electric motor through a fluid pump and fluid motor, such as an oilgear, which is a well known class of devices and permits a large ratio of speed reduction. Then drive rollers 5, 6 and 7 from the same fluid motor through two universal joints and if necessary a gear, the purpose of the latter being to adjust the speed of rollers 5, 6 and 7 to that of the fluid motor which may require a gear ratio of perhaps 1:1.2. Such use of universal joints is not new but its combination with a fluid pump and motor is novel.

The movement of rolls 5, 6 and 7 may be either steady or intermittent as required by the character of the welding adopted.

I claim:

1. A tube welding device comprising means for forming a spiral tubular member and imparting a longitudinal movement thereto, a mandrel adjacent to said forming means in the direction of travel, guiding means upon said mandrel for maintaining the edges of the spirally wound material in spaced relation, roller means positioned in the direction of travel of the spiral tube for effecting rotation of the tube and closing under pressure and in abutting relation the edges to be welded, and electrode means at the closure of said edges, for heating the abutting edges and effecting welding.

2. Apparatus as set forth in claim 1 wherein the relative location of the mandrel and the rollers is such that the diameter of the tubular member in contact with the mandrel is different from the diameter of the tubular member passing through the rolls.

3. Apparatus as set forth in claim 1 wherein the roller means consist of more than one roller on the inside of the skelp and a corresponding number of rollers on the outside thereof.

4. Apparatus as set forth in claim 1 wherein the roller means consist of more than one roller on the inside of the skelp and means are provided for varying the location of said rollers so as to change the diameter of the circle circumscribing said rollers.

5. Apparatus as set forth in claim 1 wherein the roller means consist of more than one roller on the inside of the skelp and wherein each roller is mounted on a tapered frame moving upon a tapered mandrel and means are provided to move all the roller frames to the same extent at the same time.

6. Apparatus as set forth in claim 1 wherein the rollers are so offset with respect to the mandrel that at least in one place the generating line of the tubular member as formed about the mandrel coincides when prolonged with the generating line of the tubular member passing through the roller means whilst the diameter of the tubular member as formed about the mandrel is different from that passing through the rollers.

7. Apparatus as set forth in claim 1 wherein the roller means on the outside of the tubular member are concave.

LEON CAMMEN.