Aug. 29, 1933. J. N. WHITEHOUSE 1,924,340

FORMING APPARATUS

Filed Sept. 3, 1930 2 Sheets-Sheet 1

Fig. 1.

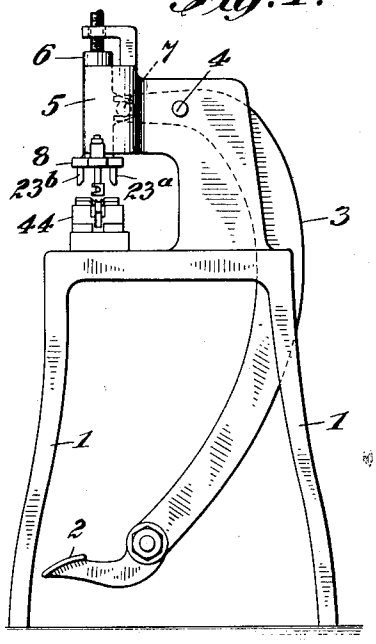


Fig. 2.

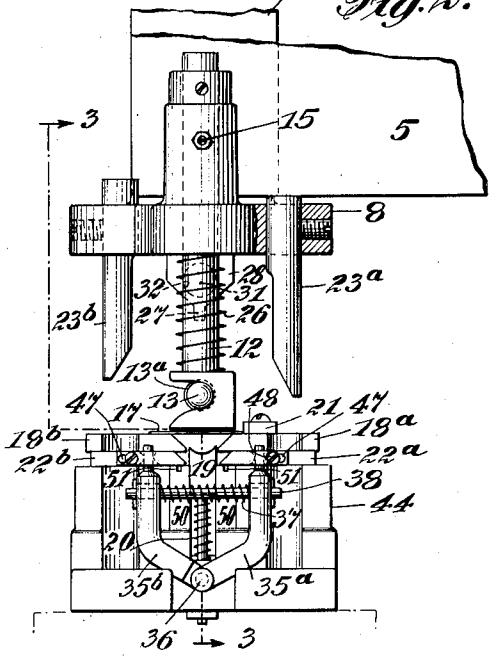
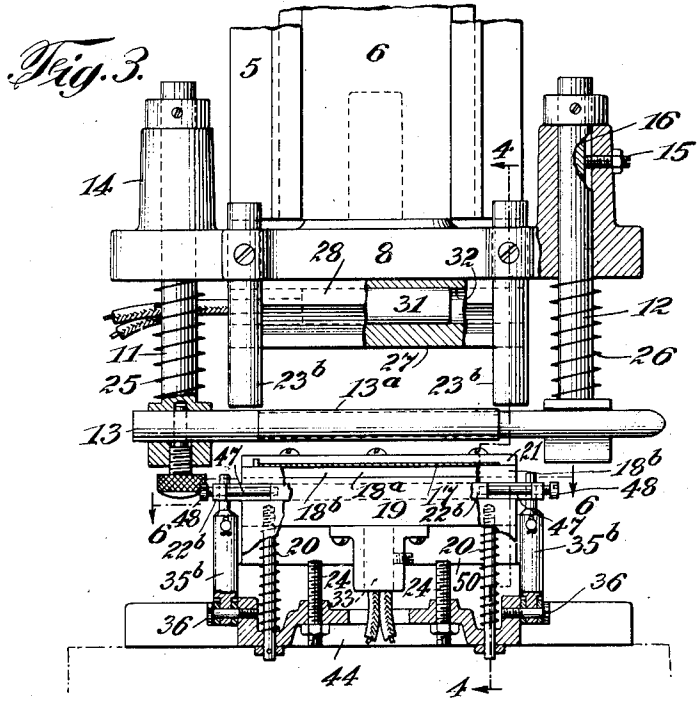


Fig. 3.



INVENTOR

John N. Whitehouse

BY

Ramsey + Kent

his ATTORNEYS

Aug. 29, 1933. J. N. WHITEHOUSE 1,924,340

FORMING APPARATUS

Filed Sept. 3, 1930 2 Sheets-Sheet 2

Fig. 4.

