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L. T. FREDERICK

METHOD OF MAKING TUBES

Filed Aug. 13, 1923

Fig. 1.

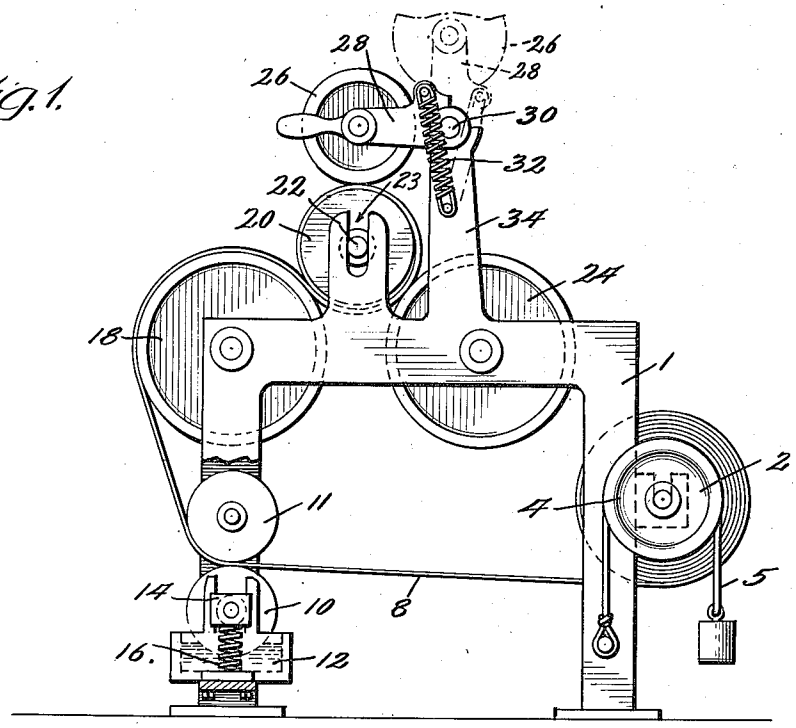
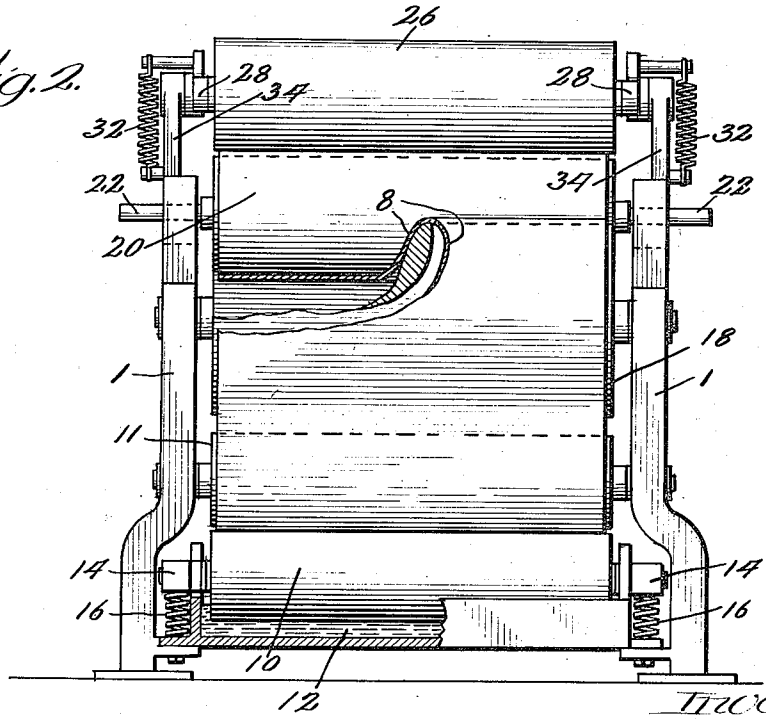


Fig. 2.



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METHOD OF MAKING TUBES.

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My invention relates to the production of tubes of that class in which a sheet of fibrous material is wound upon a mandrel and the various turns secured together by means of an adhesive. The practice has existed for many years of producing tubes by winding a sheet of paper or other fibrous material around a mandrel until the desired thickness is built up, the various layers being held together by means of an adhesive. Various materials have been employed including paper and cloth but in all previous methods so far as I am aware the material has reached the mandrel in a saturated and stretched condition. This has several disadvantages. In the first place it calls for a considerable quantity of adhesive, involving a corresponding expense. Second, the amount of moisture in the adhesive has caused the fabric to stretch with the result that the sheet goes on to the mandrel in moist and also in stretched condition and must remain on the mandrel until it is dry. If quick drying means are provided they add a complication to the process. If they are omitted a large number of mandrels must be employed if the tubes are to be produced in quantity, for obviously the mandrel must remain in place until the tube is dry. Furthermore the drying involves shrinking and it becomes necessary to use a stripping machine to remove the tube from the mandrel.

