May 15, 1962 W. W. SMITH 3,034,465

DIE

Filed Nov. 28, 1958 2 Sheets-Sheet 1

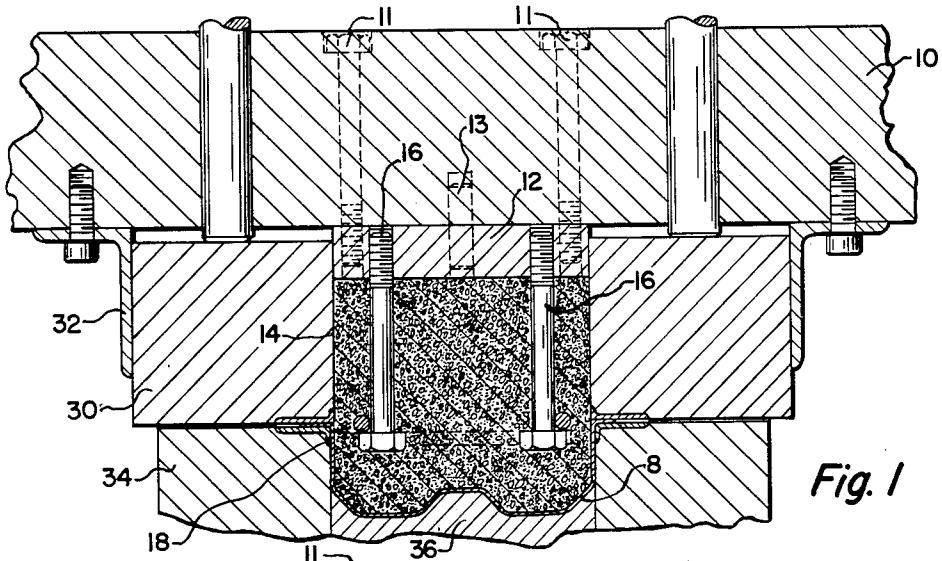


Fig. 1

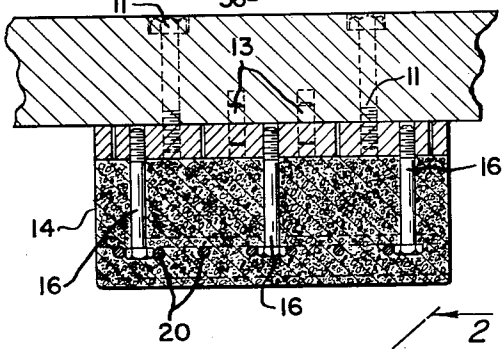


Fig. 2

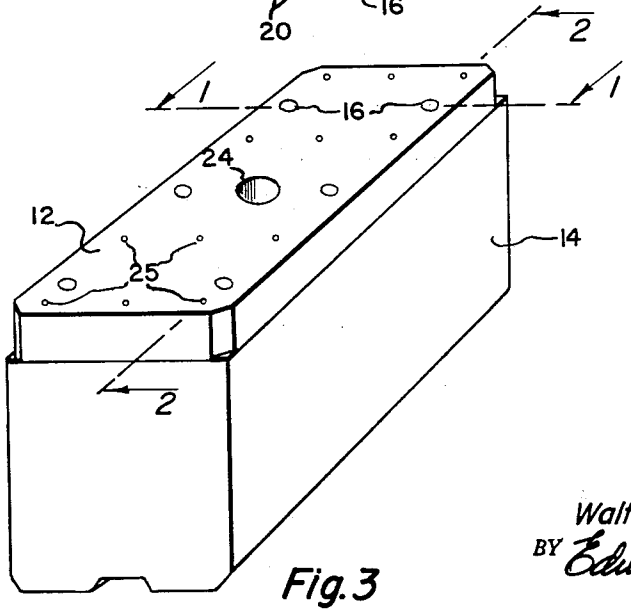


Fig. 3

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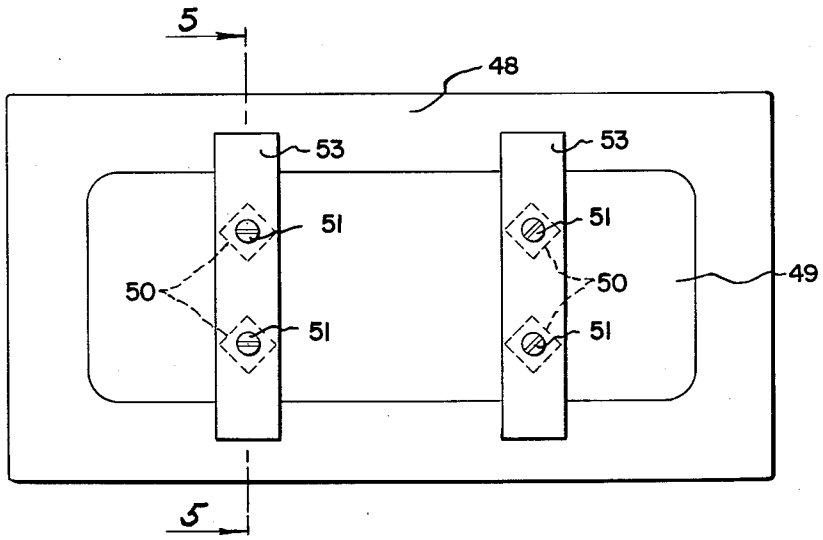


Fig. 4

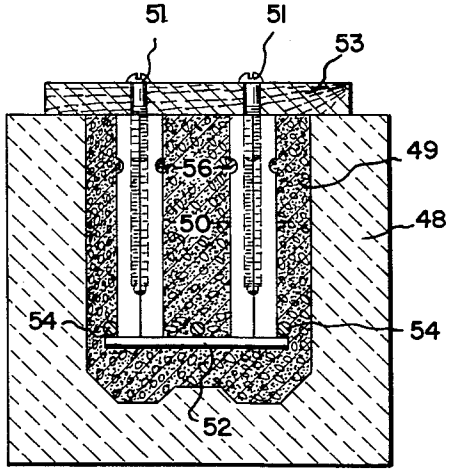


Fig. 5

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United States Patent Office 3,034,465 Patented May 15, 1962

3,034,465

DIE

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Filed Nov. 28, 1958, Ser. No. 776,982
1 Claim. (Cl. 113—49)

This invention relates to a die. It is particularly useful in making permanent forming and drawing dies which are used to form irregularly shaped articles from flat sheet stock.

The art of tool and die making has been a long established one and has acquired a status such that those who desire to practice the art must serve a long apprenticeship and have several years experience before they may be considered fully qualified. The practices and techniques generally found in tool and die making are commonly passed from journeyman to apprentice and may vary considerably from shop to shop. Much of the work involved includes the techniques of working and heat treating metal. The dies are usually made of metal which is heat treated and finished by hand, requiring long hours of tedious work which can only be done in a satisfactory manner after much experience. As a result, the cost of obtaining permanent die sets is based primarily on the labor involved rather than the materials used.

It is now proposed to provide processes and methods by which permanent die sets may be manufactured at a much lower cost which are fully equal in quality, and in many instances superior, to dies made by previous practices. Basically the invention includes the making of dies from cement reinforced by steel, glass fibers, glass cloth or other suitable reinforcing material capable of improving the tensile strength of the cement. By use of such a process, the labor and time consumed in making a die set comprised of a die and a die punch may be reduced so that the over-all cost of the die set is much less than the cost of making the same die set by previously known processes. The invention may be practiced by persons who are inexperienced in the tool and die making arts, yet the dies produced are found to be equal or superior to comparable dies made heretofore.

In many instances it is important to change the construction of a given piece part in a minimum amount of time and any delay in making new dies for the new piece part delays the changeover. It is an object of this invention to reduce the time required for making new or replacement dies so as to facilitate making product changes.

Still another object of this invention is to provide an improved shrink-proof molded rigid body die construction.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is a fragmentary vertical sectional view taken substantially on line 1—1 of FIGURE 3 showing the adjacent die supporting structure;

FIGURE 2 is a fragmentary sectional view taken substantially on line 2—2 of FIGURE 3 and showing the die shoe to which the die is attached;

FIGURE 3 is a perspective view of the die punch shown in FIGURES 1 and 2;

FIGURE 4 is a vertical sectional view showing a modified form of a cement forming die and the plaster cast used in molding the cement die; and

FIGURE 5 is a plan view of the apparatus shown in FIGURE 4.

