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2,631,333

METHOD OF MAKING SYRINGE TUBES

Filed April 12, 1950

2 SHEETS—SHEET 1

Fig. 1.

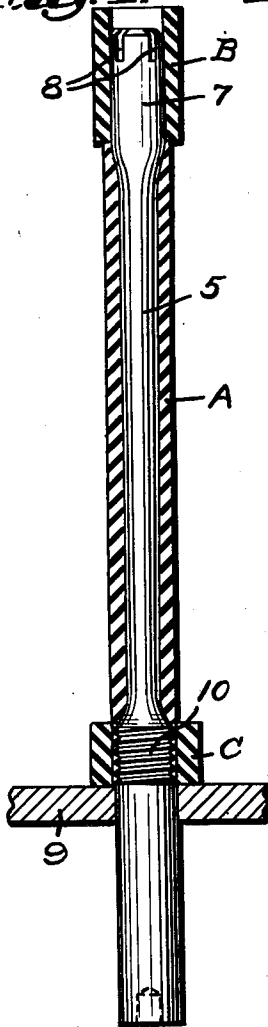


Fig. 2.

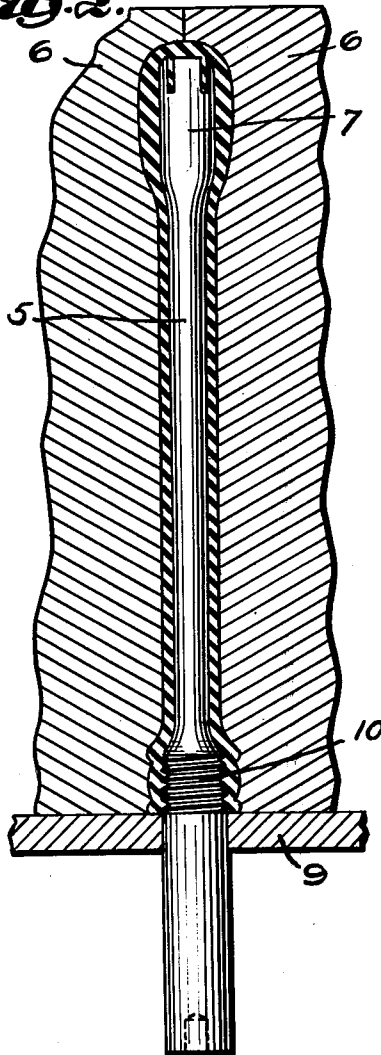
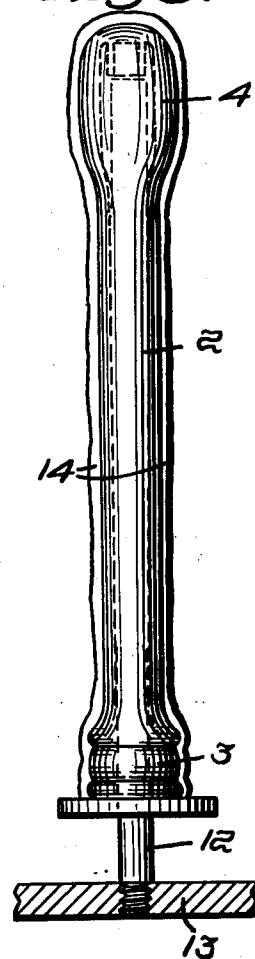


Fig. 3.



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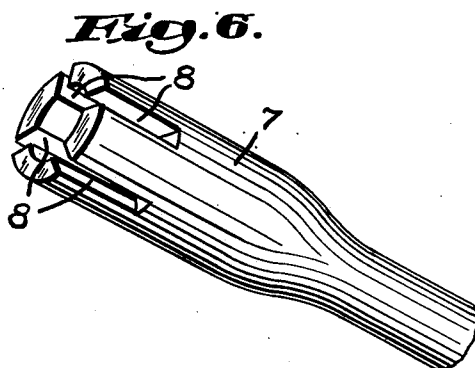
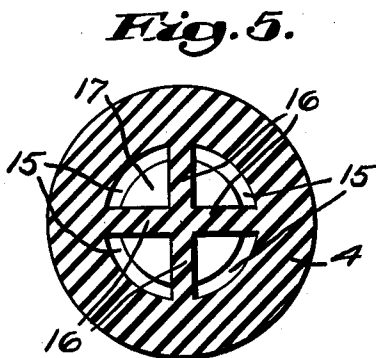
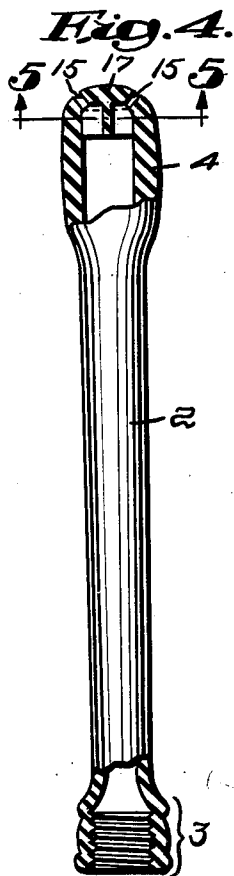
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2 SHEETS—SHEET 2



