April 28, 1942. P. HEFTLER 2,281,439

DIE SET FOR MAKING METAL-EDGE FILTERS

Filed March 6, 1941 2 Sheets-Sheet 1

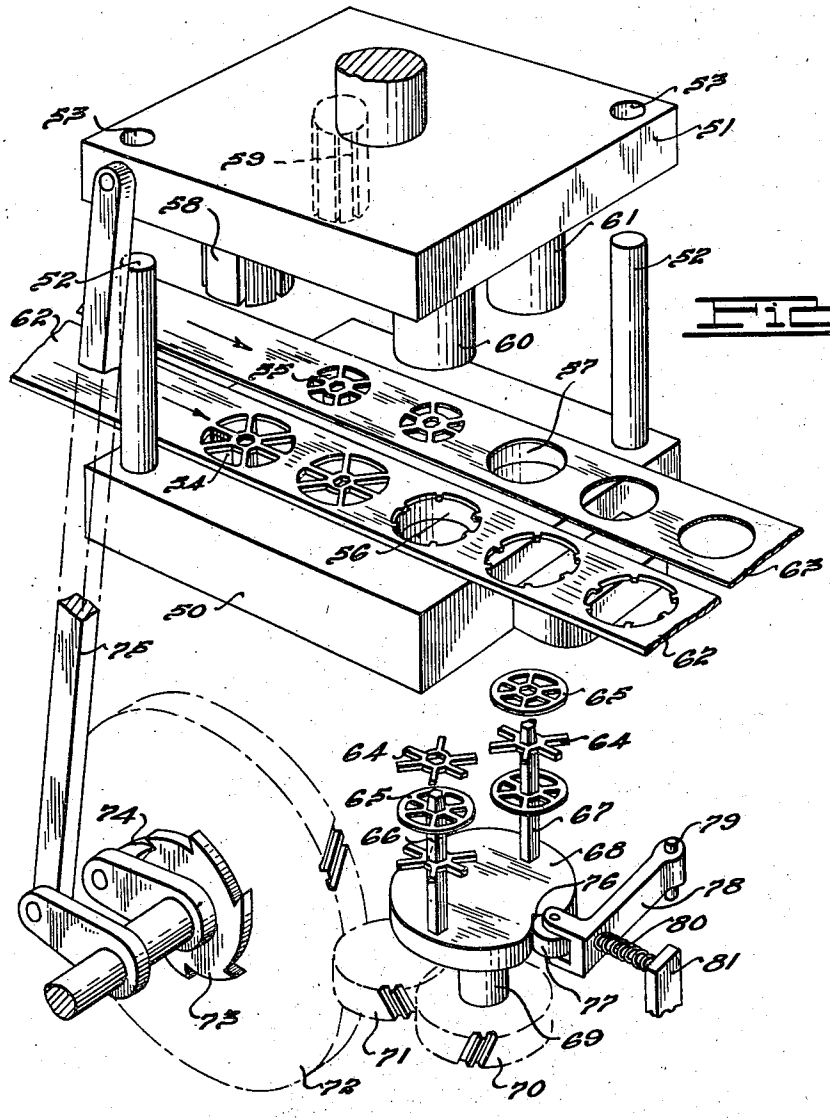


Fig. 1.

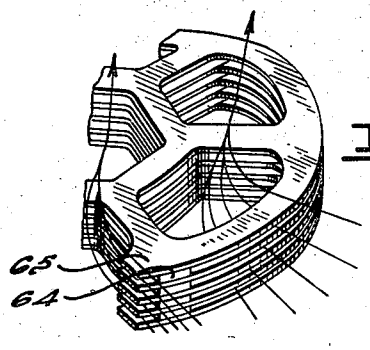


Fig. 2.

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Filed March 6, 1941 2 Sheets-Sheet 2

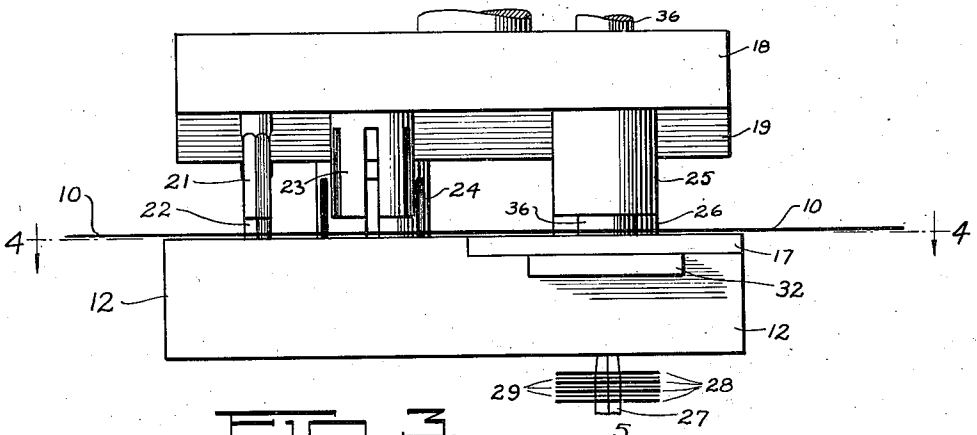


FIG. 3.

