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TUBE BENDER

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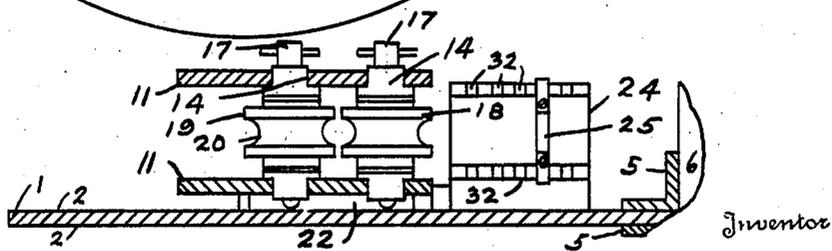
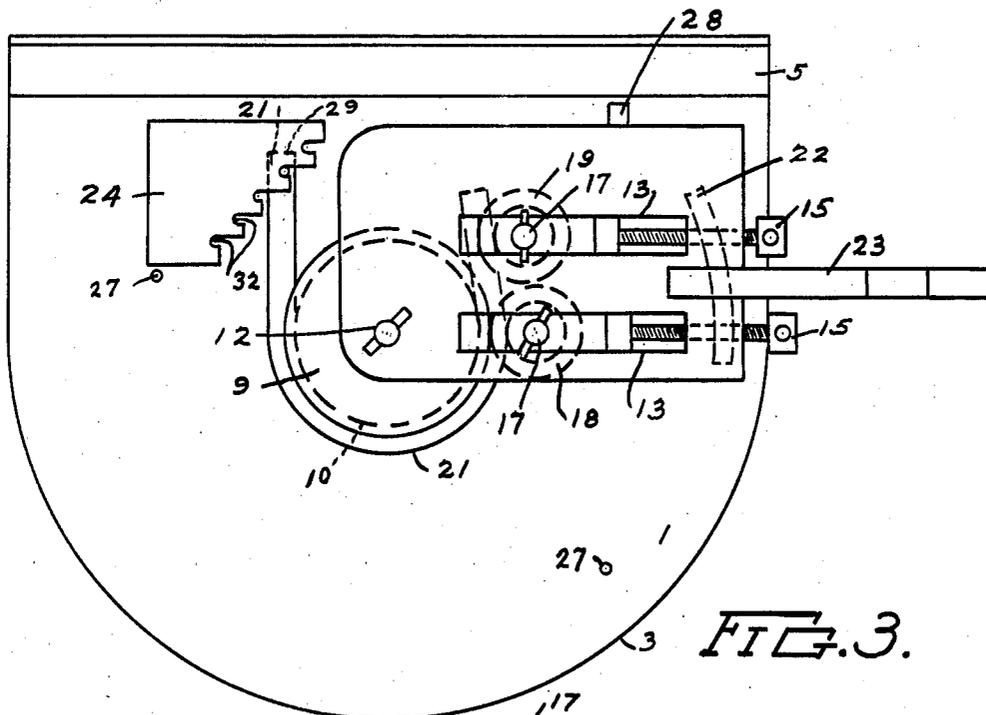
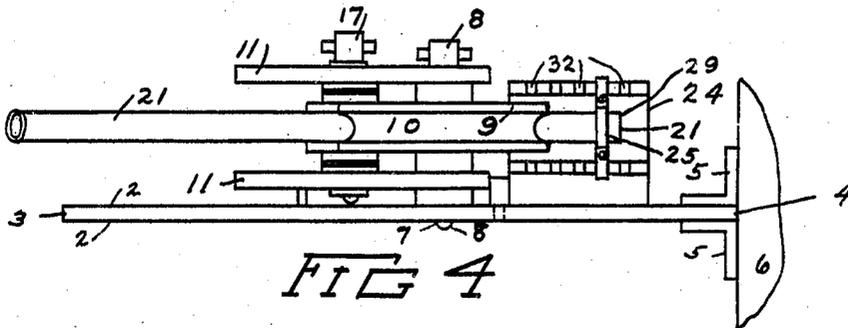


FIG. 5.

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## TUBE BENDER

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2 Claims. (Cl. 153—45)

This invention relates to pipe benders and more particularly to benders for forming tubing into shapes desired without collapsing same. It has among its objects to provide a bender of the type referred to, that will render the use of sand filling, lead and other auxiliary means, unnecessary during the bending process, to support the walls of the tubing internally. Another object is to have the bender adaptable for the cold bending of the tubing. Other incidental objects are to provide an expeditious method of bending the tubing, eliminate arrangements for annealing or heating the tubing during the bending and other time-consuming and costly processes that greatly increase the cost of operation and make the results relatively uncertain. An additional object is to have the bender designed to shape the tubing in the manner required without materially weakening the structure of the tubing or causing it to be visably damaged. A further object is to have the device adapted to preserve the wall section of the tubing in its normal peripheral contour and retain its diametrical size. It is also contemplated to have the device or machine of relatively simple and small construction, and capable of being made portable and otherwise convenient.