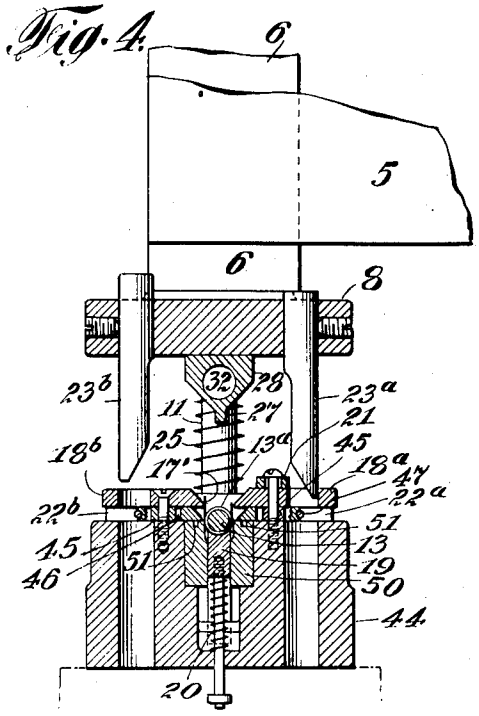


Fig. 5.

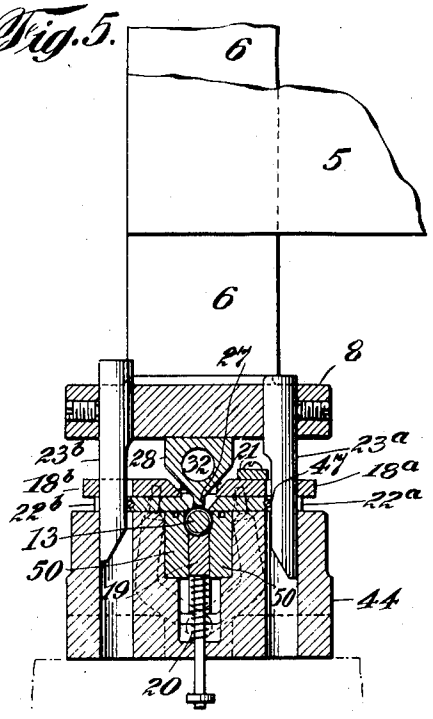


Fig. 6.

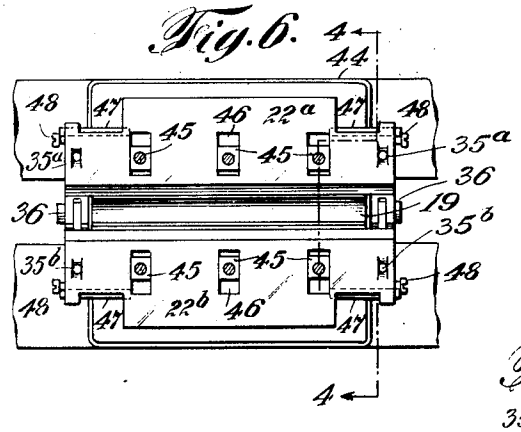


Fig. 7.

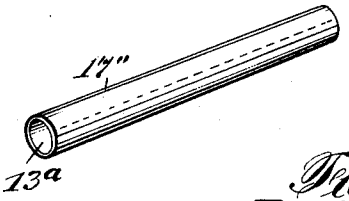


Fig. 10.

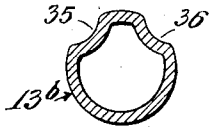


Fig. 9.

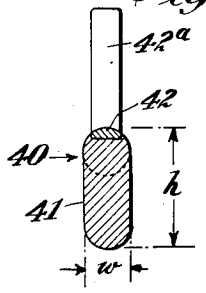
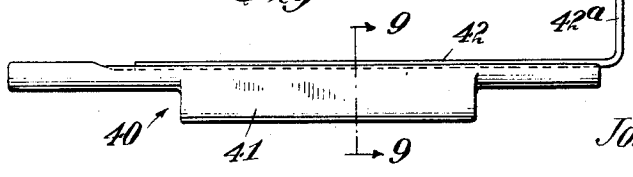


Fig. 8.



INVENTOR
John N. Whitehouse
BY
Ramsey & Kent
his ATTORNEYS

Patented Aug. 29, 1933 1,924,340

UNITED STATES PATENT OFFICE

1,924,340

FORMING APPARATUS

John N. Whitehouse, New York, N. Y.

