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DIE AND ITS METHOD OF MANUFACTURE

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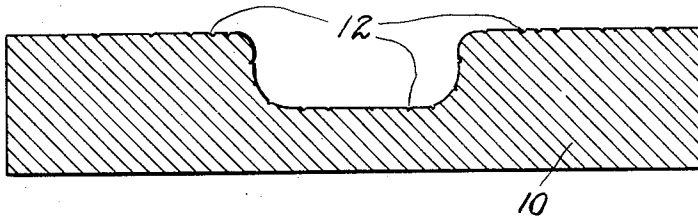


Fig. 1

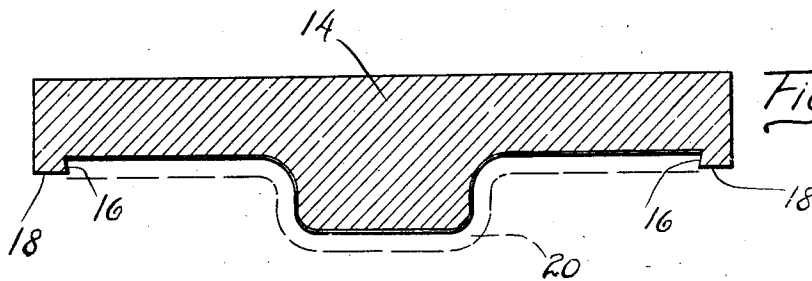


Fig. 2

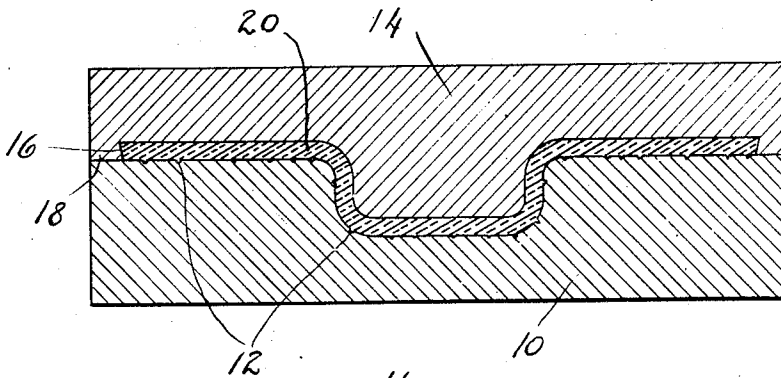


Fig. 3

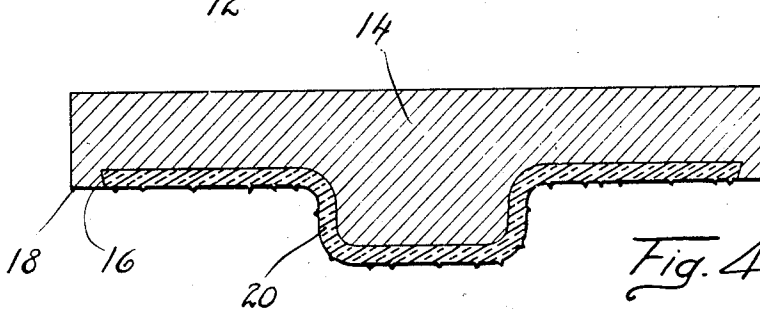


Fig. 4

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DIE AND ITS METHOD OF
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My invention relates to improvements in die constructions and in their method of manufacture.

5 An object is to provide an improved die, or more particularly an improved force to be used with the die and which is primarily applicable to die structures intended for employment in the stamping of thermoplastic sheet material.

10 A further object is to provide an improved force adapted to cooperate with the die, which force is durable in use and relatively inexpensive to make.

15 Another object is the provision of an improved force adapted to cooperate with the die, which force corresponds exactly to the die with which it is to be used and which is of relatively low cost.

A further object is the provision of a force having a deep draw contour and having a surface configuration, wherein the deep draw contour is established by a base portion made up from one matrix, and the surface configuration is established by a surface portion or face plate made up from another matrix and specifically from the die itself with which the force is to be used.

25 My improved force is characterized by having a surface or face plate portion carried by a contoured base portion which base portion possesses a general contour corresponding to the general contour of the die with which the force is to be used, and which face plate portion possesses a surface configuration corresponding precisely with the contour and with the decoration of the surface of the die with which the force is to be used.

35 My invention is characterized by the provision of a force which has a base which gives the force its general contour and which has a substantially different and lower coefficient of resiliency and compressibility than does the surface or face plate thereof which establishes their surface decoration.

40 An important feature of my invention is that I provide mechanism of the class described wherein the die member is formed of cast metal and the force member which cooperates therewith has a base of cast metal, and which base establishes the general contour of the force to correspond with the general contour of the die but which force member has a surface portion or face plate possessing substantially a different and greater degree of resiliency than does the base of the portion or the die itself.

55 My improved force is further characterized by having a base formed of metal which establishes the contour and a decorative surface portion or

face plate formed of hard rubber held in place and against distortion by a surrounding metal ring carried by the base.

An important characteristic of my invention resides in an improved method of forming a force which corresponds precisely to the die with which it is to be used and wherein the die itself is used as a matrix to give to the force the desired surface configuration.

The above and other objects and advantages of my invention will more fully appear from the following description, appended claims, and accompanying drawing wherein:

Fig. 1 is a sectional view through the female die with which my improved force is to be used,

Fig. 2 is a sectional view through the cast metal base of my improved force,

Fig. 3 is a sectional view through the male and female die members during the process of forming the male die, and

Fig. 4 is a sectional view through the completed male die or force.

This particular invention is primarily concerned with a force or male die which is used in the stamping of thermoplastic sheet material which does not require tremendous pressures such as those employed in stamping certain grades of metal. The invention resides in the construction of the force itself and the method of its manufacture and in a combined die and force of the character described. In carrying out my invention I first provide a female die according to some suitable process and this die is generally of cast metal. The invention relates particularly to a die adapted to impart a deep draw to the sheet material acted upon and which also imparts a surface decoration such as the grain of wood or leather to the surface of the sheet material.

It has heretofore been difficult to provide a suitable male die to cooperate with this female die member due to the difficulty of insuring accurate correspondence as to grain with the surface of the female die member. The practice generally followed has been to form both the male and female die members from a suitable master plate or matrix. It will be appreciated that with a deep draw contour and surface graining on both die members accurate correspondence should be obtained to insure satisfactory results. In the first place it was difficult to secure exact correspondence on a deep draw contour and particularly if the contour was represented by a number of depths and elevations varying from each other. The surface graining, however, was so

minute that exact correspondence here became exceedingly difficult. There was a tendency on the part of the metal to shrink during the casting process and the two die members did not shrink uniformly and in a similar manner. As a consequence, hand work in re-shaping and re-forming was always necessary and never exactly accurate. A further disadvantage was that this method of forming the male die to correspond with the female die or vice versa was costly and expensive.

According to my invention, I form a metal casting of one of the die members. It is here shown as of the female die member. This female die member is indicated by the numeral 10. It possesses one deep draw depression. It will be appreciated that its contour might be very irregular and consist of a number of varying depressions and elevations as is frequently the case. The surface of the die has a configuration which resembles wood graining, as indicated at 12. It is to be understood that this decoration might resemble leather or any other material. In the forming of the cooperating male die, or force to be used with this female die, I first provide a base form for the male die. This base form is indicated by the numeral 14. It is generally of cast metal. It is so formed as to possess the same general contour as the female die. It is not at all difficult to secure merely general correspondence of contour of the base of the male die with the female die because of this correspondence being merely of a general as distinguished from an exact character. It will be observed that the face of the base of the force is recessed as at 16 to provide a recessed ledge. This recess extends throughout substantially the entire area and is bounded by a ledge 18 on the force.

I now provide a suitable thermoplastic material such as a rubber compound having the following formula which is obtainable in the form of a sheet 20, percentages in the formula being by weight:

	Per cent
Pure gum rubber or pure gum rubber and reclaimer rubber	35
Sulphur	12
Filler and color materials which may be:	50
Zinc oxide	5
Asbestine	15
Lime	12
Asbestos (fibre or pulp)	12
Powdered mica	6
Palm oil	2-2.4
Accelerator	1- .6

This material is inserted within the recess in the face of the force and is secured in place by a suitable adhesive such as rubber cement, or the like. The force and the female die are then supported so as to be brought together with considerable pressure and also under the effect of heat so that the rubber sheet material 20 is vulcanized and cured against the face of the female die. The face of the female die is treated with soap stone or other suitable material so as to readily release the rubber following its cure. It will be appreciated that this rubber sheet material is of such a character that, when brought with substantial force against the face of the female die, it is compressible to correspond precisely in detail with the face of the die and to insure that the face of the force will not only correspond in surface decoration but in exact contour with the face of the female die.

This thermoplastic material which is used as the surface member or face plate of the force must be of such a character as to respond under pressure and heat to assume and retain the exact configuration of the face of the die with which it is brought into engagement. The rubber sheet is held in place by the ledge 18 so as to prevent its distortion or deterioration in use and when cured it possesses sufficient hardness to serve its purpose as a force in the stamping of thermoplastic sheet material such as composition fiber board carrying a thermoplastic binder which holds the fibers together and such a commercial example is that known as K B board.

It is noted that the ledge 18 is undercut so that the rubber face plate is held thereunder and the contacting surface of the metal base is roughened as indicated at 19 so that there is a strong tendency for the rubber face plate to retain its position notwithstanding shrinkage. Such shrinkage as occurs however takes place while the force is against the die in the cooling of the rubber face plate as it sets and the final configuration taken is one that corresponds precisely to that of the face of the die.

In use as a force my improved construction possesses advantages as compared with a force made of cast metal or a force made of a cast metal base with an electroplate surface member in addition to the advantages heretofore enumerated. The rubber face plate, though sufficiently hard to serve its normal function as a force member, possesses a different and greater characteristic of resiliency than does the cast metal base or the cast metal die. This characteristic of resiliency is such that it acts much as does a hydraulic press in its contacting engagement with the face of the die, namely, it produces a better and more accurate and complete reproduction of its surface on the sheet material acted upon.

In the stamping of sheet material if the configuration produced on one side in elevation is reproduced on the opposite side in exact correspondence therewith in depression far less force is required in the stamping operation than if one of the die members presents a flat face, in which case the sheet material must be squeezed into the depressions of the die to produce the elevations on the sheet material. With die members of the character here set forth there is a pressure produced by the elevations on the one die member which urges the material of the sheet directly with the depression, which correspond exactly therewith, of the cooperating die member.

What I claim:

1. That method of manufacturing a force complementary to a die which comprises forming a die with which the force is to be used, forming a base for the force with a recessed face area having a general contour corresponding to the general contour of the face of the die, filling said recessed face area with thermoplastic material responsive under heat and pressure to assume and retain a surface configuration, and imparting a surface configuration to said thermoplastic material by direct engagement under heat and pressure with the surface of the die.

2. That method of producing cooperating die members having precisely corresponding die faces comprising providing one die member with a hard surfaced die face possessing the precise desired surface configuration and providing a cooperating die member having the desired gen-

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eral contour for mating and having a die face formed of material deformable and responsive under heat and pressure to assume and permanently retain a surface configuration imparted thereto and yieldable under pressure against the hard surfaced die face of the first die member to reproduce the same, forcing the faces of said die members together under heat and pressure causing the hard surfaced die face of the first member to be reproduced in the yieldable surfaced face of the second die member and imparting thereto a permanent set.

3. That method of forming a die member to correspond precisely with a cooperating die member having an irregular contour and minute surface configurations which comprises providing the first mentioned die member with a base member having a face possessing the same general contour as the general contour of the minutely configured working face of the other die member, positioning a facing of rubber compound over the face of the general contoured die member, bringing the two die members together under

heat and pressure while restraining the rubber compound from flowing, and forcing the rubber facing into the minute configurations on the other die member until the rubber facing is vulcanized thereagainst.

4. Stamping mechanism for sheet material comprising, in combination, a metal die having a general irregular contour and minute surface configurations, a cooperating die to be used with said first mentioned die provided with a metal base having a recessed face possessing the same general irregular contour as the irregular contour on the first mentioned die, and a facing of rubber compound within said recess having minute surface configurations corresponding exactly with those on the other die, said minute configurations on each of said dies adapted to cooperatively function with one another during the stamping operation to reproduce complementary minute configurations on the opposite surfaces of any sheet material therebetween.

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