Other objects will become apparent as the invention is more fully set forth.

In the forming of tubing cut from stock lengths to make it fit or suit the work or construction that it is used for, the process employed requires normally the use of sand filling in the pipe and careful handling to prevent its collapse or denting. In addition the process may require heat, and may require annealing to prevent mechanical distortion of the material of the tubing and its possible fracture. This invention, takes the tubing at normal room temperatures and bends it cold without filler or damage. The parts of the device flow the material during the bending so the normal thickness of the tubing and its internal form will not be appreciably changed. The device in general consists of a forming roll on which the tubing is bent to the suitable shape and a plurality of wheels having their rims cupped to embrace the tubing. The wheels and roll are mounted on a carriage and act frictionally together and press on the tubing during the bending in such a manner as to promote the adjustment of the material therein gradually to suit the form it is bent to. An additional grip is used to keep one end portion of the tubing stationary and thereby enable it to

bend uniformly and keep the proper surfaces in progressive contact with the roll and wheels during the process of giving it the bent shape. The bending is accomplished by the pulling of the tubing around by the roll and wheels, as they travel over its external surfaces, and the grip that keeps one end of the tube in a predetermined position. The closeness of the centers of the pressure wheels with the center of the form roller prevents buckling when bending unfilled thin cold tubing.

In the drawings which illustrate an embodiment of this invention:

Figure 1 is a plan view of a tube bender embodying this invention, showing the carriage and tubing arranged for arcuate bending,

Figure 2 is a front elevation of the device with the lower wall of the carriage partly broken away to show the side construction of the forming wheels brackets,

Figure 3 is a plan view of tube bender shown in Figure 1 with the carriage and tubing advanced 180°,

Figure 4 is a side elevation of the device looking in the direction of arrows 4—4 shown in Figure 1,

Figure 5 is a section view taken along line 5—5 of Figure 1 showing the end construction of the wheel brackets,

Figure 6 is a plan view of the tube holding device,

Figure 7 is a side elevation of the device shown in Figure 6, and

Figure 8 is an end elevation of the device shown in Figure 6.

Similar reference characters refer to similar parts throughout the drawings.

In the drawings, the device is indicated, provided with a table 1, which has its upper and lower surfaces 2 flat, and its peripheral edge 3 semicircular extending from a tangential rear portion 4 that has structural members 5 provided for mounting the table on a wall or other structure 6. The table has a central hole 7 for receiving the axle 8 of a forming roll 9 which has a peripheral groove 10 for embracing the tubing 10 to be bent. The axle is formed to project into the table surface suitably on one end and to engage in the walls 11 of a carriage as indicated, that swings radially on the axle. The position of the hole 12 in which the axle projects is preferably in the corner of the carriage as shown. This forming roll is positioned stationarily in the table but may rotate thereon. The walls 11

of the carriage are slotted rectangularly at 13. Brackets 14 are positioned in the slots and adapted to travel adjustably in the latter in a longitudinal direction under the suasion of the screw threaded bolts 15, which connect therewith through passages 16 in the carriage. These brackets support the axles 17 of a pair of similar pressure wheels 18 and 19, which have their peripheral rims 20 grooved to embrace the external wall of the tubing 21, on the side opposite to that which the groove 10 of the forming roll 9 engages. The bottom wheel of the carriage has a bearing shoe 22 that slides on the upper surface of the table 1 and keeps the carriage spaced from the table. It also prevents the carriage from sagging or getting out of line and binding. The peripheral grooves 19 and 20 on the rims of the roll and wheels are preferably of the same size and form and conform with the various outside diameters of the tubes worked on. A handle 23 is attached to the carriage and extends out from same beyond the outside edge of the table. It is used for manually operating the carriage and swinging it on the center which the axle provides.

The swinging of the handle and its carriage causes the tubing clamped between the roll and wheels to bend on the curve which the groove in the peripheral rim of the roll provides. A pull block 24 is mounted on the table to the side of the position assumed by the roll and serves to hold the end of the tubing 21 that is stationary. This pull block has a holding device 25 for attachment to the tube which may be inserted at various points 32 to meet varied conditions. The inner surface of the holding device may be provided with pointed projections 26 if desired which will dig into the wall of the tubing and prevent it from getting out of position during the bending operation. The block is preferably made integral with the table and extends up sufficiently to bring the holding device and tubing into coordinate relations. A series of holes 27 are drilled in the table to take pegs that serve to provide a control or guide to the amount of bending of the tubing to be done.

The operation of the device is simple. The tubing is inserted so its wall surface contacts and is embraced in the grooves of the roll and wheels selected. The bolts 15 are adjusted until said roll and wheels clamp the tubing as it projects between them as indicated in Figure 1. The end portion 29 of the tubing is locked in the holding device and placed in the point 32 selected. The operator then pulls on the handle 23 and swings it radially on center axle 8. The peripheral faces of roll 9 and wheel 18 nearest it are brought as close together as possible and if possible until they touch, so their grooves will surround the tubing.

The other wheel 19 is adjusted to a position aligned or parallel with the axis of the tubing to exert a predetermined pressure thereon while the wheel acts with a relatively free contact on the tubing. As the carriage is rotated, its wheels 18 and 19 press and rotate on the tubing and bend it, while the pull block 24 holds one end 29 of the tubing stationary, and the roll 9 acts reactively, and rotates at the same time. This rotation of the rolls and wheels serve to press on the material of the tubing and roll it along so it flows to suit the bend and prevent thinning at any point. At the same time, the rolling action enables the tubing to be bent without collapsing or buckling. The roll and wheels hold

the tubing taut and assist in keeping it from collapsing as they pull same against the counter action of the holding device. The movement of the wheels and roll away from the pull block progresses gradually and brings the tubing over the rim groove surface 10 of the roll 9. The groove acts as a support to the tubing, and as it clamps a large area of same, serves to keep its form from spreading or changing. The movement of the roll and wheels causes same to bend the tubing as it progresses, and as these make substantial contacts with its surface, they distribute the pressure evenly over the tubing and eliminate any action that will cause collapsing or kinks.

While but one general form of the invention is shown in the drawings, it is not desired to limit this application to this particular form or in any other way otherwise than limited by the scope thereof, as it is appreciated that other forms could be made that would use the same principles and come within the scope of the appended claims.

Having thus described the invention, what is claimed is:

1. A machine for bending thin walled tubing comprising in combination, a table, a roller rotatably attached to the table in a horizontal position and parallel thereto, said roller having a peripheral groove therein for engaging the external surface of a thin walled tubing length away from one end thereof, a plurality of rotating pressure wheels of smaller diameter than the roller and having peripheral grooves therein for engaging the external surface of the tubing opposite to that engaged by the roller, the axes of the wheels being at variable distances from that of the axis of the roller and increasing as their spacing is greater from said end of the tubing, means for adjusting the position of the wheels independently of each other to and from the roller and to suit the amount of bending to be given the tubing, a pull block having a plurality of stepped grooves mounted on the table and spaced away from the roller and wheels, a clamp rigidly attachable to said end of the tubing and selectively insertable in the said stepped grooves to position the tubing to suit the bending to be done thereon, a carriage for holding the wheels in their adjusted positions and rotatable on the table with the axis of the roller as its rotation center, said carriage being connected with the table so as to be guided and controlled rotatably thereby, and handle means for operating the carriage and pressure wheels against the tubing held between same and the said roller and with its end rigidly held by the clamp in the pull block.

2. A machine for bending thin walled tubing comprising in combination, a table, a roller rotatably attached to the table in a position parallel thereto, said roller having a peripheral groove therein for engaging the surface of a thin walled tubing length away from one end thereof, a pair of rotating pressure wheels of different diameter than the roller and having peripheral grooves therein for engaging the tubing opposite to that engaged by the roller, the axes of the wheels being at variable distances from that of the axis of the roller means for adjusting the position of the wheels independently of each other to and from the roller and to suit the amount of bending to be given the tubing, a pull block having a plurality of stepped grooves mounted on the table and spaced away from the roller and wheels, a clamp rigidly attachable to the said end of the

tubing and selectively insertable in the said stepped grooves to position the tubing to suit the bending to be done thereon, a carriage for holding the wheels in their adjusted positions and rotatable on the table with the axis of the roller as its rotation center, said carriage being connected with the table so as to be guided and controlled rotatably thereby, and handle means for

operating the carriage and pressure wheels against the tubing held between same and the said roller and with its end rigidly held by the clamp in the pull block to bend it around the roller in the groove thereof away from the block and while the said end of the tubing is held rigidly in the place in the block.

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