April 15, 1958 C. S. BRAY 2,830,325

MOLD FOR FORMING OPEN-ENDED BULBS

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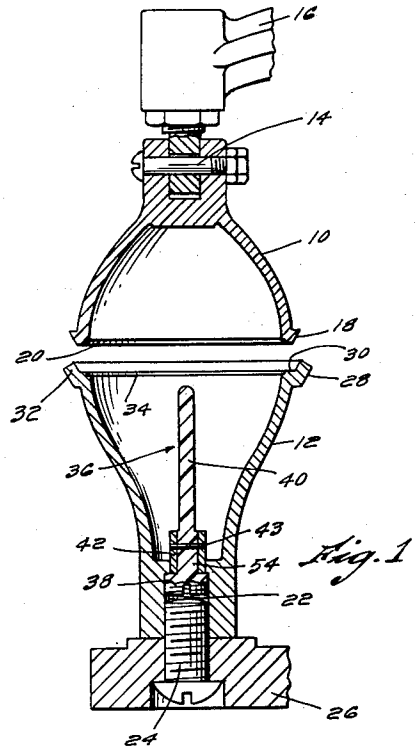


Fig. 1

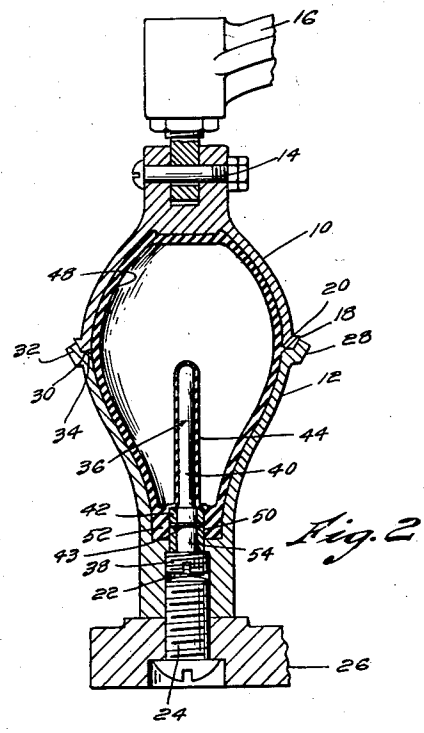


Fig. 2

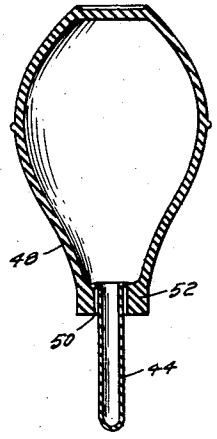


Fig. 3

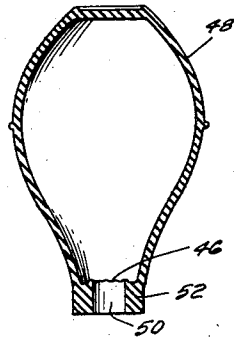


Fig. 4

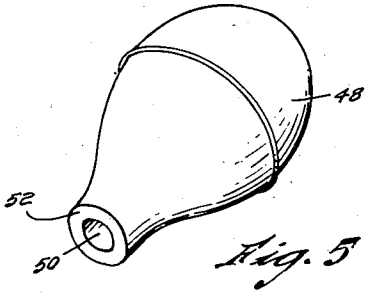


Fig. 5



Fig. 7

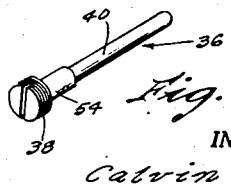


Fig. 6

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MOLD FOR FORMING OPEN-ENDED BULBS

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Application May 10, 1956, Serial No. 583,955

5 Claims. (Cl. 18—39)

The present invention relates generally to the manufacture of plastic and rubber articles, and more specifically represents a modification of certain structure disclosed in my co-pending application, Serial No. 526,228, filed August 3, 1955, and entitled "Manufacture of Inflating Bulbs."

A primary object of the instant invention is the provision of a mold particularly adapted to the manufacture of large neck inflating bulbs, such as syringe, aspirator, and evacuation bulbs.

Another object of the instant invention is the provision of a mold which will form such an inflating bulb complete with neck passage in one operation.

Another object is the provision of a mold of the character described having novel and improved pin means therein for providing the desired neck passage in the bulb and for simultaneously insuring that the bulb neck will be relatively thick and built up.