Referring now to the drawings wherein preferred embodiments of the invention have been shown, reference numeral 8 designates a sheet metal stamping in the process of being formed and reference numeral 10 designates a conventional lower die shoe which supports a punch plate 12 which in turn supports a forming die element 14. The plate 12 is secured to the die shoe 10 by screws 11 and dials 13 in accordance with conventional practice. The plate 12 serves as a support for the molded die element which preferably consists of an iron aggregate type of cement substantially devoid of silica, traprock, emery or other conventional hard brittle natural aggregates which crush under impact and abrasion. Iron aggregate cement of this type is available commercially under the name Anvil-Top at the Master Builders Co. of Cleveland, Ohio, for use in making floors known as Anvil-Top floors.

The cement consists of approximately 15% Portland cement which serves as a binder and 85% ground malleable iron particles or iron aggregate. The iron particles show about 400% greater resistance to abrasion than brittle aggregates and produce a slight expanding force during the hardening of the cement so as to prevent shrinkage. The iron aggregate varies in size from fine powder to shavings of approximately .062 by .062 by .003 inch.

In order to improve the tensile strength of the iron aggregate cement die a plurality of cap screws 16 are secured to the punch plate 12 and extend into the cement block or die body carried by the punch plate. Additional steel reinforcing rods 18 and 20 are carried by the screws 16 as shown. These reinforcing rods are preferably welded to one another and welded to the heads of the cap screws so as to form a rigid reinforcing grill work which may be vibrated in unison with the punch plate during the pouring of the cement and which subsequently forms a reinforcing means for the cement. In manufacturing the punch assembly, the punch plate is preferably supported adjacent the upper edge of a plaster of Paris mold such as the mold 48 shown in FIGURES 4 and 5 and this mold would have a cavity corresponding in shape to the shape of the finish punch. With the punch plate held over the mold, the wet cement is poured down through a fill hole 24 provided in the punch plate 12. Enough cement is poured into the hole 24 to completely fill the plaster of Paris mold. Vent holes 25 are provided in the plate 12 so as to permit air to escape from the mold as the cement fills the mold. The corners of the plate 12 have been cut away as shown to insure complete filling of the corners of the mold. If necessary the cement at the corners of the mold can be tamped down so as to insure well formed corners. In order to prevent voids in the cement, the punch plate 12 together with the reinforcing screws 16 and reinforcing rods 18 and 20 are vibrated or the mold itself can be vibrated so as to compact the cement and release any air bubbles which might otherwise prevent the cement from completely filling the mold cavity. For purposes of illustration, steel reinforcing means has been shown whereas insofar as certain aspects of the invention are concerned one could use glass cloth, glass fibers or other suitable reinforcing means for adding strength to the die.

The usual cement curing and drying techniques may be followed in curing the cement so as to reduce the powdering effect of the outside surface and so as to reduce the chances of surface deterioration. Furthermore the presence of the iron aggregate in the cement makes it possible to machine the surfaces of the die if and whenever necessary.

In FIGURE 1 of the drawing reference numeral 30 designates the usual draw ring of a conventional draw die and reference numeral 32 designates the conventional guard elements which are standard in die assemblies. Reference numeral 34 designates a conventional die ring

which in cooperation with a die pad **36** forms a one part of the die assembly. The die pad **36** could also be made of iron aggregate cement if desired.

Referring now to FIGURES 4 and 5 of the drawing wherein a modified forming die has been shown, reference numeral **48** designates a plaster cast used in molding a forming die **49**. In lieu of using a separate punch plate such as the plate **12** shown in FIGURES 1, 2 and 3, a plurality of cast steel die mounting plugs **50** are molded into the main body of the cement forming die or punch. These plugs have tapped openings for receiving mounting screws used in securing the die to a die shoe. During the molding operation the die mounting plugs **50** are supported in place within the mold **48** by means of screws **51** carried by temporary wooden supports **53** which are removed after the die is removed from the mold. Reinforcing rods **52** and **54** are welded or otherwise secured to the steel plugs **50** as shown. The mounting plugs have been shown as square plugs so as to prevent turning of the plugs within the cast cement block when the conventional die mounting screws are inserted into the tapped openings in the mounting plugs. Notches **56** are provided in the corners of the mounting plugs **50** so as to better anchor the mounting plugs within the molded cement body.

While the forms of embodiment of the invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted, as may come within the scope of the claim which follows.

What is claimed is as follows:

In a forming or draw die, a plate having a fill opening and a plurality of vent openings formed therein, an iron aggregate cement block forming a die element supported by said plate, metallic reinforcing means carried by said plate and extending into said cement, said reinforcing means comprising a plurality of cap screws secured to said plate with their heads spaced from said plate, and reinforcing rods secured to said cap screws and preventing rotation of said cap screws.

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