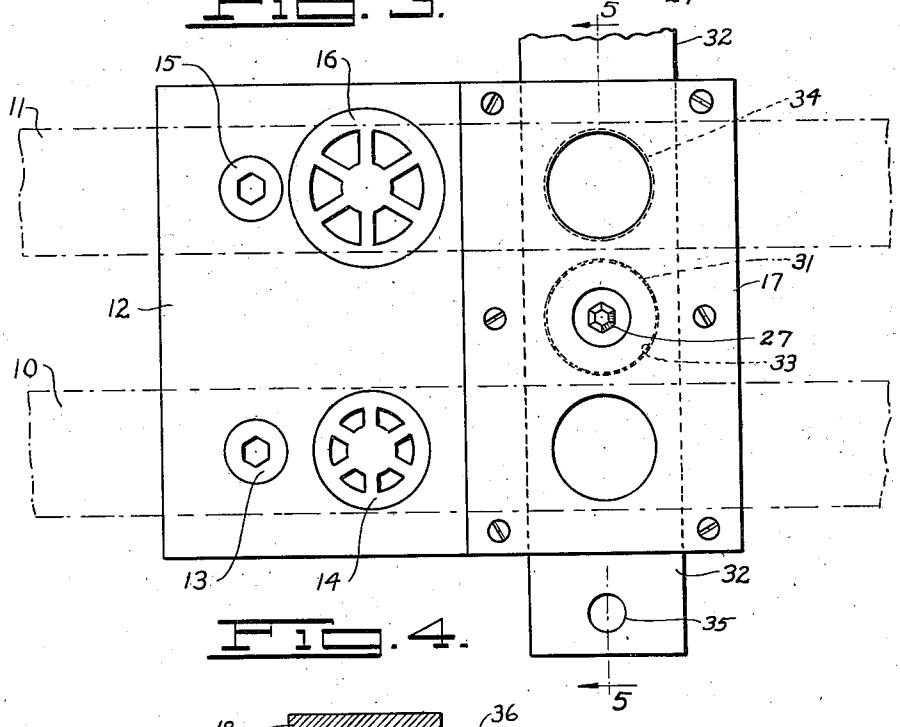


FIG. 4.

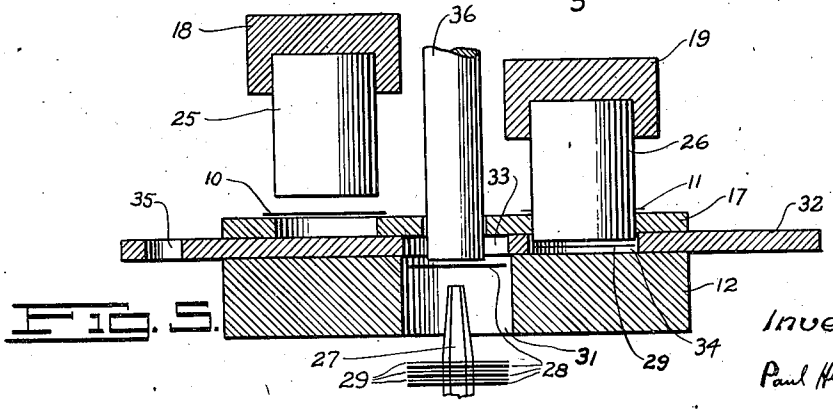


FIG. 5.

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DIE SET FOR MAKING METAL-EDGE FILTERS

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Application March 6, 1941, Serial No. 382,049

9 Claims. (Cl. 164—21)

This invention relates to punch press tools or die sets for forming and stacking, in the proper arrangement, washers of special shape in order to form so-called "edge filters" or "metal-edge filters" such as are shown in United States Letters Patent No. 1,641,485 to Victor R. Heftler and No. 1,977,174 to Matthew O. Crawford, and marketed under the trade-mark "Zenith." Filters of this type made under the above-mentioned patents have achieved considerable commercial success, being used as standard equipment on refrigerators, marine engines, tractor engines, Diesel engines, truck engines and expensive passenger car engines, but their more general adoption has been limited by their cost.

One of the principal objects of this invention is to provide automatic or mechanical means for forming and stacking the washers or stampings which form the essential elements of this type of filter, thus lowering their cost.

Another object of this invention is to provide a method of forming and assembling the above-mentioned washers or stampings which is particularly adapted to being carried out mechanically.