A further object of the instant invention is the provision of a mold particularly adaptable to the manufacture of relatively large bulbs of the character described.

Other objects, features and advantages of the invention will become apparent as the description thereof proceeds when considered in connection with the accompanying illustrative drawings.

In the drawings which illustrate the best mode presently contemplated by me for carrying out my invention:

Fig. 1 is an elevation in section of a mold embodying the instant invention in separated relation;

Fig. 2 shows the mold of Fig. 1 in operative position with the bulb formed therein;

Fig. 3 is a sectional elevation of a bulb formed in accordance with the instant invention after removal from the mold;

Fig. 4 is a sectional elevation of the bulb of Fig. 3 after the resilient closure has been broken away;

Fig. 5 is a perspective detail of a bulb made in accordance with the instant invention;

Fig. 6 is a perspective detail of the pin element which forms a part of the instant invention; and

Fig. 7 is a perspective detail of a collar element that forms a part of the instant invention.

As described in detail in my co-pending application, Serial No. 526,228, filed August 3, 1955, there has been provided a way to mold resilient bulbs of the type used in connection with syringes and the like in a single operation. More specifically, the mold comprises an upper bulb section **10** and a cooperating lower bulb section **12**. Section **10** is pivotally mounted as at **14** to an outwardly extending arm **16** which extends from a central hub, not shown. It will be understood that a plurality of the radially extending arms **16** may be provided for establishing a rotary mold of the gang type. In view of the fact that this structure forms no part of the instant invention, however, no detailed description thereof is deemed necessary. It will be noted that the upper bulb section **10** is provided with a peripheral bead **18** at its lowermost edge, and on the interior of said lowermost edge there is provided an annular recess **20**.

The lower bulb section **12** is provided with a threaded bore **22** at its lower extremity for receiving a screw **24** which mounts said lower section to a plate or support **26**. The upper edge of section **12** is provided with an annular upper rim **28** having a flat portion **30** and an upwardly inclined portion **32** which cooperate with the peripheral bead **18** to form a snug enclosure when the sections are brought together, all in a manner clearly illustrated in Fig. 2. Lower section **12** also carries an annular recess **34** which cooperates with the aforementioned recess **20** to provide an annular internal groove in the assembled or closed mold.

It will be understood that the plate or support **26** and the arms **16** are adapted to rotate as a unit about the hub (not shown) and that arm **16** may be raised and lowered by any desired means to open and close the mold. Thus when the mold sections are in the position of Fig. 1, it is only necessary to swing the upper mold section slightly away from the lower section whereby the proper amount of moldable liquid may be poured into the latter. It has been found that a plastic material known to the trade as "Plastisol," which material actually is polyvinylchloride, has proven to be particularly adaptable to this molding operation although it will be understood that any other material in liquid form which can be cured into a flexible hollow form, such as latex in solution, may be utilized if desired. After the proper amount of moldable liquid has been poured into the lower mold, the mold sections are locked together and are rotated in a curing oven in a manner well known in the art.

Since the instant invention is adapted to the one operation molding of single- or double-necked bulbs of the type disclosed, an internally extending pin element **36** is carried by the lower bulb section **12**. It will be understood, however, that the same pin structure could be utilized on the upper mold section also should it be desirable to form a double-necked bulb. The pin **36** comprises an externally threaded head **38** which is adapted to be threadedly received by the bore **22**. Pin **36** further comprises an elongated shank portion **40** and a shoulder portion **42**, the outer diameter of which determines the size of the passage to be formed in the bulb neck. As described in my aforementioned co-pending application, a thin covering **44** will form over shank **40** during the molding operation, which covering will be pulled inside-out when the molded bulb **48** is removed from the lower mold section. The covering **44** is then in the position shown in Fig. 3 and may be easily broken away whereby the bulb assumes the appearance of Fig. 4. As illustrated therein, any burrs or irregularities such as shown at **46** will be disposed interiorly of the completed bulb and will not be visible.

