

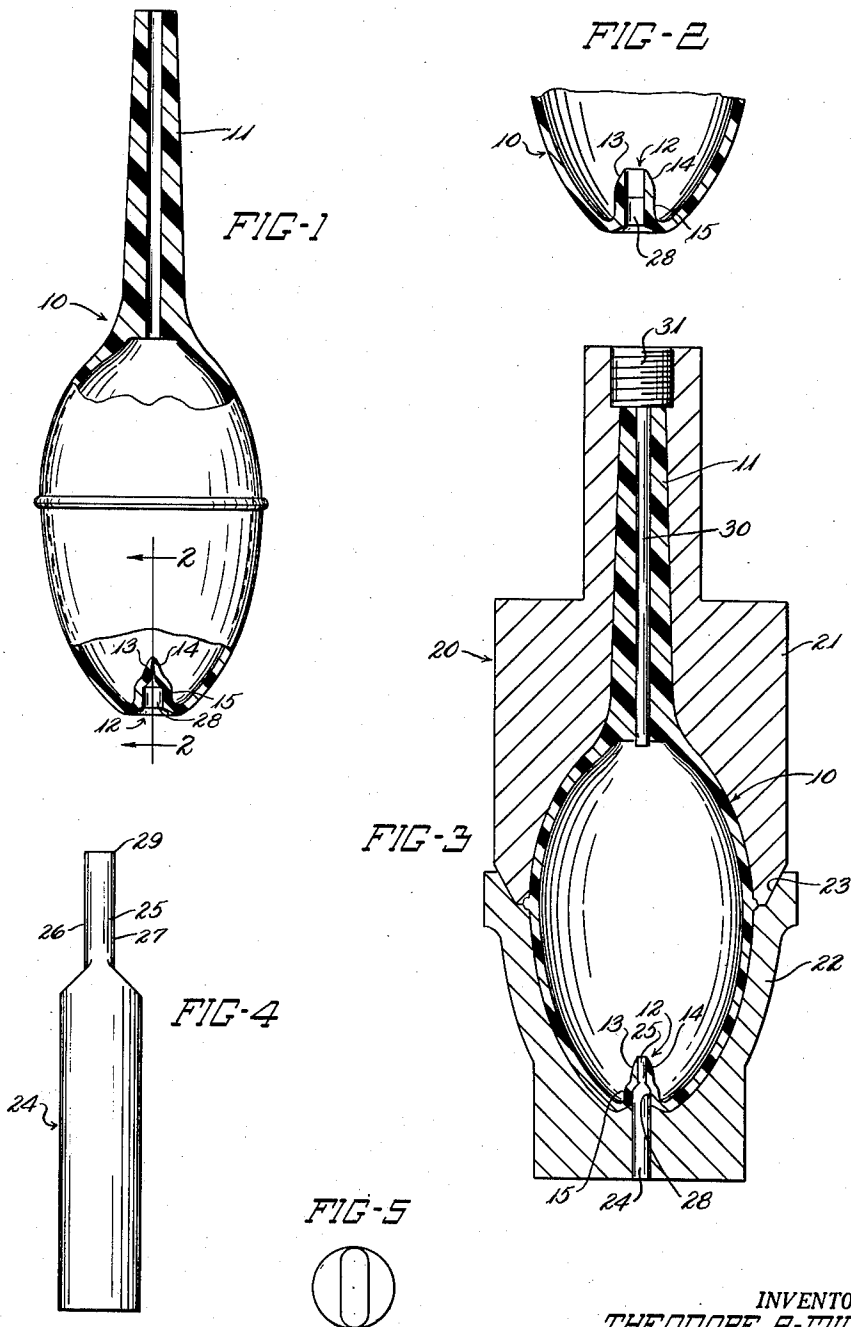
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T. A. MILLER

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VALVED FLEXIBLE HOLLOW ARTICLE

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INVENTOR.
THEODORE A. MILLER
BY
Oldham & Oldham

ATTY'S

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VALVED FLEXIBLE HOLLOW ARTICLE

Theodore Albert Miller, Cuyahoga Falls, Ohio

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4 Claims. (Cl. 222—215)

This invention relates to valved flexible hollow articles and is especially useful in the manufacture of syringe and other bulbs or hollow flexible articles where it is desired to provide a valved aperture to permit the flow in one direction only.

Heretofore, it has been proposed to employ hollow flexible bulbs to advance fluids as in syringe bulbs and the like and these bulbs have had apertures in which valves of metal were inserted. Such devices presented certain difficulties in that the valves were often forced from the apertures, did not operate as fast as was desirable, were influenced by position of the bulb in their operation, and became corroded when contacted by certain solutions.

It has also been proposed to provide valves made of non-corrodible flexible material and to assemble them with a hollow article by cementing or vulcanizing them in place, but such valves could not be adapted to syringe bulbs and the like having only very small apertures.

The present invention aims to overcome the foregoing and other difficulties.

It is an object of the present invention to provide a hollow flexible article with an integral valve of the same material.

Another object is to provide a valved bulb capable of operating at a faster cycle of operations.

Another object is to provide for forming the bulb and its valve of the same material in a single operation.

Another object is to provide a valved bulb article without the necessity of trimming operations.

These and other objects will appear from the following description and the accompanying drawings.

Of the drawings:

Fig. 1 is a side view partly broken away and partly in section of a valved bulb constructed in accordance with and embodying the invention.

Fig. 2 is a sectional detail view thereof, taken on line 2—2 of Fig. 1.

Fig. 3 is an axial sectional view of the bulb and its mold before the bulb is removed therefrom.

Fig. 4 is an enlarged side view of a mold pin of the mold of Fig. 3.

Fig. 5 is an end view of the mold pin.

Referring to the drawings, the numeral 10 designates a syringe bulb constructed in accordance with and embodying the invention. The bulb terminates at one end in a long tubular neck 11 and at its opposite end has a valve 12 formed integrally with the bulb. The valve has a pair of lips 13, 14 extending inwardly of the bulb as continuations of an inwardly directed tubular stem 15, the lips bearing against one another and tapering toward their meeting lips so as to provide a valve which will permit air to enter the bulb by parting of the lips but will strongly prevent flow of air in the opposite direction. Due to stresses in the lips brought about by cooling of the article and consequent shrinkage after molding, the lips are pressed against one another and are quick acting in return from an open position making possible fast cycles of operation of the syringe.

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While valves of this type have been heretofore proposed, such valves have always required separate manufacture and assembly with inflatable articles by cementing, vulcanizing or other securing means.

The valve of the present invention is constructed simultaneously with a hollow article such as the bulb and of the same material and this is made possible apparently because of its mode of manufacture. In making the valved hollow article, a mold 20 is provided having separable mold members 21, 22 held in alignment with each other by a female socket 23 formed on one mold member and a conical lip of the other member for sealing therein.

For forming the valve member of the article, a pin 24 is inserted in an axial aperture of the mold member 22 and projects therebeyond into the mold cavity. The inwardly projecting end 25 of the pin is of reduced thickness in one direction to provide a portion of oval cross-section having relatively flat and substantially parallel faces 26, 27. The round shank of the pin extends into the mold cavity a considerable distance so as to form a round entrance 28 to the valve.

The pin 24 is formed with a sharp peripheral edge 29 at the end of the flattened portion. For providing the bore of the neck portion, a core member 30 of round cross-section is mounted in the mold, as by a threaded member 31 at its face engaged in a threaded axial bore of the mold member 21. The pin 30 projects well into the bulb cavity of the mold and is provided with a sharp peripheral edge at its innermost end.

In making the valved article, an accurately weighed or measured quantity of plastisol, a liquid thermo-setting plastic material having a vinyl resin base, is introduced into the cavity and the mold is closed and held closed by clamping means. Thereafter, the mold is rotated about a plurality of axes to distribute the plastisol over the mold surfaces while the mold is heated to gel and thermoset the plastisol. By so constructing the mold that the pins 24 and 30 project sufficiently into the mold cavity, by providing the sharp peripheral edges on the ends of those pins, and by accurately measuring the mold charges, substantial coating of plastisol over the end faces of pins 24 and 30 is provided and no trimming of rim from the article is necessary.

As the bulb is withdrawn from the mold, the bulb may be grasped and rotated slightly which breaks any film of deposited material at the mouth of the valve should such a film form across the end of the valve molding pin, it will tear along one flat edge of the film and remain attached at the other lip of the valve providing good valve action.

During the thermosetting of the plastisol material, shrinkage of the material takes place. Also, after the article is removed from the mold, additional shrinkage takes place. The effect of such shrinkage is to cause the lips of the valve to close upon one another providing a normally closed valve adapted to be opened only by flow toward the interior of the bulb.

The valved article is of one piece construction with no loose parts to become lost. Also the entire article is of non-corrodible non-metallic material which will resist most chemicals. Due to the one piece construction, the valve is positive and fast in action permitting the bulb to be operated at a higher frequency. When the bulb body is compressed, the lip portions are forced together in making engagement so as to prevent passage of air outwardly.

Thus, it will be seen that the objects of the invention have been accomplished.

Variations may be made without departing from the scope of the invention as it is defined by the following claims.

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What is claimed is:

1. A valved flexible one piece molded hollow article comprising a substantially closed hollow body having an inlet aperture and a one-way valve integral with the article and extending within the article at said aperture in communication therewith, said valve comprising a tubular sleeve terminating inwardly of the article in a pair of opposed flexible flat lips molded in spaced apart relation but after molding engaging each other in sealing relation by virtue of tensions in said lips resulting from cooling the article after forming it.

2. A one piece molded syringe bulb comprising a substantially closed hollow flexible body of material having an air inlet aperture and a one-way valve at said aperture within the body and communicating with said aperture, said valve being integral with said body and comprising a tubular sleeve terminating inwardly of said body during molding of the bulb in a smooth walled oval bore having spaced apart flat walls providing in the article after molding a pair of substantially flat lips pressed against each other in sealing engagement by virtue of tensions in said lips resulting from cooling the article after forming it.

3. The method of making a valved flexible hollow article which comprises introducing a measured amount of plastisol into a hollow mold cavity having a pin with an end portion of substantially uniform cross-section of oval cross-section extending into said cavity terminating in a

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sharp peripheral edge, rotating the mold about a plurality of axes while heating it to gel and thermoset the plastisol, opening the mold, and removing the article from the mold with a rotative action about the axis of the pin to break any plastisol extending across the inner end of the pin.

4. A valved one piece molded flexible hollow article comprising a bulbous hollow body closed except for a small outlet at one end thereof and a small inlet at its opposite end, said inlet comprising an inwardly directed tubular extension of the wall of the article terminating in a one-way valve and having a smooth bore of round cross-section near the wall of the body and of flattened oval cross section inwardly thereof defining a pair of flat opposite lips spaced apart during molding of the article but held in face to face sealed relation by stresses in the molded article due to shrinkage after molding.

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