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UNITED STATES PATENT OFFICE

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METHOD OF MAKING SYRINGE TUBES

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1 Claim. (Cl. 18—47.5)

1

This invention relates to a method of making syringe tubes, and is more especially concerned with tubes of the so-called "balloon spray" type.

Such a tube includes a tubular body with one end constructed for connection to a water supply tube and the opposite end or head shaped to produce the balloon type of spray. In the more popular constructions the intermediate portion of the tube is smaller in diameter than either end and the head is provided with an annular slot through which the water or solution is discharged.

Because of the peculiar shape and construction of the discharge or nozzle end, it has always been considered necessary to make tubes of this character in two pieces; namely, a body section and a separate tip or nozzle end, the latter usually being screw-threaded into the end of the body section. Several practical objections or difficulties have attended the production of tubes of this two-part construction, due mainly to the varying shrinkages which occur in the manufacturing process. Heretofore the commercial tubes of this type have been made entirely from vulcanite or hard rubber, and because the two parts are manufactured independently of each other, warping and differences in shrinkage which occur during the vulcanizing or curing operation necessarily produce corresponding variations in the relationship of the two parts to each other. It is not uncommon to find that when the tip and the body of one of these tubes are assembled, the discharge slot is materially wider at one side of the tip than the other. Or, one or the other of the parts may be so warped that it does not fit the companion section.

This means that a very high percentage of the tubes produced are found unsaleable. Because the expense involved in producing them necessarily is added to the expense of manufacture of the saleable units, the expense per tube of the latter is high. At the same time this particular type of tube has proved exceptionally satisfactory in use and there is a large demand for it.

The present invention is especially concerned with the foregoing considerations, and the problem arising out of the formation of a two-piece unit, and it aims to improve the construction of syringe tubes of the balloon spray type and to devise a method of moulding a one-piece unit with a view to avoiding the objectionable features of the prior art constructions and reducing the expense of manufacture of them.

The nature of the invention will be readily understood from the following description when read in connection with the accompanying draw-

2

ings, and the novel features will be particularly pointed out in the appended claims.

In the drawings,

Fig. 1 is a vertical, sectional view, with some parts in elevation, illustrating one step in the process of manufacture of a spray tube in accordance with this invention;

Fig. 2 is a similar view showing an additional step in the method of manufacture provided by this invention;

Fig. 3 is a side elevation showing a further step in said method;

Fig. 4 is a side elevation, with some parts in section, showing a completed tube made by the method of this invention;

Fig. 5 is a section on the line 5—5 of Fig. 4; and

Fig. 6 is a perspective view of the larger or head end of a core of the type preferably used in moulding the tubes.

As above indicated, one of the objects of this invention is to do away with the conventional two-piece construction and provide a one-piece moulded product, and I have discovered an improved method of moulding by which I may successfully mould the entire tube, including the middle or body portion 2, the internally threaded base section 3, and the bulbous head 4 in one single integral piece. Such a moulding operation necessarily involves shaping both the internal and external surfaces of the tube. Accordingly, the moulding equipment includes an internal mould element or core 5, Figs. 1 and 2, and an external divided mould, parts of which are indicated at 6 in Fig. 2.

The general shape and configuration of these molds will be obvious from the nature of the tube itself, at least so far as the external shape of the sections 2, 3 and 4 are concerned, since these may be of the same general form heretofore used. However, the head 7 of the core is provided with radial slots 8, Fig. 6, which divide this end into four sections of suitable form and dimensions. The molds customarily are of the multiple cavity type and, consequently, the cores 5 are mounted on a base 9 of suitable form to fit into the respective cavities.

Assuming that the tubes are to be made of hard rubber, the composition may be essentially like those heretofore used and with which the trade is thoroughly familiar. Preferably the unvulcanized stock is tubed and cut into suitable sections for use on the middle reduced section of the core, the head 7, and the screw-threaded base 10. These three sections are indicated, respectively, at A, B and C in Fig. 1. They are made of such

dimensions that, when the mold is closed, each cavity will contain substantially the volume of rubber composition required to fill out the mold completely with a very slight overflow. After the cores have been loaded, positioned in the mold cavities and the mold has been closed, it is placed in a suitable vulcanizing oven, such as those commonly used in this industry, where it is subjected to a sufficient degree of heat to promote the chemical reaction required for curing.

