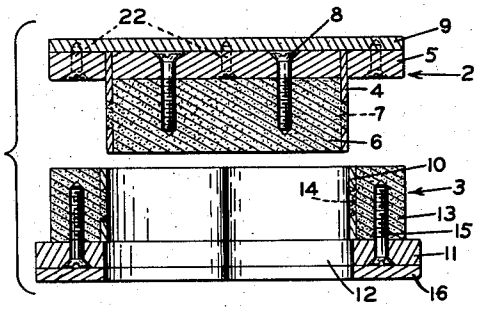
May 12, 1959 R. F. LESCALLETTE 2,885,913

SHEARING DIE AND METHOD OF FORMING THE SAME

Filed Sept. 26, 1956 2 Sheets-Sheet 1

Fig. 1



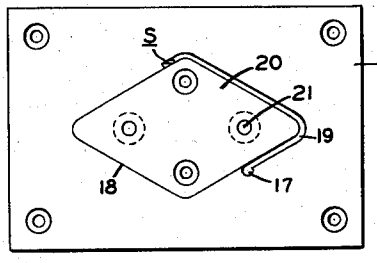
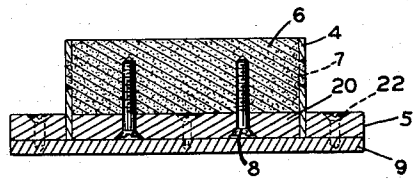


Fig. 2

Fig. 3



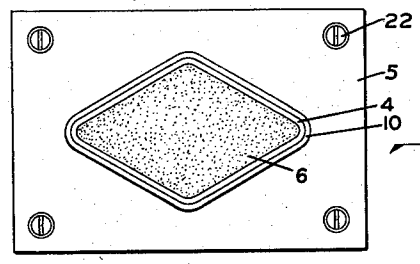
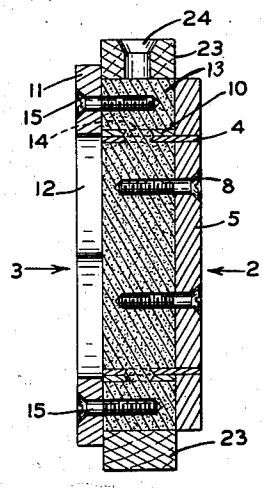


Fig. 4

Fig. 5



INVENTOR
RICHARD F. LESCALLETTE
by
Harold H. Dettweiler
ATTORNEY

May 12, 1959 R. F. LESCALLETTE 2,885,913

SHEARING DIE AND METHOD OF FORMING THE SAME

Filed Sept. 26, 1956 2 Sheets-Sheet 2

Fig. 6

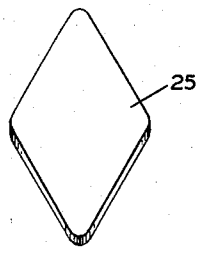


Fig. 7

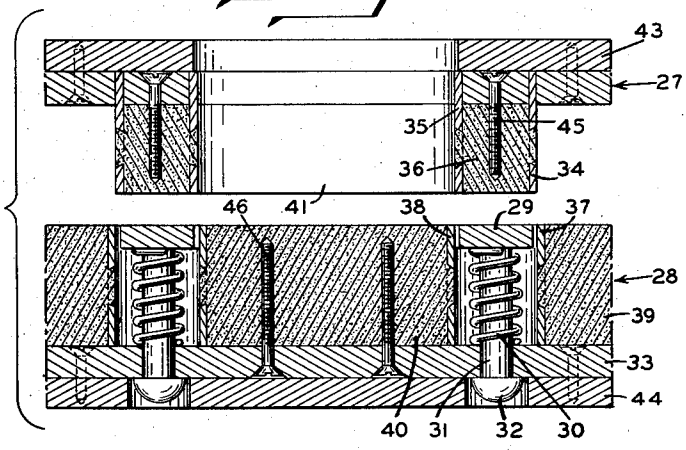
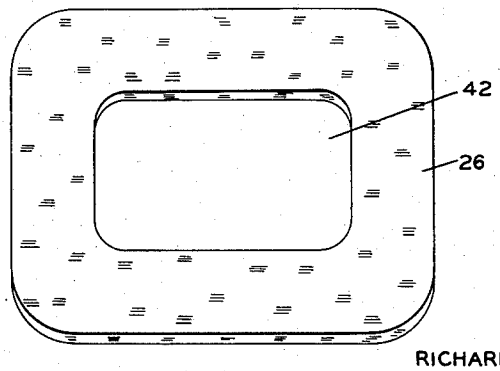


Fig. 8



INVENTOR

RICHARD F. LESCALLETTE

by Harold A. Bottinick

ATTORNEY

United States Patent Office 2,885,913 Patented May 12, 1959

2,885,913

SHEARING DIE AND METHOD OF FORMING THE SAME

Richard F. Lescallette, Sewickley, Pa., assignor to Armstrong Cork Company, Lancaster, Pa., a corporation of Pennsylvania

Application September 26, 1956, Serial No. 612,217

6 Claims. (Cl. 76—107)

This invention relates to a method of making a die set. It is concerned more particularly with the fabrication of a blanking die from materials which may be more economically formed than the steel blanks used in forming conventional all steel die sets.

According to the present invention, both the punch member and the die member are formed of steel cutting rule which is formed to the desired contour and supported by an anchoring mass of castable material, such as a hydraulic setting cement composition, molten babbit, or the like. The members are secured to mounting plates which may be made of plywood, hardboard, aluminum, or other sheet material which may be conveniently fabricated.

The invention will be described in conjunction with the attached drawings, in which:

Figure 1 is a vertical sectional view of a blanking die set incorporating the invention;

Figures 2 to 5 are top plan and sectional views illustrating the steps in the fabrication of the die set of Figure 1;

Figure 6 is a perspective view of a piece severed with the die set of Figure 1;

Figure 7 is a vertical sectional view of a blanking die set for forming a piece with a center opening; and

Figure 8 is a perspective view of a piece severed with the die set of Figure 7.

The die set of Figure 1 includes a punch member **2** and a die member **3** arranged for relative movement with respect to each other to sever a workpiece disposed therebetween.

The punch member **2** includes a cutting punch **4** formed of steel rule, such as steel alloy, which may be hardened, if desired. If the die set is to produce a piece of intricate shape, preferred practice will be to form the steel rule to the desired shape while soft and subsequently harden it. The steel rule is positioned within a mounting plate **5** which may be of hardboard, plywood, aluminum, soft steel, or other material. Within the confines of the steel rule **4**, there is provided a supporting or anchoring matrix **6** of poured material, such as a nonshrinking, quick-setting cement, babbit, sulphur, or other material which may be deposited as a molten or plastic composition and subsequently congealed. Openings **7** are preferably provided in the steel rule **4** to mechanically interlock it with the supporting matrix **6**. Also, mechanical fasteners, such as the screws **8** shown in Figure 1, may be used to secure the supporting matrix **6** to the mounting plate **5**. The supporting matrix is preferably poured around the fastenings, as will be more fully discussed in conjunction with the description of a method of making the die set which will follow. A steel or other backing plate **9** may be provided for the punch assembly.

The die member **3**, as shown in Figure 1, includes a shearing die **10** which, like the cutting punch **4**, may be formed of steel rule, hardened if desired. The die

10 is supported by a mounting plate **11** similar to plate **5**. Plate **11** may be provided with an opening **12** for the passage of severed pieces through the die in the usual manner.

A supporting and anchoring matrix **13**, similar to the matrix **6** in the punch member, surrounds the shearing die **10** and may be mechanically secured thereto by providing openings **14** in the steel rule which forms the shearing die and into which the supporting matrix **13** will flow. Mechanical fastening members also may be provided, such as the screws **15** which are shown in Figure 1. These pass through the mounting plate **11**. They serve to mechanically secure the matrix **13** to the backing plate **11** in a manner similar to the fastening members **8** of the punch member. A steel backing plate **16** having an opening therein corresponding with the opening **12** may be provided for the die unit.

A method of fabricating the punch and die unit of Figure 1 will be given to illustrate the practice of the method of the invention, reference being made to Figures 2–5, inclusive.

The mounting plate **5** for the punch member **2**, made of hardboard or plywood, for instance, such as tempered Masonite, will be provided with a drilled opening **17** (Figure 2), and a scroll saw will be positioned therethrough and will be operated to form an opening in the mounting plate **5** following a line **18** scribed thereon. A portion of the saw kerf formed by the saw has been indicated at **19** and the saw at S in Figure 2. This kerf is preferably of the same width as the thickness of the steel rule **4** which is to be received within the sawn opening. After the opening has been completed in the mounting plate **5**, corresponding in outline to the line **18**, the severed piece **20** is removed. Steel rule **4** is formed to an outline corresponding to the line **18**. The steel rule is preferably shaped and then brazed to form a unitary punch member which is fitted within the opening formed in the mounting plate **5**. The piece **20** is then pressed within the confines of the formed steel rule **4**, as shown in Figure 3.

If screws **8** or other members are to be used to mechanically fasten the supporting matrix **6**, drilled and countersunk openings **21** will be provided in the piece **20** and the screws **8** may be inserted therein before the piece **20** is positioned within the confines of the steel rule **4**. The threaded ends of the screws **8** will project into the compartment defined by the steel rule **4** and preferably will extend to within a short distance from the exposed edge of the steel rule, as shown in Figure 3.

The backing plate **9** preferably is fastened to the mounting plate **5** by screws **22**, prior to assembly of the steel rule, to hold the parts in proper position for assembly. Clamps or other temporary fastening devices may be used, however.

The supporting matrix **6** will be assumed to be a nonshrinking, fast-setting anchor cement, such as the product sold by Hallemite Manufacturing Company, of Cleveland, Ohio, under the trademark "Por-Rok." It is mixed with the requisite quantity of water to form a thick, pourable mass which is deposited in the cavity defined by the steel rule **4**. When the cavity has been filled to the desired depth, preferably level with the upper edge of th steel rule **4**, the upper surface is smoothed off with a spatula, trowel, or screed, if necessary. If the mix is reasonably free-pouring, natural leveling may be relied upon. The mix will flow through the openings **7**; and after it has set, any excess material which may be disposed beyond the confines of the openings **7** may be chipped off and smoothed up. Where molten babbit, sulphur, or the like is used, it may be necessary to place suitable barriers over the outer surface of the steel rule **4** to prevent escape of the molten material through the

openings 7, or the openings may be arranged to extend only part way through the steel rule.

The die member 3 may be formed by first shaping the steel rule 10, using the formed punch member 2 as a fixture to which the steel rule 10 is contoured in the manner shown in Figure 4. The steel rule 10 is then brazed or otherwise fastened into a fixed shape and hardened, if desired.

The mounting plate 11 may then be cut to provide the opening 12 therein (Figure 5). This opening preferably is .005" to .010" larger than the inside dimensions of the formed steel rule 10 to provide clearance for the severed pieces in passing through the die set and to provide also for proper supporting of the steel rule 10. The fastenings, such as the screws 15, are positioned through the mounting plate 11, a wooden or other confining mold 23 is positioned around the periphery of the punch member, and the parts are assembled as shown in Figure 5, with the unit disposed in a generally vertical position. The unit is clamped between the jaws of a vise or other clamping arrangement.

A delivery opening 24 is provided in the mold 23 at the top, and the composition for forming the anchoring mass 13 is poured through this opening. It flows around the steel rule 10 and the fastening screws 15 and passes through the openings 14 in the steel rule 10 but is confined in its flow by the mold members 23, the steel rule 10, and, at the openings 14 in the steel rule 10, by the steel rule 4. Preferably, the anchoring openings 14 in the steel rule 10 for the die member do not coincide with the anchoring openings 7 in the steel rule 4 for the punch member. They have been shown in such positions in the drawing only for clarity of illustration.

After the anchoring material has hardened sufficiently, the dies may be removed from the vise or other clamping arrangement, the wooden mold 23 may be removed, and the punch and die elements separated, cleaned, and finished, ready for use.

While the steel rule has been shown as flat-edged and that is preferred, it may be ground to any desired contour for shearing of any particular material to be fabricated. The supporting matrix may be positioned so as to lie below the upper edge of the steel rule. However, it is preferred to have the supporting matrix lie substantially parallel with the upper edge of the steel rule, as shown in Figure 1. Such a unit is ideally suited for cutting soft, pliable materials. Where the supporting matrix is disposed substantially below the cutting edge of the steel rule, a cavity is formed into which such soft, pliable materials being cut will be deformed during the cutting operation and a deformed cut will result. Where the supporting matrix is positioned to lie parallel with the upper edge of the steel rule of the die, it is preferred to use as a matrix material which can be ground readily so that a grind across the entire face of each of the punch and die elements will sharpen the cutters and at the same time will provide a flat surface on the matrix for supporting the material as it is being cut when the punch and die elements are put into use.

Figure 6 shows a piece 25 sheared with the die set of Figure 1.

Figure 7 illustrates another embodiment of the invention, in which the die set is arranged to sever a piece, such as a cork composition gasket 26, as shown in Figure 8.

The unit of Figure 7 includes a punch member 27 and a die member 28. A stripper plate 29 is fitted in the die member and is urged to a position adjacent to the upper face of the die member by springs 30 which encircle holding pins 31 threaded into the stripper plate 29. Heads 32 on the pins 31 engage a mounting plate 33 to limit movement of the stripper plate 29.

This die set includes steel rule type shearing members 34 and 35 on the punch member, with a supporting matrix 36 disposed in the area between the members 34 and 35. Complementary steel rule die members 37 and 38 are provided in the die member and are anchored in position in a smilar fashion, with supporting matrixes indicated at 39 and 40. A central opening 41 may be provided in the punch member to pass the material severed to form the central opening 42 of the gasket shown in Figure 8. Steel backing plates 43 and 44 may be provided for the punch and die members, respectively. Anchoring screws or other mechanical fasteners 45 and 46 also may be provided, as shown in Figure 7.

In this die set, as in conventional all steel punch and die units, a strip of material to be severed is fed between the dies, mounted in a punch press, for example. The dies are closed, severing a piece from the strip in an outline as indicated at 26 in Figure 8. The center portion 42 of the punched out piece is pushed up through the hollow center 41 of the punch unit. When the dies are parted, the stripper plate 29 pushes the cut out piece 26 back into the strip from which it was severed, and the strip is moved to a position ready for the next cutting operation. The finished piece 26 is subsequently ejected from the strip. Thus, with the die set of the invention, operations conventionally performed with an expensive solid steel punch and die set may be effected on materials such as cork composition, fibrous gasket compositions, light metals, and the like.

The shearing member and the die set herein disclosed are the subject matter of a divisional application, Serial No. 661,401, filed May 24, 1957.

I claim:

1. In a method of making a shearing die member for a blanking die set, the steps comprising forming cutting rule to the shape to be sheared, securing said shaped cutting rule to a support and thereby forming a shearing punch member, forming cutting rule around said shearing punch member as a fixture to provide interfitting shearing punch and die members which are complementary to shear a workpiece disposed therebetween and, with said cutting rule of said shearing punch member and said cutting rule of said shearing die member disposed in said interfitting relationship, casting a supporting matrix directly around the cutting rule of said shearing die member.

