

[54] PRESS TOOLS AND DIES

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[51] Int. Cl.B21k 5/20

[58] Field of Search72/475, 476; 264/225; 76/107 R

[56]

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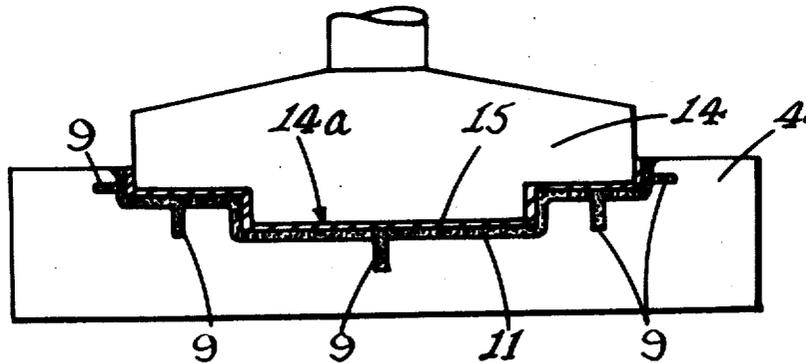
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[57]

ABSTRACT

A method is disclosed for producing dies, tools and the like adapted for use in conjunction with a press wherein a backing element having the general configuration of the would be die is provided with a thin skin of polymeric material having a profile which corresponds exactly in shape and dimensions to the integers of the would be die. A particular method of forming the skin on the backing element is also disclosed.

4 Claims, 5 Drawing Figures



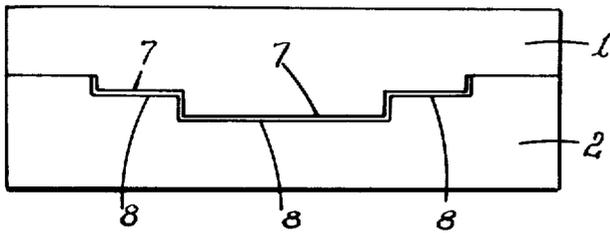


Fig. 1.

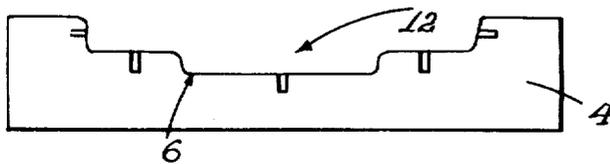


Fig. 2.

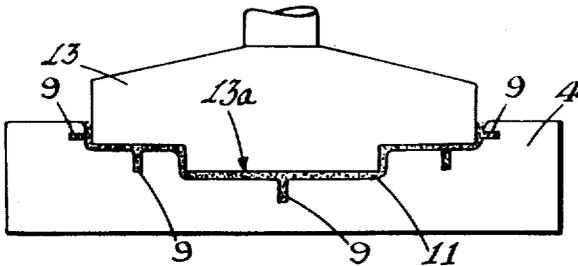


Fig. 3.

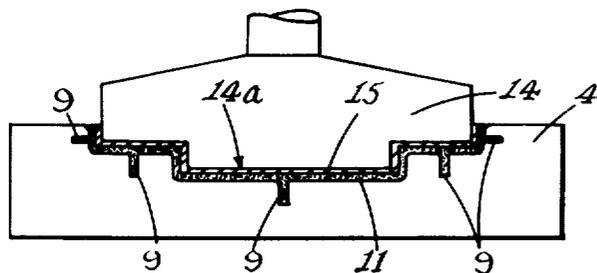


Fig. 4.

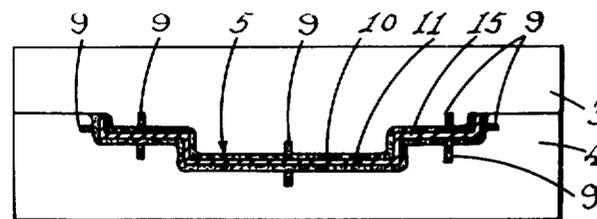


Fig. 5.

PRESS TOOLS AND DIES

This invention relates to press dies and tools and to a novel method of manufacturing such dies and tools.

