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APPARATUS FOR PRODUCING CLOSED ENDED TUBES OF CELLULOID OR THE LIKE

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Fig. 1.

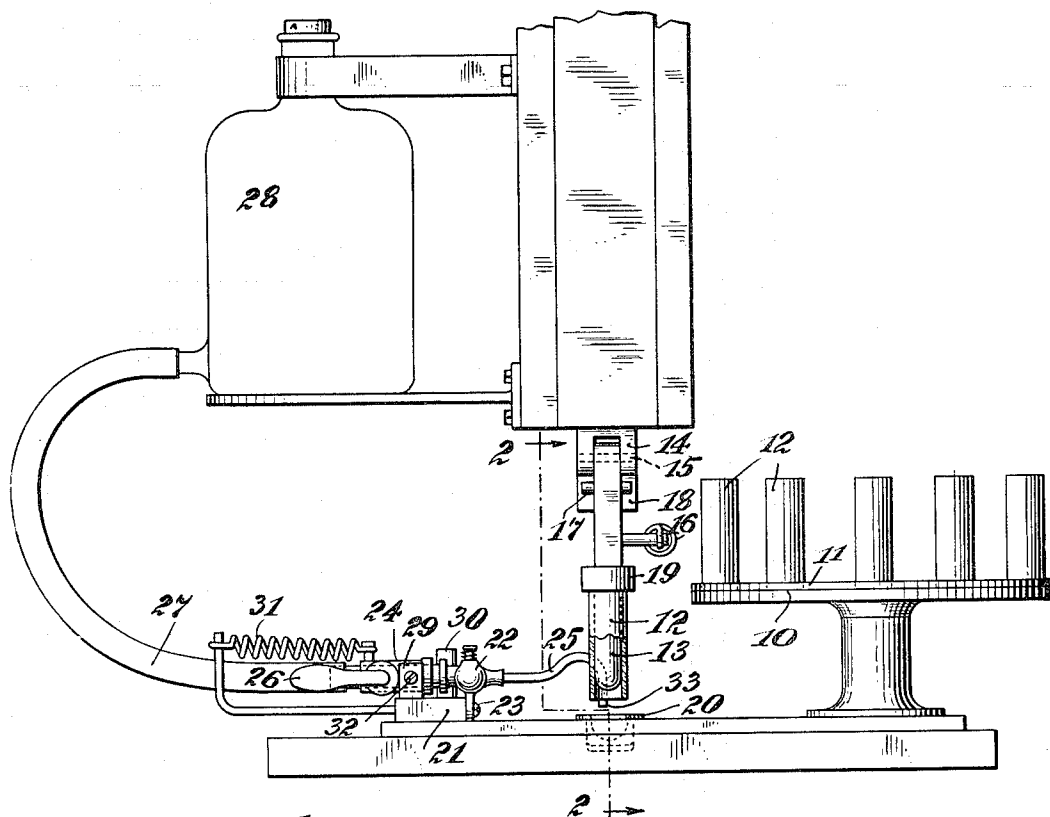


Fig. 4.

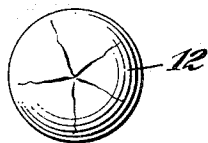


Fig. 3.

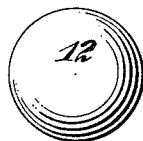
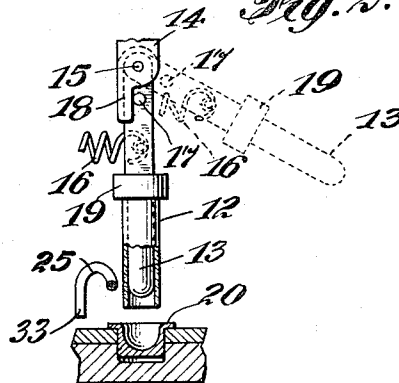


Fig. 2.