The object of my invention is to provide a process in which a smaller amount of adhesive will be required, heating will be dispensed with, shrinkage will be avoided, and the time and number of mandrels required be reduced to a minimum.

Generally speaking, I accomplish my purpose by employing as the sheet material a paper which is calendered or glazed to such an extent that it will prevent for a considerable period penetration of the adhesive into the body of the material. In other words, the paper is substantially non-absorbent; also I apply to the surface of the sheet only so much adhesive as will be necessary to form a thin surface coating for it. The sheet is then wound upon the mandrel under pressure but without heat.

In the accompanying drawings I have illustrated one type of machine by which my method may be carried out, although it will be understood that the machine is illustrative only and may assume various forms in practice.

In the drawings

Figure 1 is an end elevation of the machine, and

Figure 2 is a front elevation thereof, parts being broken away to better reveal the construction.

Like numerals denote like parts in the two views.

In the machine illustrated there is a main frame 1. A storage roll 2 is rotatably mounted on the frame and provided with a friction device for preventing the roller from unwinding too fast. This consists of a sheave 4 with a weighted belt 5 passing around it. From the storage roller the sheet material 8, from which the tube is to be made, passes between two rollers 10 and 11. The lower roller 10 dips into a tank 12 containing the adhesive. As an example the adhesive may be a solution of dextrine or it may be a heavy viscosity varnish, or shellac, or insulating glue.

The roller 10 is journaled in boxes 14 which slide vertically and these boxes are continuously pressed upward by compression springs 16. The upper roller 11 limits the upward movement of the lower roller and between them they remove surplus adhesive so that a thin coating of the adhesive will be applied to one side of the sheet. The pressure is regulated in such manner as to permit but a small amount of adhesive to remain upon the sheet.

From the rollers 10, 11 the sheet passes over a roller 18 which is journaled in the main frame and cooperates with the mandrel 20. Said mandrel is mounted upon a shaft 22 which is rotatable and vertically movable within vertically slotted posts 23. A roller 24, which is also journaled in the main frame, is in position to contact the mandrel 20. The mandrel is under constant pressure toward the rollers 18 and 24 due to the action of a pressure roller 26 journaled in arms 28 pivoted upon stationary pins 30. The weight of the roller may be augmented by a tension spring 32, which is fastened to arm 28 and to the post 34, in which shaft 30 is journaled. The spring is so arranged that when the arm is in horizontal position it will pull downward upon it to increase the pressure, and when the arm is swung to up-

right position will move past the center of shaft 30 and tend to hold arm 28 in upright position as shown in dotted lines in Figure 1.

The operation will be readily understood. When the parts are brought to the position shown in Figure 1 if the mandrel is rotated it will wind the strip 8 of fibrous material around it, drawing it between the two rollers 10 and 11 by which a small amount of adhesive will be applied. The proper degree of pressure of the layers or turns of the strip is produced by the roller 26, which operates under the action of the springs 32 in addition to the weight of the roller itself.

The apparatus which I have just described is not greatly different from apparatus previously known for the production of tubes of this character. The important features of my process reside in the employment of a fabric adapted to resist rapid penetration of liquid adhesive and the employment of means for applying to the fabric in cold condition a small amount of the adhesive. An additional characteristic of the invention, which follows as a natural sequence, is the dispensing of heating means for driving off the moisture, and the employment of a non-contracting mandrel (contracting mandrels having been found necessary in many cases in order to make it possible to remove the finished tube from the mandrel). Such a contracting mandrel is shown, for example, in Ball Patent 148,544.

As a result of my method the adhesive forms merely a surface coating on one side of the sheet and is present in such small quantities that there is no saturating or stretching of the paper and the tube will be ready for removal from the mandrel just as soon as the necessary quantity of paper has been wound upon it. Furthermore the tube may be readily stripped from the mandrel without requiring the latter to contract, although ordinarily the mandrel will be greased preparatory to receiving the fabric. This makes it easier to slip the tube from the mandrel when the tube has reached its proper thickness. As there is no surplus moisture a tube may be removed from the mandrel immediately, thus releasing the latter for immediate re-use. Furthermore the operation can be greatly speeded up and the output correspondingly increased, for it is not necessary to slow up the machine to wait for the driving off of any excess moisture.

Having thus described my invention what I claim as new and desire to secure by Letters Patent is:

1. The method of making tubes which includes applying a thin coating of adhesive to a sheet of paper which is calendered or glazed to such an extent that it will prevent for a considerable period penetration of the adhesive into the body of the paper and winding the sheet upon a mandrel whereby to avoid stretching the paper during the formation of the tube.

2. The method of making tubes which includes applying a thin coating of adhesive in a cold condition to a sheet of paper that is calendered or glazed to such an extent that it will prevent for a considerable period penetration of the adhesive into the body of the paper and winding the sheet upon a mandrel under pressure.

In witness whereof, I have hereunto subscribed my name.

LOUIS T. FREDERICK.