Most dies are manufactured by the conventional method in which a wood, epoxy or plaster pattern is first produced. By means of a die sinking machine, the pattern so produced is transformed into a die manufactured from a suitable metal alloy. The various processes in the production of the die demand the use of highly skilled tool and/or pattern makers and this in turn contributes to the high cost of these dies. In most cases, the dies are not an economic proposition unless a large production run is contemplated.

Various arrangements have therefore been proposed whereby the cost of producing dies is reduced. In one arrangement, use is made of an epoxy resin for forming the tool, the main stress points being reinforced with metal inserts. For various reasons, these proposals have not met with success.

Accordingly it is an object of the present invention to provide a method for forming dies and tools which the applicant believes will at least lead to a reduction in the production cost of the die.

According to the invention a method of producing dies, tools and the like adapted for use in conjunction with a press includes the steps of providing a backing element the profile of one of the faces of which corresponds generally in shape to the male or female integers of the desired die, and forming on the face a skin of polymeric material of which the profile of the exposed surface corresponds exactly in shape and dimensions to the shape and dimensions of the said male or female integers.

The thickness of the skin may be in the order of 20 to 50 thousandths of an inch. The polymer may be one selected from the group of polymers known to have high impact or compressive strength. Thus polymers displaying a compressive strength in the order of 9 tons per square inch may be used. Certain epoxy resins display this strength and are therefore suitable for this purpose.

The backing elements may be formed from a suitable metal alloy such as the alloy sold under the trade name "Meehanite." This alloy has a compressive strength in the order of 100 tons per square inch and may easily be formed into the shape required for the backing elements. The backing elements may be formed in a casting process.

The skin may be formed on the backing elements in a number of ways.

Preferably the skin is formed by carrying out the following steps:

- a. pouring a suitable quantity of polymeric material in fluid form into the cavity defined by the female backing element;
- b. imprinting a pattern corresponding exactly in shape and dimensions to that of the female integers of the desired die in the material;
- c. allowing the material to set;
- d. covering the imprint on the material with a layer of a moldable release agent of which the thickness is equal to that of the article to be formed in the die;
- e. imprinting on the moldable layer a pattern corresponding exactly in shape and size to that of the male integers of the desired die;
- f. pouring a suitable quantity of polymeric material in fluid form onto the imprint in the moldable layer;

g. pressing the male backing element into the polymeric material;

h. allowing the material to cure, and

i. separating the male and female die members so formed from each other.

Preferably the skin of polymeric material is secured to the backing elements by means of a polymeric adhesive which is applied to the elements after they have been cleaned, degreased and provided with keying apertures over their operative faces.

The invention also includes within its scope a die tool or the like adapted for use in conjunction with a press of which at least one of the die members includes a backing element the profile of one of the faces of which corresponds generally in shape and size to that of the male or female integers of the desired die, and a skin of polymeric material formed on this face, the profile of the exposed surface of the skin corresponding exactly in shape and dimensions to that of the male or female integers of the desired die.

A preferred non-limiting embodiment of the invention will now be described by way of example with reference to the drawings in which:

FIG. 1 illustrates two die members produced by the method according to the invention, and

FIGS. 2 to 5 illustrate various steps of the method according to the invention.

Male die member 1 and female die member 2 each include a backing element 3 and 4 respectively cast from the alloy known as "Meehanite." The profile of face 5 of element 3 corresponds generally in shape to that of the male integers 7 of member 1 while the profile of face 6 of element 4 corresponds generally in shape to that of female integers 8 of member 2.

Each element 3 and 4 is provided with a number of holes 9 disposed over its faces 5 and 6 respectively the reason for the presence of which will be explained below.

Each of the faces 5 and 6 of elements 3 and 4 is also provided with an epoxy resin skin 10 and 11 respectively, the profile of the exposed surface of which corresponds exactly in shape and dimensions to integers 7 and 8 respectively.

Skins 10 and 11 are formed as follows: Female backing element 4 defining cavity 12 is cleaned, degreased and heated to a temperature of about 45° C. A thin layer of the epoxy adhesive Araldite AV 123b together with Hardener HY 956 or Gussolite Grundierung is applied to face 6 and allowed to cure under cooling for 24 hours.