Another object of this invention is to provide a means for forming and stacking the pieces comprising filters of the above-described general type but having some of the pieces thicker than the others.

More particularly, it is an object of this invention to provide a means of rapidly and economically forming and stacking the pieces forming a filter stack of the type shown in the above-identified patent to Victor R. Heftler but in which the pieces functioning as spacers in the stack are either thicker or thinner than the other pieces.

The principal features of the present invention are the provision of entirely separate means for forming the two types of elements in the stack and blanking them out of the stock from which they are formed, and the provision of a receiving means which is shifted alternately from a position to receive one of the types of element to a position to receive the other. Of course, by "entirely separate means" is meant entirely separate cutting edges in the die set or separate punches and dies, although they may form part of the same punch and die or be mounted in the same punch and die holders and be operated by the same mechanism.

Other objects and features of the invention will appear from the following description and claims and from the drawings, in which:

Figure 1 is a perspective view of one of the preferred embodiments of the invention, with the parts separated to more clearly show their structure;

Figure 2 is an enlarged view of a broken-away portion of one form of filter stack produced by the embodiment of the invention shown in Figure 1;

Figure 3 is a side elevation of another embodiment of the invention;

Figure 4 is a plan view of the lower part of the die set shown in Figure 3, as seen from the line 4—4 in Figure 3; and

Figure 5 is a section taken on the line 5—5 in Figure 4 and showing also the parts above the part of the die set shown in Figure 4.

The particular embodiment of the invention shown in Figure 1 comprises a die holder 50 and a punch holder 51 adapted to be secured to the bolster and the ram of a suitable punch press. The die holder 50 and the punch holder 51 are guided with respect to each other by guide posts 52 which fit into and slide in guide holes 53. The die holder 50 carries two pattern dies 54 and 55 and two blanking dies 56 and 57. Pattern punches 58 and 59 and blanking punches 60 and 61 are carried by the punch holder 51 and are positioned so as to cooperate with the dies 54, 55, 56, and 57 in the conventional manner. The punches and dies 54 to 61 are arranged to act upon two strips of stock 62 and 63, which are fed through the die set in parallel paths by a conventional push or roll feed mechanism. The punches and dies are arranged so that each strip is acted upon by one pattern punch and die and by one blanking punch and die, the strip being fed forward by the feed mechanism so that the pattern which is punched at one stroke of the press is blanked out of the strip at a later stroke.

The pattern formed by the pattern punch 58 and the pattern die 54 is larger, in its outside dimensions, than the blanking punch 60. Thus, when this pattern is blanked out, a "star" piece 64, like a wheel without a rim, is formed. The other pattern, formed by the other pattern punch 59 and the other pattern die 55, is smaller than the blanking punch 61 associated with it, so that, when this pattern is blanked out by the blanking punch 61 and blanking die 57, a "wheel" piece 65, like a wheel complete with a rim, is formed. Thus, at each stroke of the press, one star piece 64 and one wheel piece 65 are formed.

The desired alternate arrangement of star and wheel pieces 64 and 65 is secured by letting them fall from the blanking dies 56 and 57 upon two hexagonal receiving stems 66 and 67, which are

shifted from one side to the other so that each one is first under the die 56 which blanks out the star pieces 64 and then under the die 57 which blanks out the wheel pieces 65. Any suitable means for shifting the stems 66 and 67 back and forth can be used, the one shown being merely illustrative. The means illustrated consists of a table or disc 68 which is carried by a shaft 69 driven through gearing 70, 71, and 72 from a ratchet and pawl mechanism 73 and 74. The pawl 74 is connected to the punch holder 51 or to the ram of the press through a link 75, so that, at each stroke of the press, it moves enough to cause the stems 66 and 67 to interchange their positions. A roller 77 is carried by an arm 78 in such a position as to fit into either one of two diametrically opposite notches 76 in the edge of the table 68 whenever the stems 66 and 67 are located directly under the blanking dies. The arm 78 is mounted on a fixed pivot 79 and acted on by a spring 80 bearing against a fixed abutment 81, the pivoting of the arm permitting the roller to retract when the table is turned, and the spring forcing the roller into the next notch in the edge of the table to insure accurate indexing.

A broken-away portion of a filter stack formed by the die set shown in Figure 1 is shown in Figure 2. From this it may be seen how the wheel pieces 65 are spaced apart by the star pieces 64, so that slots are formed between the rims of adjacent wheel pieces. These slots communicate with longitudinal passages formed in the stack and permit liquid to flow into and through the stack along the paths shown by the arrows, but any dirt larger than the slots will be stopped at the outside of the stack. If very fine filtering is not necessary, the stars can be made thicker than the wheels, as shown, and the filtering capacity increased. If extremely fine filtering is desired, the stars can be made thinner than the wheels, the wheels being left comparatively thick so that they will be rigid.

