June 6, 1950 H. E. RENAUD 2,510,907

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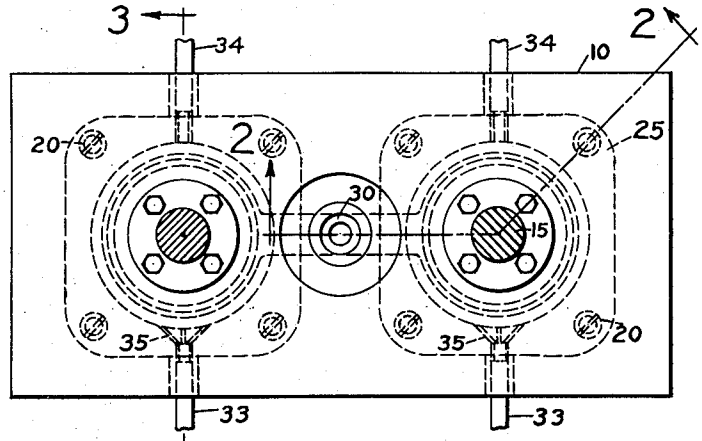


FIG. 1.

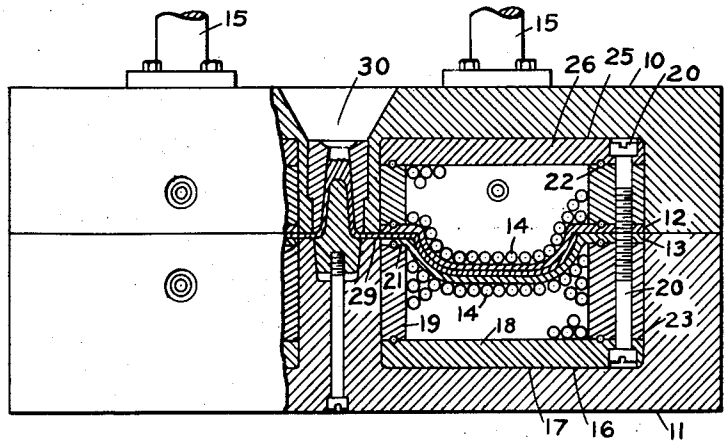


FIG. 2.

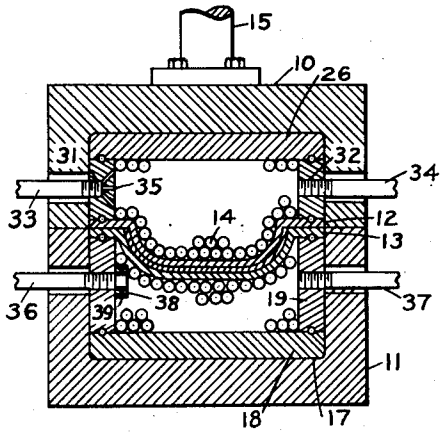


FIG. 3.

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9 Claims. (Cl. 18—42)

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This invention relates to dies and more particularly to dies for molding molten metals and non-metallic plastics.

One common method of making the cooperating parts of multi-part dies for forming metal die castings or plastic moldings is to electrodeposit a relatively thick coating of a suitable metal, such as chromium, copper, or the like, upon a form. The die members so made are attached to die holders and used in making die castings and molding non-metallic plastics in the usual way. Difficulties are encountered in the use of such dies, however, in backing the die members so as to suitably reinforce the same, as well as to provide for cooling the dies where hot plastics or molten metals are cast in the die.

The principal object of the present invention is to provide a die of this general character with a backing material that reinforces the die members.

A further object is to provide a simple means for cooling such dies.

These objects, as well as others ancillary thereto, will more fully appear in the following specification when read in connection with the accompanying drawings, wherein:

Figure 1 is a plan view of a double die utilizing the present invention;

Figure 2 is a fragmentary cross-sectional view taken on substantially the line 2—2 of Figure 1; and

Figure 3 is a cross-sectional view taken on substantially the line 3—3 of Figure 1.

In general, the die shown in the drawings comprises upper and lower die holders 10 and 11 respectively, upper and lower cooperating die members 12 and 13 respectively, and backing material for the die members in the form of steel balls 14.

The die shown in the drawings is of the double type or, in other words, one which includes two separate set of dies of identical form which are filled from the same gate. The upper and lower die holders 10 and 11 are preferably steel blocks suitably formed. They are adapted to be connected to a ram and a bed of a press, respectively, not shown. The upper die member 10 is connected to the ram by means of vertical bars 15. The lower die holder 11 rests upon the bed of the press and is attached thereto in any suitable manner.

The lower die holder 11 is provided with two generally square, relatively deep cavities 16 to receive female die members 13 and supports 17 therefor. The supports may be in box shaped form, open at the top, and fashioned to fit relatively snugly within the cavities 16. Preferably each die support 17 comprises a bottom plate 18 and a continuous side wall 19. They are bolted together by a plurality of vertically extending bolts 20 which also connect the die member 13 to the side wall 19.

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The die member 13, as are all of the other die members used in the die, is preferably made by electro-depositing a suitable metal, such as chromium, upon a mold until the die is of the desired thickness. Usually the thickness of such die members is on the order of $\frac{3}{16}$" to $\frac{1}{4}$".