2. In a method of making an element for a blanking die set, the steps comprising forming cutting rule to the shape to be sheared, forming a supporting matrix in intimate engagement with said formed cutting rule to fully support substantially the entire periphery of the formed cutting rule against distortion during shearing, and sharpening said element by grinding both said cutting rule and supporting matrix to define a common plane.

3. In a method of making a shearing punch for a blanking die set, the steps comprising forming a shearing punch from cutting rule bent to the shape to be sheared, fastening said formed cutting rule in a mounting plate on edge and thereby forming a chamber the wall of which is formed of said cutting rule and the bottom of which is formed of said mounting plate, filling the chamber with a supporting matrix which fully supports said cutting rule projecting above said mounting plate, and sharpening said shearing punch by surface grinding said cutting rule and said matrix in a common plane.

4. In a method of making a blanking die set, the steps comprising forming a shearing punch from cutting rule bent to the shape to be sheared, fastening said bent cutting rule to a mounting plate on edge and thereby forming a chamber the wall of which is formed of said cutting rule and the bottom of which is formed of said mounting plate, filling the chamber with a supporting matrix, hardening the matrix while in intimate contact with said cutting rule, bending cutting rule to the shape of said shearing punch to provide inter-fitting shearing surfaces on said shearing punch and shearing die, disposing a mounting plate for said shearing die in position with respect to said shearing die interfitted with said punch, and

casting a matrix in intimate contact with said shearing die and its mounting plate while said shearing punch and shearing die members are disposed in said interfitted position.

5. In a method of making an element for a blanking die set, the steps comprising forming cutting rule to the shape to be sheared, said cutting rule being provided with a plurality of recesses in its face, mounting said formed cutting rule on a support, casting and hardening a supporting matrix in intimate engagement with said support and said formed cutting rule including the walls of said recesses in said cutting rule to fully support substantially the entire periphery of the formed cutting rule against distortion during shearing and to join said cutting rule, matrix, and support into a unitary structure, and sharpening said element by grinding both said cutting rule and supporting matrix to define a common plane.

6. In a method of making a blanking die set, the steps comprising forming a shearing punch from cutting rule bent to the shape to be sheared, disposing said bent cutting rule on a mounting plate on edge and thereby forming a chamber the wall of which is formed of said cutting rule and the bottom of which is formed of said mounting plate, filling the chamber with a supporting matrix, hardening the matrix while in intimate contact with said cutting rule, bending cutting rule to the shape of said shearing punch to provide interfitting shearing surfaces on said shearing punch and shearing die, disposing a mounting plate for said shearing die in position with respect to said shearing die interfitted with said

punch, casting a matrix in intimate contact with said shearing die and its mounting plate while said shearing punch and shearing die members are disposed in said interfitted position, separating said punch and die members, and sharpening said shearing die member by grinding both said cutting rule and supporting matrix to define a common plane.

References Cited in the file of this patent

UNITED STATES PATENTS

163,674	McKenzie	May 25, 1875
552,800	Wells	Jan. 7, 1896
1,082,986	Wilder et al.	Dec. 30, 1913
1,701,546	Shaw	Feb. 12, 1929
1,701,547	Shaw	Feb. 12, 1929
1,747,311	Myercord et al.	Feb. 18, 1930
2,124,591	Ryan	July 26, 1938
2,124,676	Ryan	July 26, 1938
2,703,022	Sarno	Mar. 1, 1955
2,703,023	Sarno	Mar. 1, 1955
2,787,922	Bien	Apr. 9, 1957
2,791,134	Bien	May 7, 1957
2,821,871	Sarno	Feb. 4, 1958

FOREIGN PATENTS

42,995	Germany	Mar. 1, 1888
126,836	Australia	Feb. 13, 1948
236,432	Switzerland	June 16, 1945
165,649	Great Britain	Sept. 14, 1953