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APPARATUS FOR PRODUCING CLOSED
ENDED TUBES OF CELLULOID OR THE
LIKE

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Application September 3, 1930, Serial No. 479,504
Renewed July 29, 1933

7 Claims. (Cl. 18—3)

This invention relates to a method and apparatus for producing closed caps such as are used on fountain pens.

The principal object of the invention is to form a closed-end cap from a short length of tubing of celluloid or other suitable material, open at both ends. Such open-end tubing can be economically produced and by subjecting it to the process of the present invention, one end can be closed by forming over the material of the tube, the process resulting in a perfect closed end.

In carrying out the invention, one end of the open tube is first heated and the tubing is then put in a press and the heated end is pressed in a die member which contains a small amount of solvent for the material of the tube.

While preferred forms of the apparatus and method are disclosed herein, it should be understood that various changes may be made without departing from the spirit and scope of the invention as hereinafter set forth and claimed.

In the drawing, Fig. 1 is a side elevation showing parts of the apparatus as applied to a conventional press.

Fig. 2 is a detail partly in section taken on line 2—2 of Fig. 1.

Fig. 3 is an end view of the closed cap produced by the present invention.

Fig. 4 is a view similar to Fig. 3, but showing how the closed end would be formed if no solvent were used.

Referring to the drawing more particularly, the reference numeral 10 indicates a hot plate which contains a series of sockets 11 of a size to receive the lower ends of the pieces of tubing 12, which are made of celluloid or some other material suitable for forming the desired caps. The sockets 11 are of a suitable depth to heat the tubes for the desired distance.

After a tube has been sufficiently heated, it is placed on the mandrel 13. This mandrel 13 is hinged to the lower end of a plunger 14 of any suitable press, preferably foot-operated. The mandrel 13 is hinged to the plunger 14 by the pivot pin 15 and a spring 16 normally biases the plunger 13 to a vertical position in which the stop pins 17 mounted on the mandrel 13 engage shoulders 18 carried by the plunger 14.

In placing a piece of tubing on the mandrel 13, the mandrel is pulled forward to the dotted line position of Fig. 2 and the tube is slipped over the end of the mandrel until the upper end of the cylinder engages the stop shoulder 19. Upon releasing the mandrel 13, it will then spring back to its normal vertical position.

The lower end of the mandrel 13 is rounded to correspond with the desired contour on the interior of the finished cap, and the tubes 12 are formed of such a length that they project

beyond the lower end of the mandrel as will be clear from Figs. 1 and 2. The die member 20 is mounted on the bed of the machine directly below the mandrel 13 and is formed with a rounded socket corresponding to the desired contour for the exterior of the finished cap.

In order to provide for perfect homogeneous fusion of the material of the tube when it is pressed together to form the closed end, the invention provides for placing a small amount of a suitable solvent in the die 20 before the pressing operation takes place. The solvent is supplied by the following apparatus.

A block 21 is rigidly secured to the bed of the press and a stop cock 22 of a well known conventional type is attached to the block 21 in an inverted position by means of a screw 23 passing through the handle of the stop cock. A pipe member 24 is attached to the inlet side of the stop cock 22 and a delivery tube 25 is attached to the outlet side of the stop cock. The pipe 24 is provided with a suitable manual valve 26 for controlling the flow of liquid to stop cock 22, and a flexible tube 27 connects pipe 24 to a liquid supply 28. The block 21 carries a front stop 29 and a rear stop 30, and a spring 31 normally biases the pipe 24 toward the forward stop 29, which carries an adjusting screw 32 for accurately adjusting the parts.

These parts are so arranged that when the pipe 24 is at rest against the forward stop 29, the delivery tube 25 is disposed with its open end 33 to the rear of the die 20 as will be clear from Fig. 2. When the mandrel is pulled forward to the dotted line position of Fig. 2, pipe 24 can be swung about the axis of the valve stem of cock 22. This movement opens cock 22 and simultaneously swings the open end 33 of the delivery tube forward to a position directly over the die 20, thereby delivering a very small amount, preferably only a drop or so, of the solvent to the socket of die 20. Pipe 24 is then released and the spring 31 restores it to its forward position. The mandrel 13 is also released and is brought to its vertical position by spring 16.

The press is now operated and the softened lower end of the tube 12 is pressed into the die 20 where the combined action of the pressure and the solvent serves to fuse the lower end of the tube 12 into a perfect dome shape with the parts homogeneously united in substantially the same manner that they would be if the cap were originally molded with a closed end.

If the solvent were not introduced into the die 20, the pressing operation would cause the sides of the tube to come together along distinct joint lines as indicated in Fig. 4 and while these lines might not be seriously objectionable in appearance, they would provide lines of weakness which might give way when the cap is in use.

In the operation of the apparatus, it will be clear that the tubes can be readily applied to and removed from the mandrel and the parts are so disposed that the operations of loading the mandrel, feeding the solvent into the die 20, operating the press and removing the finished cap can be carried out in an easy and expeditious manner.

This method of introducing the solvent directly into the die just prior to the pressing operation provides for a most effective and economical application of the solvent.

I claim:—

1. Apparatus for forming closed-end tubes which comprises a press having a plunger, a mandrel attached to the plunger, a die formed with a socket and located below the mandrel, and means for supplying solvent to the socket in the die.

2. Apparatus for forming closed-end tubes which comprises a die formed with a socket shaped to correspond to the desired external contour of the closed end, a delivery system for supplying solvent to the socket, said delivery system including a movable delivery tube arranged to move to a delivery position over the socket or to a non-operating position to the rear of the socket, a mandrel adapted to receive a piece of tubular material, and means for pressing the mandrel into the die.

3. Apparatus for forming closed-end tubes which comprises a die formed with a socket shaped to correspond to the desired external contour of the closed end, a plunger connected to suitable operating means, a mandrel pivotally connected to the plunger and having its lower end formed to correspond with the desired internal contour of the closed end, said mandrel being adapted to receive a piece of tubing, a delivery system for supplying solvent to the socket, said delivery system including a movable delivery tube arranged to move to a delivery position over the socket or to a non-operating position to the rear of the socket, and means for pressing the mandrel into the die.

4. Apparatus for forming closed-end tubes which comprises a die formed with a socket shaped to correspond to the desired external contour of the closed end, a delivery system for supplying solvent to the socket, said delivery system including a pivoted delivery tube arranged to move to a delivery position over the socket or

to a non-operating position to the rear of the socket, a valve arranged to operate automatically during the pivoting of the tube to open a supply line to the tube when it is in delivery position and to close the supply line when the tube is in non-operating position, a mandrel adapted to receive a piece of tubular material, and means for pressing the mandrel into the die.

5. Apparatus for forming closed ends on short tubes, which comprises means for heating one end of each tube, a die formed with a socket corresponding with the desired external shape of the closed end, a mandrel adapted to receive a tube and provided with a thrust collar, the mandrel being swingable to a vertical operating position in alinement with the socket of the die, and to a forward loading position, and means operable when the mandrel is in its forward loading position to supply solvent for the material of the tube to the socket.

6. Apparatus for forming closed ends on short tubes, which comprises means for heating one end of each tube, a die formed with a socket corresponding with the desired external shape of the closed end, a mandrel adapted to receive a tube and provided with a thrust collar, the mandrel being swingable to a vertical operating position in alinement with the socket of the die, and to a forward loading position, and means operable when the mandrel is in its forward loading position to supply solvent for the material of the tube to the socket, said supply means including a delivery tube movable to a delivery position over the socket and to a non-operating position.

7. Apparatus for forming closed ends on short tubes, which comprises means for heating one end of each tube, a die formed with a socket corresponding with the desired external shape of the closed end, a mandrel adapted to receive a tube and provided with a thrust collar, the mandrel being swingable to a vertical operating position in alinement with the socket of the die, and to a forward loading position, a delivery tube movable to a delivery position over the socket and to a non-operating position, and a valve automatically controlled during movement of the delivery tube to open a supply line to the delivery tube when the latter is in delivery position and to close the supply line when the delivery tube is in non-operating position.

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