Application September 3, 1930. Serial No. 479,503

12 Claims. (Cl. 18—14)

This invention relates to a forming apparatus and method. It is particularly applicable to the formation of tubes from sheet material, including the formation of a tubular covering about an already existing tube.

An object of the invention is to provide an apparatus and/or method for economically making tubes (including tubular coverings) from sheet material, particularly from celluloid or other readily soluble materials.

A more specific object of the invention is to provide an apparatus adapted for the production of various sizes of tubes by a single machine.

A further object of the invention is to provide an apparatus and/or method for rapidly and economically making single convolution tubes (including tubular coverings) from sheet material, particularly from celluloid or other readily soluble materials.

Other objects of the invention will be obvious from the following disclosure.

The form of machine disclosed is constructed and operated as follows: A reciprocating head carries a horizontally mounted, rod-like mandrel. One edge of a sheet of celluloid is moistened with a suitable solvent; and then the sheet is placed upon a divided support beneath the mandrel. The mandrel is depressed, carrying the sheet down between the two sections of the support and bending it about the mandrel to U-shaped form. Automatically operated slides complete the bending of the sheet to tubular form and overlap the edges of the sheet. A heated pressure member presses the overlapped edges together and causes evaporation of the solvent, thereby uniting the overlapped edges. The machine parts are then returned to their initial position, and the tube removed from the mandrel.

Fig. 1 is a side elevation of the machine.

Fig. 2 is a side detail view (partially in section) showing the tube forming parts of the machine.

Fig. 3 is a front detail view taken in general on the line 3—3 of Fig. 2.

Fig. 4 is a detail view taken approximately on the lines 4—4 of Figs. 3 and 6, the parts being partially advanced to the position where the sheet has been bent into U-shaped form.

Fig. 5 is a sectional view similar to Fig. 4, but showing the parts advanced to fully operated position, where the sheet has been formed into a complete tube.

Fig. 6 is a detail view taken on line 6—6 of Fig. 3.

Fig. 7 is a perspective view of a completed tube formed as a covering for an already existing tube.

Fig. 8 is an elevation of one form of mandrel which the invention contemplates.

Fig. 9 is a section on the line 9—9 of Fig. 8.

Fig. 10 is a cross section of a form of mandrel which may be used in applying a tubular covering to an already existing tube.

The machine may be supported by legs 1, and operated by a pedal 2 which is attached to a pedal arm 3, pivoted at 4. A stationary bracket 5 slidably supports a reciprocatory head 6. The arm 3 is so connected with the head at 7 that the head will be depressed upon application of pressure to the pedal 2. The weight of arm 3 is so distributed that it automatically returns the head 6 to its uppermost position when pedal 2 is released.

As best shown in Fig. 3, the reciprocatory head 6 includes a frame 8 from which depend two slidably mounted mandrel supports 11 and 12. Removably secured to mandrel support 11 is a rod-like mandrel 13; and support 11 is rotatably mounted in its bearing 14 to permit the mandrel to be swung in a horizontal plane. The lower end of mandrel support 12 is notched formation, as best shown in Fig. 2, to receive the right hand end of the mandrel. Preferably the mandrel support 12 is secured against rotation, as by a screw 15 which projects into a slot 16 without, however, clamping the mandrel support 12. If the celluloid tube is to be formed as a tube covering about an already existing tube (e.g. a sheet metal tube), such already existing tube 13^a is placed upon the mandrel. Then as far as the formation of the celluloid tube is concerned the tube 13^a becomes a part of the mandrel and for convenience it will be so considered.

A sheet of celluloid 17 (Figs. 2 and 3), one edge of which has been moistened with a suitable solvent, is placed upon a divided support comprising stationary plates 18^a and 18^b. The sheet may be correctly positioned by placing it against a stationary (but adjustable) abutment strip 21. Pressure applied to the pedal 2 causes the mandrel 13 to descend between stationary plates 18^a and 18^b, the mandrel carrying the celluloid sheet with it until it has been bent into U-shaped form as shown at 17' in Fig. 4. In this position the bottom portion of the sheet of celluloid is held against a concave vertical slide 19, which is biased upwardly by light pressure helical springs 20, 20 (Fig. 3).

Upon further movement of the head 6, each end of a reciprocatory horizontal slide 22^a is en-

gaged by a cam 23^a (one shown) and the slide moves inwardly. As the slide moves it bends the right hand edge (Fig. 4) of the sheet of celluloid adjacent the top surface of the mandrel 13. As the head 6 continues to move, a similar horizontal slide 22^b is actuated by cams 23^b, 23^b and bends the left hand edge of the strip of celluloid over the top of the opposite edge. At about this time downward motion of the mandrel is terminated by vertical slide 19 striking adjustable detents 24, 24 (Fig. 3).

Helical springs 25 and 26, associated respectively with mandrel supports 11 and 12, now yield and the movement of head 6 continues until the nose 27 of pressure member 28 has been brought against the overlapped edges of the sheet of celluloid. Preferably the pressure member 28 is kept hot by a suitable electric heating element 31 (Fig. 3) located in a bore 32 in the member 28. The heat quickly evaporates the solvent, and the overlapped edges are so securely united as to become virtually one piece of celluloid. Preferably a second electric heating element 33 is secured to the bottom of vertical slide 19, thereby keeping the slide hot. Considerable heat is transmitted to various associated parts, including the mandrel 13, thus accelerating the evaporation of the solvent and making it possible to speed up production.

When the pedal 2 is released head 6 rises and the parts are returned to their non-operated positions. Horizontal slides 22^a and 22^b are restored by a pair of links 35^a, 35^b (Fig. 2) attached to stationary pivot 36, and biased outwardly by helical spring 37. The spring 37 surrounds a rod 38 which passes loosely through the links 35^a and 35^b. A smiliar pair of links is preferably located at the opposite end of slides 22^a and 22^b as shown in Fig. 3.

To remove the finished tube, the operator grasps the right hand end of the mandrel (Fig. 3) and swings it away from mandrel support 12. No difficulty is experienced in the removal of the finished product from the mandrel 13 where the celluloid tube 17'' (Fig. 7) has been formed as a covering for a sheet metal tube 13^a. In cases where the celluloid tube is desired by itself, a two part mandrel may be utilized to facilitate removal of the tube. Such a mandrel is shown in Figs. 8 and 9.

The mandrel, designated as a whole by 40, has a body 41 which is channelled at the top to receive a removable slide 42, provided with a handle portion 42^a. This form of mandrel fits into the machine which has been already described. After the celluloid tube has been formed on the mandrel, the operator swings the right hand end of the mandrel away from support 12 and pulls out the slide 42. The solvent and the drying action causes the top portion of the tube to adhere to the slide 42. The tube does not, however, adhere to the body 41 of the mandrel. Accordingly, the tube comes off with the slide 42 and then the slide can be pulled away from the wall of the tube.

The dimension W (Fig. 9) represents the smallest diameter of tube to be made, and the machine is built to operate with a mandrel of this horizontal dimension. For progressively larger tubes mandrels are used which have the same horizontal dimension w, but have progressively increasing vertical dimensions h. Thus the circumference of the mandrels vary progressively, but all can be used in the same machine without any adjustment other than adjusting dents 24 (Fig. 3) to vary the descent of vertical slide 19. The tube will be formed non-circular (except when h is equal to w), but after being removed from the mandrel it is sprung or reshaped into circular form.

Various minor structural details of the machine will now be described. Stationary plates 18^a and 18^b are suitably spaced from base block 44 by spacers 45 (Figs. 4 and 6) to permit free movement of slides 22^a and 22^b. These spacers pass through suitable slots 46 in the slides 22^a and 22^b. To minimize wear where the actuating cams engage the slides 22^a and 22^b, bearing surface is provided in the form of short lengths of replaceable drill rod 47, held in by screws 48. Adjacent vertical slide 19, are guide plates 50, 50, the upper edges of which are channelled at 51 to collect solvent that may be brought back by slides 22^a and 22^b. These channels 51 may be cleaned from time to time with a conventional pipe cleaner used by smokers.

The form of the invention disclosed is merely illustrative in compliance with the patent statutes and is not to be construed as limiting the appended claims.

In placing tubular coverings on relatively large sheet metal tubes, it frequently happens that the sheet metal tubes do not run true to size. Hence, some of the individual tubes may not properly fit on a round mandrel, such as shown in Figs. 2 to 5. This difficulty may be overcome by using a mandrel of the cross sectional form shown in Fig. 10. The mandrel 13^a is channelled at 55 and 56, thus permitting an under sized tube to flatten somewhat throughout two zones as the tube is applied to the mandrel. In this way, a comfortably tight fit is made with individual sheet metal tubes varying somewhat in actual size from the nominal tube size.

I claim:

1. A tube forming machine comprising: a reciprocatory head, a mandrel attached to said head, means to manipulate sheet material in conjunction with said mandrel, and means to automatically actuate said manipulating means when the head is reciprocated.

2. A tube forming machine comprising: a head, a mandrel attached to the head, a divided support for sheet material, means to cause relative movement between the mandrel and said support whereby the mandrel passes between the parts of the support and carries the sheet material with it.

3. A tube forming machine comprising: a head, a mandrel attached to the head, a divided support for sheet material, means to cause relative movement between the mandrel and said support whereby the mandrel passes between the parts of the support and carries the sheet material with it, and means to bend the sheet substantially completely around the mandrel.

4. A tube forming machine comprising: a head, a mandrel attached to the head, a divided support for sheet material, means to cause relative movement between the mandrel and said support whereby the mandrel passes between the parts of the support and carries the sheet material with it, and means to overlap the edges of the sheet and apply heat and pressure simultaneously to the overlapped edges.

5. A tube forming machine comprising: a bar-like mandrel, a slide biased toward the mandrel, and means to cause relative movement between the mandrel and the slide whereby the mandrel engages the slide and displaces the same.

6. A tube forming machine comprising: a bar-

like mandrel, a slide biased toward the mandrel, means to cause relative movement between the mandrel and the slide whereby the mandrel engages the slide and displaces the same, and means to adjustably limit the displacement of the slide.

7. A tube forming machine comprising: a reciprocatory head, a mandrel carried by the head, a base, a vertical slide mounted in the base and biased upwardly beneath the mandrel, means to reciprocate the head to project the mandrel with a sheet of material between the mandrel and the slide, means to adjustably limit displacement of said slide by the mandrel, and horizontal slides operable to manipulate said sheet material.

8. A tube forming machine comprising: a reciprocatory head, a mandrel carried by the head, a base, a vertical slide mounted in the base and biased upwardly beneath the mandrel, means to reciprocate the head to project the mandrel with a sheet of material between the mandrel and the slide, means to adjustably limit displacement of said slide by the mandrel, horizontal slides operable to manipulate said sheet material, and means carried by the head to automatically actuate said slides successively.

9. A tube forming machine comprising: a reciprocatory head; a mandrel carried by the head, the head being movable with respect to the mandrel and the mandrel being biased away from the head; means to move the head to project the mandrel against a sheet of material; means to manipulate the sheet material and overlap the edges adjacent the surface of the mandrel; and means carried by said head to actuate said manipulating means.

10. A tube forming machine comprising: a reciprocatory head; a mandrel carried by the head, the head being movable with respect to the mandrel and the mandrel being biased away from the head; means to move the head to project the mandrel against a sheet of material; means to manipulate the sheet material and overlap the edges adjacent the surface of the mandrel; and means carried by the head to apply pressure to the overlapped edges of the sheet.

11. A tube forming machine comprising: a reciprocatory head; a bar-like mandrel carried by the head, the head being movable with respect to the mandrel and the mandrel being biased away from the head; means to move the head to project the mandrel against a sheet of material; means to manipulate the sheet material and overlap the edges adjacent the surface of the mandrel; means carried by said head to actuate said manipulating means; means carried by the head to apply pressure to the overlapped edges of the sheet; and means to heat said pressure applying means.

12. A tube forming machine comprising: a reciprocatory head; a replacable bar-like mandrel carried by the head; a divided support for a sheet of material; means to move the head to project the mandrel between the parts of the support to carry the sheet material with it and partially fold the sheet about the mandrel, the mandrel being of elongated cross-section and having its greatest cross-sectional dimension disposed in the direction of movement of the mandrel; means to adjustably limit the movement of the mandrel between the parts of the divided support, and means to complete the folding of the sheet about the mandrel.

JOHN N. WHITEHOUSE.