

PATENT SPECIFICATION

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DRAWINGS ATTACHED

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(54) IMPROVEMENTS IN OR RELATING TO APPARATUS
 FOR MOLDING HOLLOW OBJECTS FROM
 THERMOPLASTIC MATERIALS

(71) I, STEWART PIVAR, a citizen of the United States of America, residing at 1 Lynn Drive, Muttontown, Long Island, State of New York, United States of America, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to apparatus for molding hollow objects and especially to molding objects from thermoplastic materials.

In accordance with the present invention, there is provided an apparatus for molding hollow objects comprising a mold, means for rotating the mold about an axis, and a support for the mold comprising a stand providing a fulcrum for rocking the apparatus from a position in which the rotational axis of the mold is generally horizontal to a position in which the said axis is inclined and the apparatus rests on the said fulcrum and on a further support member with the centre of gravity of the apparatus lying above and between the said fulcrum and the said member.

An illustrative embodiment of the invention is hereinafter described with reference to the accompanying diagrammatic drawings, in which:

30 Figure 1 is a diagrammatic side-elevational view of an apparatus in accordance with one embodiment of the invention, the apparatus being in an inclined attitude;

35 Figure 2 is a similar view of the same apparatus in a horizontal attitude; and

40 Figure 3 and 4 are respective diagrammatic side-elevational views of a mold and a mold lid used in the apparatus of Figs. 1 and 2.

In the drawing is shown a supporting frame or stand 1 capable of being selectively set in an inclined position as illustrated in Fig. 1 or in a horizontal position as in Fig. 2 by means of handles 2 or by means of any convenient mechanical or hydraulic system (not

shown). The stand 1 is constructed to have two stable positions of equilibrium, this resulting from the provision of a flat bottom 1a (or the equivalent thereof) and a brace structure 1b with the lower stand edge 1c providing a fulcrum in appropriate relation to the center of gravity of the overall structure about which the apparatus can be rocked from the stable position of equilibrium of Fig. 2 to that in Fig. 1 in which the apparatus rests on the edge 1c and on a further support member constituted by the brace structure 1b.

The frame has rotatably mounted thereon a mold 3 which is shown, for example, as being cylindrical, the mold 3 being supported for rotation about axis A by a drive bracket 4 permanently attached to the center of the bottom 3a of the mold. The mold 3 is also supported for rotation by a support pin 5 fixed to the center of a diametral cross bar 6 which is attached to opposite sides of a large opening 7a in the rim 7b of a mold lid 7. Mold 3 is generally symmetrical with respect to axis A.

The drive bracket 4 is removably attached to a drive shaft 8 by pins 8a and 8b. The support pin 5 withdrawably enters the base of a plunger clamp shaft 9 by means of which it is supported and within which pin 5 is free to rotate.

The plunger clamp shaft 9 engages and disengages the support pin 5 due to the action of a plunger clamp 10 which controllably moves the plunger clamp shaft back and forth a few inches in each direction when a mold is to be mounted or taken away. The drive shaft 8 is rotated by a drive motor 11 and conventional power transmission gear system 12.

The mold 3 is open at end 3b and is supported for rotation at the open end by means of the aforesaid lid 7 which includes a narrow flange 7c fitting removably over the periphery of the mold and which consists also of the narrow flat powder retaining rim 7b (mentioned above), the function of which is to

constrain the charge from falling out of the mold when the mold is in a horizontal position.

5 A gas burner 17 is attached to the frame 1 in a position beneath the mold so as to direct heat upwardly against the outer surface of the rotating mold without allowing heat to enter the opening in the mold lid 7. For this purpose, the burner terminates at end 17a which is substantially aligned with the end 9a of shaft 9.

10 The plunger clamp 10 is supported by the plunger clamp support 16 which is attached adjustably to the frame 1 in such a way that its position can be altered back and forth longitudinally so that the apparatus can accommodate molds of varying lengths. This adjustment is of a type that can be made in a few seconds to permit an operator of the apparatus to use selectively molds of different sizes.

20 The burner 15 is attached to the frame 1 by means of telescopic burner supports 17b which are capable of raising or lowering the burner quickly to accommodate molds of different diameters or widths.

The steps for producing a molded article such as a container molded of powdered polyethylene are outlined below:

30 The lid 7 is assembled on the mold 3 and the mold is mounted for a molding operation by engaging the drive bracket 4 with the drive shaft 8 and by then engaging the support pin 5 with the plunger clamp shaft 9 by use of the plunger clamp 10. The machine is set in the inclined position as shown in Fig. 1 and a preweighed charge of molding powder is poured in through the opening in the lid. The rotation is started by motor 11 and the burner is lighted. It may be mentioned at this point that, if the charge is very large, only a portion of it need be introduced at the beginning. The remainder can be added later in the molding cycle. It is not necessary to stop the rotation to add additional powder.

40 The rotation is allowed to continue for a timed interval which is generally one to five minutes at the end of which time the bottom of the mold has been sufficiently coated to provide the desired wall thickness. The machine is then set in the horizontal attitude illustrated in Fig. 2. Rotation is permitted to continue until the remainder of the mold has been coated and fusion is complete. This can be verified visually by observing the inside of the mold through the opening in the lid. This part of the molding cycle generally takes one to ten minutes, although very large moldings with thick walls can take even longer depending also on the characteristics of the material being used.

60 Modifications can take place in this procedure. For example, an observed thin area can be corrected by adding additional molding

powder and returning the machine to the inclined position if necessary. At completion of the article, the mold is dismounted from the machine by disengaging the plunger clamp shaft 9 from the support pin 5 and then disengaging the mold support bracket 4 from the drive shaft 8. The mold is then set aside to cool preferably with the use of a fan which blows air into the opening in the lid.

70 The molding procedure described above can be modified by returning the machine to the inclined position more than once and by changing the timed intervals for the two positions to vary the wall thickness of the bottom and the sides of the molded article. When very heavy parts are being molded, which may weigh hundreds of pounds, it is found efficacious to introduce the charge into the mold a small portion at a time. A large mass of uncongealed molding material is capable of absorbing heat from the sides of the mold thereby slowing the molding process. For this same reason, it is sometimes found desirable to introduce no material at all until the empty mold has reached a temperature capable of causing fusion.

80 Certain specialized types of molded articles can be molded in the process described in the present invention due to some uniquely convenient features of the process. For example, a multiplicity of colors or materials can be embodied in a single article. By consecutively adding differently pigmented materials during the cycle, moldings can be made, the outside of which is colored differently than the inside. By using one color in the inclined stage of the cycle and another in the horizontal stage it is possible to produce articles the bottom of which is colored differently than the sides. A simple procedure permits the molding of articles with decorative or identifying stripes or bands of contrasting color. This is accomplished by starting the cycle in the horizontal position and adding small amounts of material to narrow portions of the mold. This last technique is possible because of a phenomenon peculiar to this invention, namely that during most of the molding cycle the unmolded material remains generally, longitudinally motionless with respect to the axis of rotation.

110 The process described above lends itself admirably to the production of moldings embodying molded-in inserts of other materials such as metal members to achieve stiffness or strength, handles, fittings to accommodate pipe connections and other contrivances which can materially increase the utility of the molded part. This procedure is especially convenient because of the ability to halt the molding cycle at a time before the entire charge has been introduced into the mold and at which all the material previously introduced has adhered or fused to the walls of the mold. An insert set in place at this time will be

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molded in place by the addition of the remainder of the charge. The inside of the mold is very accessible due to the opening in the lid. This opening is typically large
5 enough for the operator to reach both arms into the mold and gain access to any part or zone therein.

WHAT WE CLAIM IS:—

1. Apparatus for molding hollow objects
10 comprising a mold, means for rotating the mold about an axis, and a support for the mold comprising a stand providing a fulcrum for rocking the apparatus from a position in which the rotational axis of the mold is
15 generally horizontal to a position in which the said axis is inclined and the apparatus rests on the said fulcrum and on a further support member with the centre of gravity of the apparatus lying above and between the said
20 fulcrum and the said member.

2. Apparatus as claimed in claim 1, in which the mold comprises a cylindrical body with a bottom and an open end and a cover detachably engaged with the body at the open
25 end, the cover having an open central portion to permit a visual access into the mold and a rim portion concentrically disposed

around the open end to retain material in the mold when the axis is horizontal.

3. Apparatus as claimed in claim 2, in which the cover includes a diametral part extending across the opening, the means for rotating the mold including elements at each end of the mold which are coupled in driving relationship with the bottom and the diametral
35 part.

4. Apparatus as claimed in any of claims 1 to 3, in which the drive means is mounted on the stand.

5. Apparatus as claimed in any one of claims 1 to 4, including a burner mounted on the stand and moveable therewith.

6. Apparatus as claimed in claim 5, in which the burner includes support means by which the burner is adjustable radially relatively to the mold axis to accommodate different sizes of molds.

7. Apparatus for molding hollow objects, substantially as herein before described with reference to the accompanying drawings.
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