In the manufacture of inflating bulbs of the type described, it is desirable that the completed bulb have an enlarged or built-up neck portion surrounding the passage aperture **50**. It is also important that the covering **44** be relatively thin so that it may easily be broken away from the completed bulb **48**. And in addition to these features, it is, of course, necessary that the bulb itself be of the desired thickness. When making relatively small bulbs, the aforementioned factors do not present a very serious problem. However, when relatively large bulbs are being molded in the aforedescribed manner, a very real and serious problem exists with respect to the factors just enumerated. Therefore, in accordance with the instant invention, means are provided for overcoming these problems, and thus it follows that my invention is of particular value in connection with the molding of relatively large bulbs.

Since it has been found that the thickness or amount of build-up of polyvinylchloride which results during the aforedescribed molding operation is directly proportional to the heat applied at any given location, I have found it desirable to provide a pin **36**, the shank portion of which is of a material having a relatively low coefficient of heat conductivity, while the shoulder portion thereof is of a material having a relatively high coefficient of heat conductivity. The mold sections **10** and **12** are preferably constructed of a material, the heat conductivity of which is less than that of said shoulder portion but greater than that of said shank portion. Thus I construct the pin **36** of a plastic material, preferably that which is known to the trade as "Teflon" and which chemically is known as polytetrafluoroethylene. I find that satisfactory results can be obtained, however, by making the pin **36** of a plastic known to the trade as "Kel-f," which chemically is trifluorochloroethylene. Since these plastics are characterized by a relatively low coefficient of heat conductivity, it will follow that the covering **44** which forms thereon will be relatively thin, and hence said covering may be easily broken away from the completed bulb in the manner aforedescirbed.

Since it is desired to provide a thick and built-up neck section, however, such as shown at **52**, I make the shoulder portion **42** of the pin **36** of a material characterized by a high coefficient of heat conductivity. Thus the shoulder **42** may actually comprise a separate element, such as a copper collar which is a press fit over enlarged portion **54** of shank **40** and abuts against head **38**. In some instances, it may be desirable to actually pin or stake the collar **42** in position, as shown at **43**. Since the shoulder or collar **42** is highly heat conductive, it will follow that a relatively large degree of heat will accumulate in the area of the mold where the neck portion is to be formed, thus insuring that a solid neck portion, such as shown at **52**, will result. The mold sections themselves are preferably constructed of aluminum whereby to result in the provision of a completed bulb having a thickness somewhere in between the thickness of the covering **44** and the neck portion **52**.

Thus it will be seen that the instant invention presents a modification which enables my original invention as disclosed in my afore-referred-to co-pending application to be successfully utilized in connection with the manufacture of relatively large bulbs. The basic concept of the invention is the provision of an internally extending pin, the shank portion of which is of a material having a relatively low coefficient of heat conductivity while the shoulder portion thereof is highly heat conductive. Without my invention, it has been found that relatively large bulbs are formed with an inwardly extending sleeve or hub at the passage rather than the desired solid neck portion shown at **52**. Not only does this result in an article which is not as effective or durable in use, but it also poses a problem when tearing away the resilient

covering **44** since there is a tendency for the entire sleeve or hub to rip off.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

I claim:

1. A mold for use in the manufacture of hollow resilient bulbs having a neck portion with a passage extending therethrough, said mold having a lower bulb section, an upper cooperating bulb section separably mounted thereon, and a pin element extending inwardly from one of said sections, the portion of said pin adjacent to the section from which it extends being of a more highly heat conductive material than that of said sections.

2. A mold for use in the manufacture of hollow resilient bulbs having a neck portion with a passage extending therethrough, said mold having a lower bulb section, an upper cooperating bulb section separably mounted thereon, and a pin element extending inwardly from one of said sections, the portion of said pin most closely adjacent to the section from which it extends being more highly heat conductive than said sections, while the remainder of said pin is of a material characterized by a lesser degree of heat conductivity than said shell.

3. A mold for use in the manufacture of hollow resilient bulbs having a neck portion with a passage extending therethrough, said mold having a lower bulb section, an upper cooperating bulb section separably mounted thereon, and a pin element extending inwardly from one of said sections, said pin having a shoulder portion adjacent the section from which the pin extends, and a relatively thin shank portion extending inwardly therefrom, said shoulder portion being of a material having a greater degree of heat conductivity than said sections, and said shank portion being of a material having a lesser degree of heat conductivity than said sections.

4. In the mold of claim 3, said sections being of aluminum and said shank portion being constructed of polytetrafluoroethylene.

5. In the mold of claim 4, said shoulder portion comprising a separable copper collar.

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