In the die shown the upper surface of the die member is the molding surface. It is shaped to conform to the finished article to be molded. It is also provided with a perimetral flange 21. The flange 21 has a plurality of tapped openings therein to receive the threaded ends of the bolts 20. Preferably both the upper edge of the side wall 19 of the die support and the lower surface of the flange 21 are provided with cooperating perimetral grooves to receive a gasket 22, thereby sealing the joint between these two parts. A gasket 23 is also placed between the bottom wall 18 and the side wall 19 of the die support 17.

The hollow space bounded by the die member 13, the bottom wall 18 and side wall 19 of the die support is tightly packed with a multiplicity of relatively small incompressible solids. Preferably these solids are in the form of stainless steel spherical balls. The balls are placed within the die support during assembly of the die member and die support. Balls of varying diameters may be used in order that there will be a good contact between a large number of the outermost balls and the adjacent walls of the die member and the die support. Preferably the diameter of the balls will be on the order of $\frac{1}{8}$" to $\frac{3}{16}$" in diameter. It is important that there be spaces around all of the balls for the passage of cooling fluid in a manner which will be set forth presently.

The upper die holder 10 is provided with a pair of cavities 25 to receive die supports 26 and male dies 12. The die supports 26 and die members 12 are constructed in a manner similar to the die 13 and die support 17 previously described. The hollow space formed by the die support 26 and die member 12 is packed with spherical steel balls 14 in the same manner as the die support 17.

Both upper and lower die holders 10 and 11 are provided with passageways for the admission of molten metal or non-metallic plastic in fluid form. These passageways are indicated by the

numeral 29. The passageways 29 open into a gate 30 in the upper die holder 10 through which the metal or plastic may be poured.

Each of the upper and lower parts of each die are provided with an inlet and an outlet for cooling fluid. These are shown best in Figure 3. The upper die support 26 is provided with opposed tapped openings 31 and 32. They receive an inlet conduit 33 and an outlet conduit 34 respectively. Preferably the opening 31 for the inlet conduit does not go completely through the side wall of the die support 26. Instead, the inner end of the relatively large opening 31 communicates with a plurality of obliquely extending small apertures 35. Thus, when fluid is passed through the conduit 33 into the interior of the die support 26 the fluid will be diverted in several directions in order to follow the contour of the interior of the die support and the back of the die member 12, so as to effectively cool the same.

The lower die support 17 is provided with an inlet conduit 36 and an outlet conduit 37 threaded into opposite walls of the die support. Preferably the inner end of the inlet conduit 36 is provided with a head 38 having laterally extending apertures 39 so as to divert the fluid and disseminate it through the interior of the die support.

In molding an object from molten metal or fluid plastic, as in the present invention, the upper and lower die holders with their associated die members are brought into tight fitting contact by means of the ram. The fluid plastic or metal is then poured through the gate 30 from whence it flows between the opposed die members 12 and 13. There it is allowed to solidify. After the dies have been filled with the fluid material, cooling fluid is passed through the inlet conduits 33 and 36 into the hollow interiors of the die supports and out through the outlet conduits 34 and 37. Due to what may be termed the cellular construction of the backing of the die members, namely, that produced by the spaces between the steel balls 14, the cooling fluid can reach all parts of the interiors of the die members and effectively cool the same. At the same time the spherical steel balls that form the backing for the die members contact the latter at a multiplicity of closely spaced points and thereby effectively reinforce the die members and hold them in their proper shape.

From the foregoing it will be seen that the present invention provides both a simple and effective manner of reinforcing die members of the plate like type, as well as providing for efficient and rapid cooling of the same.

The scope of the invention is indicated in the appended claims.

I claim:

1. A die comprising a pair of opposed hollow relatively movable rigid die supports open at their sides adjacent to each other, a pair of cooperating die members attached to the respective die holders at the open sides thereof, and backing means for said die members comprising a multiplicity of relatively small incompressible individual solids filling said die supports in tightly packed relationship, the outermost of said solids contacting the adjacent walls of said die supports and the backs of said die members.

2. A die as defined in claim 1 wherein said solids are of spherical form.

3. A die as defined in claim 1 wherein said solids are spheres of varying diameters.

4. A die comprising a pair of cooperating relatively thin die members adapted to be placed in juxtaposition to each other to form a mold, hollow rigid die supports attached to said die members at the sides of the latter remote from each other, and backing means for said die members comprising a multiplicity of relatively small incompressible individual solids, filling the space within said die supports in tightly packed relationship, the outermost of said solids contacting the adjacent walls of said die supports and the adjacent sides of said die members.

5. A die as defined in claim 4 wherein said solids are corrosion resistant steel spheres.

6. A die as defined in claim 4 wherein said die holders are provided with inlet and outlet conduits for the passage therethrough of cooling fluid.

7. A die comprising a pair of opposed hollow relatively movable rigid die supports open at their sides adjacent to each other, a pair of cooperating die members attached to the respective die supports in sealed engagement therewith, inlet and outlet conduits connected to each of said die supports for the passage of cooling fluid therethrough, and backing means for said die members comprising a multiplicity of relatively small incompressible solids filling said die holders in tightly packed relationship, the outermost of said solids contacting the adjacent walls of said die supports and the backs of said die members.

8. A die as defined in claim 7 wherein said solids are of spherical form.

9. A die as defined in claim 7 wherein said solids are spheres of varying diameters.

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