An important step of applicant's method is here introduced consisting in interrupting the cure after it has proceeded far enough to make the molded product self-sustaining and resistant to the normal forces which it must be expected to withstand while still retaining its molded shape and dimensions. For example, in a typical instance with compounds such as have been used heretofore, the vulcanizing operation may proceed from, say, seven to nine minutes at a temperature of in the neighborhood of 300° F. I have found that if at this point the mold is taken out of the vulcanizer and opened, the molded tubes on the cores can then be pulled off over the heads of the cores. That is, the cure is such at this time that these molded and partially cured tubes have sufficient resiliency or elasticity to permit such removal without undergoing permanent distortion.

Next, the cure of the molded tubes is completed by mounting them on pins, one of which is shown at 12 in Fig. 3, a series of these pins being positioned side by side on a support 13. As above indicated, the tubes are self-sustaining at this time, their desired shape has been determined, except as presently described, and their shape is made permanent by completing the cure in a dry heat. This may occupy a period of in the neighborhood of six hours, the time depending upon the nature of the composition. However, these compounds contain a large quantity of curing agent so that when the tubes have been subjected to a high temperature for the necessary time period, they are converted into substantially non-elastic hard rubber.

While the tubes have previously been given their final shape in the first cure, certain structural changes must be made in the head 4 and the small amount of flash or overflow which is present in the form of thin, narrow fins 14, Fig. 3, projecting from opposite sides of the tube, must be removed. The latter step is accomplished after the cure has been completed by tumbling.

Subsequently the manufacture of the tubes is completed by cutting a circular slot 15, Figs. 4 and 5, in the upper end of the head 4. This operation may be performed by a knife of suitable dimensions revolving at a high speed and operating a good deal like a cutting-off tool used in a lathe. Preferably it cuts the slot at approximately a 45° angle with reference to the axis of the tube 2. This cut is made completely through the wall of the head and into the four radial flanges 16, Fig. 5, which have been formed in the slots 8, Fig. 6, of the head 7 of the core, but the cut leaves the solid disk-like end tip 17 secured rigidly to the side walls of the head by the flanges 16 which form a supporting spider for the tip.

It should be observed, however, that the discharge slot 15 for the water, or other liquid forced through the tube, completely encircles the tip 17 and because this slot is formed only after the molding and curing operations have been completed, the tube is entirely free from those defects which heretofore have been introduced by

the shrinkage or deformation of the tube in prior art methods.

This invention thus produces a one-piece syringe tube of the balloon spray type in which no distortion interferes with the free flow of the liquid through it; the factors determining the final shape and dimensions of the critical points in the head are all under control; and in which, therefore, there is very little danger of producing imperfect non-saleable products. Thus, this method not only produces a superior product but, in addition, it has been found in actual practice to reduce the expense of manufacture very substantially.

If it is desired to have these tubes bent to a curvature, that can be done by placing them in forms or racks, such as those heretofore used in the industry for this purpose and in which the tubes are held in the desired curve condition during the second or dry heat cure. In some of these tubes, also, the internally screw-threaded base 3 is replaced by a nipple, or is made of some other shape designed to be connected to a supply tube.

While I have herein shown and described a preferred embodiment of my invention and a preferred method of producing these tubes, it will be evident that the method is also applicable to other designs of syringe tubes and that the invention may be embodied in tubes of other constructions.

Having thus described my invention, what I desire to claim as new is:

That improvement in methods of making syringe tubes of the balloon spray type comprising the steps of moulding suitable material between an internal core and an external mould both shaped to produce a small tubular body and an integral larger bulbous head thereon having the desired interior and exterior surfaces, the interior core having a bulbous head transversely slotted at its extremity to produce flanges extending across the interior of the head and connecting the inner face of the end of the head with the inner adjacent sidewalls thereof, interrupting the moulding operation while the moulded material will retain the shape imparted to it against a substantial degree of distortion but while it is still elastic, separating the elastic but self-sustaining body formed on the core from the core by a rectilinear movement of the self-sustaining body in the direction of the length of the body to cause the travel of the head of the core through the smaller tubular portion of the body by temporarily expanding the latter while still in elastic condition, thereafter completing the cure of the body to produce a hardened structure, and subsequently machining the end portion of the head to produce a circular slot therein which is inclined relatively to the axis of the tube to leave a center tip connected to the inner wall of the head solely by said flanges.

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