Element 4 is again heated to substantially the same temperature as before and a suitable quantity of the epoxy resin Araldite SW 417 or Gussolite-Metal Type 30 in fluid form together with Araldite Hardener SW 417 as curing agent, is poured into cavity 12 to form a layer of between 20 to 50 thousandths of an inch thick thereon.

A stamp 13 of which the profile of the operative face 13a is complementary in shape to the female integers 8 and of exactly the same dimensions, is then lowered into cavity 12 to form an imprint on the epoxy layer the pattern of which will correspond in shape and dimension to that of female integers 8. Some of the epoxy material will be forced into holes 9 of element 4 in this way keying the body of epoxy material to the element. The resin is then allowed to cure under cooling for 12

to 24 hours, whereafter stamp 13 is withdrawn from cavity 12. The cured layer of epoxy material comprising skin 11 of between 20 and 50 thousandths of an inch thick will hence adhere to element 4. The profile of the exposed surface of skin 11 corresponds exactly in shape and dimensions to that of female integers 8.

A suitable quantity of a moldable release agent such as a wax is then introduced onto skin 11 and a second stamp 14 of which the profile of its operative face 14a is complementary in shape to male integers 7 on member 1 and of the same dimensions is lowered on to the wax which is hence forced into a layer 15 of the same thickness as that of the article to be formed between members 1 and 2. At the same time stamp 14 will leave an imprint on wax layer 15 which corresponds in shape and dimensions to that of male integers 7.

A suitable quantity of the same resin as before together with the same curing agent, is then poured on to layer 15 whereafter backing element 3, which has been similarly provided with a cured adhesive as for element 4 and heated to a temperature of about 45° C, is lowered on to the resinous material which is spread out in a layer of between 20 and 50 thousandths of an inch thick.

The resin is allowed to cure under cooling for 12 to 24 hours whereafter element 3 is withdrawn from cavity 12. The epoxy material will hence adhere to element 3 as a thin skin 10 the profile of the exposed surface of which will correspond exactly in shape and size to male integers 7. Wax layer 15 is then removed from element 4 and die members 1 and 2 cleaned and prepared for use.

It will be appreciated that many forms of the invention exist each differing in matters of detail only and in no way departing from the scope of the invention. Thus, for example, many other types of resins may be suited for forming the skin on the backing elements and the invention should therefore not be construed as limited to epoxy resins. Furthermore, alloys other than "Meehanite" may be employed for the production of the backing elements and in this regard an alloy marketed under the name "Jewelrite" may be found to be suitable. Depending on the required compressive strength cast iron may also be employed in certain circumstances. The backing elements may be reinforced if

necessary to withstand the high pressures to which these elements will be subjected.

I claim:

1. A method of producing dies, tools or the like comprising a male member and female member adapted for use in conjunction with a press, including the steps of providing a male and female backing element; forming the operative faces of the elements to correspond generally in shape and dimensions respectively to that of the male and female integers of the desired members and providing the operative faces each with a skin of polymeric material the profiles of which respectively correspond exactly in shape and dimensions to that of the male and female integers of the desired die members by:

- a. pouring a quantity of polymeric material in fluid form into the cavity defined by the female backing element;
- b. imprinting a pattern corresponding exactly in shape and dimensions to that of the female integers of the desired die member in the material;
- c. allowing the material to set;
- d. covering the imprint on the material with a layer of a moldable release agent corresponding in thickness to that of the article to be formed between the members;
- e. imprinting a pattern corresponding exactly in shape and dimensions to that of the male integers of the desired male member on the moldable layer;
- f. pouring a quantity of polymeric material in fluid form on to the pattern in the moldable layer;
- g. pressing the male backing element into the polymeric material;
- h. allowing the material to set; and
- i. separating the male and female die members so formed from each other.

2. The method of claim 1, wherein the polymeric material is secured to the backing elements by means of polymeric adhesive which is applied to the elements after they have been cleaned, de-greased and provided with keying apertures on their operative faces.

3. The method of claim 1, wherein the moldable layer is wax.

4. The method of claim 2, wherein the moldable layer is wax.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,683,722 Dated August 15, 1972

Inventor(s) Edward Alexander Pears

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On the cover sheet insert -- [73] Assignee Mercury
Outboard Motors (South Africa) Limited --.

Signed and sealed this 19th day of December 1972.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents