Nov. 13, 1945. M. GERMAN 2,389,038

METHOD OF BENDING PLASTIC TUBING

Filed May 4, 1945 2 Sheets-Sheet 1

Fig. 1.

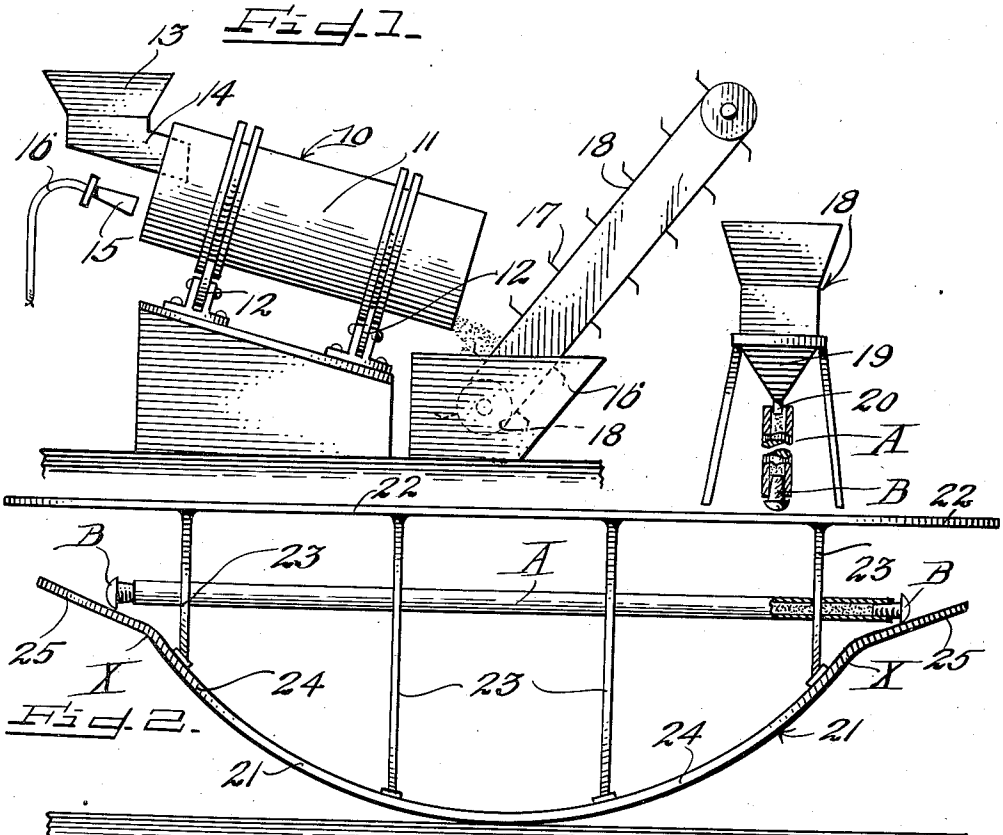
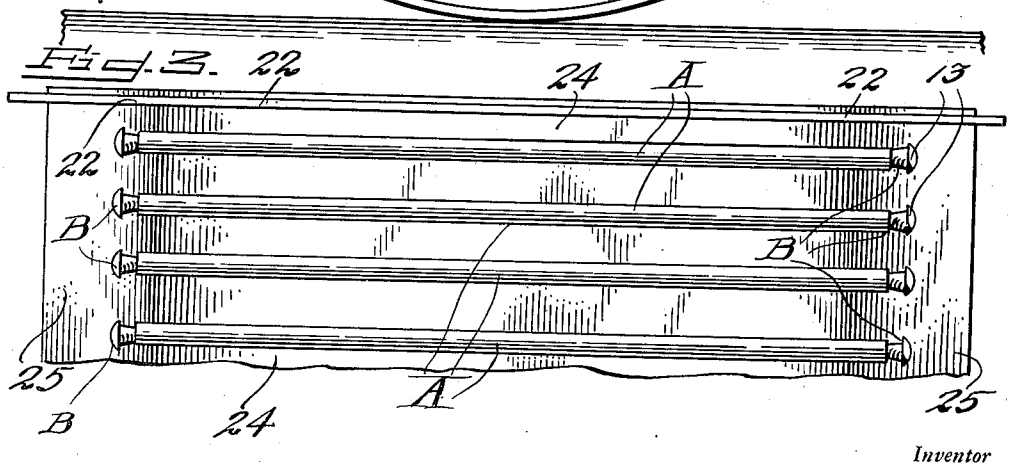


Fig. 2.

Fig. 3.



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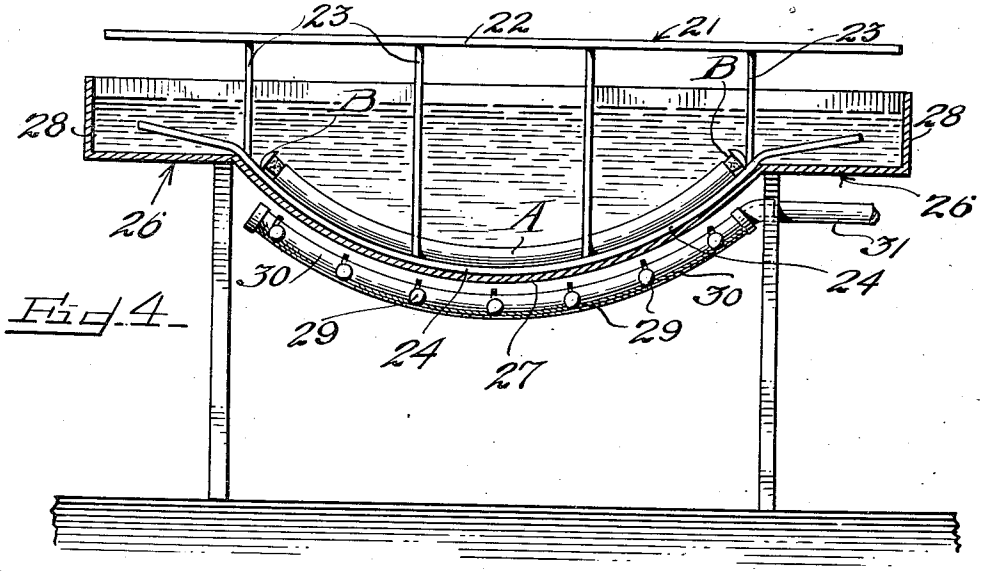


Fig. 4.

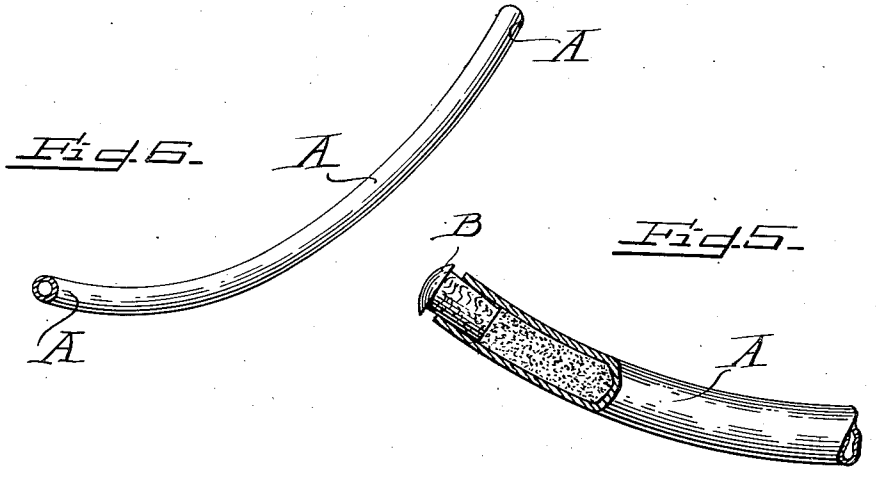


Fig. 6.

Fig. 5.

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METHOD OF BENDING PLASTIC TUBING

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Application May 4, 1945, Serial No. 591,997

2 Claims. (Cl. 18—56)

This invention relates to bending plastic tubing and more particularly to the preservation of the bore of the tubing while causing it to bend in desired configuration.

The primary object of the invention is to avoid mutilation of the tubing and preserve its cross-sectional contour irrespective of the number of bends or undulations that it may be subjected to during the bending operation.

Another object is to preserve the final contour of the tubing after the bending operation has been effected.

The above and other objects may be attained by employing this invention which embodies among its features introducing dehydrated finely divided material such as sand into the interior bore of a tube of plastic material which is subject to bending under the influence of heat.

Other features embody the steps of heating the sand to dehydrate it and while in such heated condition introducing the sand into the bore of the tubing which is to be bent into the desired shape, plugging the ends of the tube length to prevent dislodgment of the sand therefrom and the entrance of moisture thereinto and subsequently depositing the tube in a tank containing heated liquid and allowing it to sag into proper shape under its own weight, allowing the liquid within the tank to assume normal temperature while the tube remains therein, withdrawing the tube from the liquid, removing the plugs from the ends of the bent tube and emptying the sand from the interior thereof.

In the drawings:

Figure 1 is a view showing diagrammatically the same dehydrating and tube filling equipment employed in carrying out my invention.

Figure 2 shows one embodiment of the tube shaping cradle employed in connection with my invention.

Figure 3 is a fragmentary top plan view of Figure 2.

Figure 4 is a longitudinal sectional view through a tank containing heated liquid and showing my tube bending cradle supported therein with a piece of bent tubing in place.

Figure 5 is a fragmentary view partly in section of a piece of tubing showing the manner in which I plug the ends to prevent the escape of the sand from the interior thereof and the entrance of liquid thereinto, and

Figure 6 is a perspective view of a length of tubing bent in accordance with my invention.

Referring to the drawings in detail, I have illustrated diagrammatically in Figure 1 a dehydrator designated generally 10 embodying a hollow rotary cylinder 11 mounted on rollers 12 by means of which it is suspended for rotation about an inclined axis. Supported near the upper end of the cylinder 11 is a hopper 13 carrying a spout 14 which discharges into the interior of the cylinder as shown. Supported immediately below the hopper 13 with its discharge end directed into the interior of the cylinder is a tuyère or burner 15 which is fed by a suitable fuel supply pipe 16 and is so positioned as to direct its flame into the interior of the cylinder 11 in order to heat and dehydrate the material which is introduced thereinto from the hopper 13. Arranged adjacent the lower discharge end of the cylinder is a hopper 16 into which the buckets 17 of a belt conveyor 18 dip in order to elevate the heated material from the hopper 16 and discharge it into the hopper 17 of a cyclone designated generally 18. The cyclone not only serves to agitate the finely divided dehydrated material but also is provided with a discharge hopper 19 carrying discharge spouts 20 beneath which the ends of the lengths of tubing to be bent are supported as illustrated. While it is possible to use other substances it is my preference that sand be introduced into the hopper 13 and after being properly dehydrated in the dehydrator 11 it is conveyed on the conveyor 18 to the hopper 17 and discharged through the cyclone and hopper 19 and spout 20 into the length of tubing A which is to be bent. As shown one end of the tubing A is closed by a tightly fitting plug B so as to prevent the escape of the sand from the interior thereof and also prevent the entrance of moisture into the end of the tubing.

Having thus prepared the tubing A it is placed in a cradle designated generally 21 which comprises a pair of side bars 22 depending from which are legs 23 which serve to support at their lower ends a platform 24 which is bent into the shape that the tubing is to take and in the present instance is shown as being substantially the arc of a circle. As illustrated in Figure 2 the length of tubing A is somewhat greater than the chord between the points X, X of the arc formed by the member 24 so that as the tubing sags to the desired contour it will be sustained or suspended until it has assumed the desired contour. Extensions 25 are formed at opposite ends of the member 24 to accommodate the excess length of tubing as illustrated.

Having filled the tubing with dehydrated finely divided material such as sand and plugged the ends with the plugs B the tubing lengths are

placed in the cradle 21 as illustrated in Figures 2 and 3 whereupon the cradle is lifted in its entirety and set into a liquid containing tank designated generally 26. This tank is provided with a bottom wall 27 which conforms to the shape of the platform 24 of the cradle 21 and is likewise provided with extensions 28 to accommodate the members 25. The liquid within the tank 26 is heated in any suitable manner, as for instance, by gas burners 29 served from a header 30 which, in turn, is supplied with gaseous fuel through a supply pipe 31. Any other type of heating may be employed, however, which lends itself to the flexibility necessary for the process.

It is understood, of course, that the tubing lengths A are straight or substantially straight at the time that they are filled with the finely divided substance which has been dehydrated and heated in the equipment shown in Figure 1 and remain so until they are brought under the influence of the heated liquid within the tank 26 at which time they slowly sag into the shape shown in Figure 4 or any other contour that may be imparted to the cradle bottom 24. The liquid is kept heated by the burners 29 until the complete sagging has taken place after which the heat is turned off and the tank 24 and its contents allowed to cool to normal temperature. During this cooling period the tubing is restored to its normal rigidity and after complete cooling it may be withdrawn from the liquid and the plugs B removed so that the sand or other material employed on the interior of the tubing may be completely dislodged therefrom. Due to the fact that the finely divided material has been dehydrated immediately before being introduced into the tubing and that the tubing is introduced into the tank while the sand is still hot, it is obvious that the heat of the sand contributes to the heat of the liquid in allowing the tubing to sag to proper shape. Also, due to the fact that the sand has been dehydrated and sealed within the tubing it is obvious that no steam or gases will be generated within the tubing which cause bulging or disruption of the tubing during the heating process.

It is obvious that any suitable liquid may be employed within the tank 26 which will meet the requirements for bending tubing made from plastic which can be shaped by thermal means and, therefore, I do not wish to be limited to the use of any specific types or kinds of heating liquids nor do I wish to be limited to the particular contours of tubing disclosed herein but I do wish to have my invention construed broad enough to include the method set forth in the appended claims.

What I claim is:

1. The method of bending plastic tubing which comprises filling the bore of the tubing with a finely divided dehydrated substance of an inert character, plugging the ends of the tubing to confine the finely divided substance and prevent the entrance of moisture into the interior of the tubing, suspending the tubing by opposite ends over a form conforming to the contour which is to be imparted to the tubing, introducing the tubing thus suspended into a bath of heated liquid, allowing the tubing to sag to conform to the shape of the form, cooling the tubing in the liquid, extracting the tubing from the liquid, removing the plugs from the ends of the tubing and discharging the finely divided substance from the interior of the tubing.

2. The herein described method of bending tubing which includes subjecting sand to a heating and dehydrating process, introducing the sand while in heated and dehydrated form into the interior of a length of tubing, plugging the ends of the tubing to prevent the escape of sand and the entrance of moisture, suspending the tubing above a matrix of the contour which the tubing is to finally assume, introducing the tubing and matrix into a liquid bath, heating the liquid constituting the bath, allowing the tubing to sag in the liquid to conform to the shape of the matrix, cooling the bath and tubing, withdrawing the tubing from the bath after it has cooled and becomes set, removing the plugs from the ends of the tubing and discharging the sand from the tubing.

MILO GERMAN.