The embodiment of the invention shown in Figures 3 to 5 operates on the same broad principles as the one shown in Figure 1, but differs from it in some details. In this form of the invention, as in the one shown in Figure 1, there are parallel paths for two strips of stock 10 and 11, and these pass over a die-holder 12, in which are mounted various pattern and blanking dies 13, 14, 15, 16 and 17. Directly above the strips of stock 10 and 11 are two separate punch-holders 18 and 19, one above each strip of stock, in which are mounted pattern and blanking punches 21, 22, 23, 24, 25 and 26.

The pattern punches 21 and 23 and the pattern dies 13 and 14 along the path of the strip of stock 10 form the central hexagonal hole and the six arcuate holes of a wheel washer like the washers 65 in Figure 1, and the periphery of the washer is formed as it is blanked out of the strip of stock 10 by the blanking punch 25 and die 17. In going through these operations, the washer occupies four successive positions, the first being between the first pattern punch 21 and die 13 which punch the central hexagonal hole, the second being between the second pattern punch 23 and die 14 which punch the six arcuate holes, the third being an intermediate position at which nothing is done but which is provided to secure greater spacing between the punches and dies, and the fourth being between the blanking punch 25 and die 17 which punch the washer out of the stock and form its periphery.

The pattern punches 22 and 24 and the pattern dies 15 and 16 along the path of the other strip of stock 11 are similar to those along the path of the first strip of stock 10, but the second pattern punch 24 and die 16 are larger than the blanking punch 26, so that the washers which are formed by these punches and dies have no rims but are of the star pattern, like the washers 64 in Figure 1.

As described thus far, the die set shown in Figures 3 to 5 is generally similar to that shown in Figure 1, except that the punches 21, 22, 23, 24, 25 and 26 are mounted in two punch-holders 18 and 19 instead of in a single punch holder, and it forms wheel and star pattern washers in the same general way. The chief difference between the two die sets is in the means for assembling the washers in alternate order in a filter stack.

In the die set shown in Figures 3 to 5, the two sets of pattern and blanking punches are operated alternately, this being possible because they are mounted in separate punch holders 18 and 19, and the two types of washers are blanked out alternately by the two blanking punches 25 and 26. There is a single hexagonal stem 27 to fit the hexagonal central holes in the washers 28 and 29, and means are provided for moving each washer over to the stem 27 and dropping it down onto it as the next washer is being blanked out, so that the two types of washers 28 and 29 from the two strips of stock 10 and 11 are stacked up on the stem 27 in alternate order.

The hexagonal stem 27 is located in a hole 31 extending up through the die-holder 12 on a line halfway between the two blanking punches 25 and 26, and it lies below the mechanism for moving the washers 28 and 29 sideways after they are blanked out. This mechanism comprises a slider or shifter 32 which can slide back and forth in a groove or guideway extending across the die-holder 12 just under the blanking die 17. The shifter 32 has two holes or pockets 33 and 34 spaced half as far apart as the blanking punches 25 and 26 and located so as to come directly under the holes in the blanking die as the shifter is slid back and forth. One end of the shifter is provided with a hole 35 for connecting it to the mechanism which moves it, this mechanism being arranged to move the shifter 32 back and forth a distance equal to half of the distance between the centers of the blanking punches 25 and 26 and to move it after each working stroke of either set of punches. Thus the pocket 34 in the shifter arrives in the position shown in Figure 5 to receive a washer 29 as soon as that washer is blanked out of the thin strip of stock 11 by the punch 26, and, similarly, the pocket 33 arrives in a position directly under the other blanking punch 25 when that punch is blanking out a washer 28 from the thick strip of stock 10.

When one pocket 34 of the shifter is receiving a washer 29 from one strip of stock 11, the other pocket 33 is directly above the hexagonal stem 27 in the hole 31 in the die-holder, and the washer 28 previously received in that pocket from the other strip of stock 10 drops down onto the hexagonal stem. In order to be sure that the washer drops down out of the pocket 33, a pusher 36 is provided directly above the hexagonal stem 27 and is connected to a mechanism that moves it up and down each time that the shifter 32 moves in one direction or the other. The pusher operating mechanism is synchronized with the shifter moving mechanism so that the pusher comes down through each pocket of the shifter

when that pocket comes over the hexagonal stem 27 and moves up out of the way as the shifter starts to move.

Although the die-set shown in Figures 3 to 5 produces only a single stack of washers as compared to the two stacks produced at the same time by the die set shown in Figure 1, its rate of production is just as great or even greater because each of the two sets of punches can be operated just as fast as the set of punches in the other die set, and the strips of stock 10 and 11 can be moved forward just as fast. Its rate of production may be greater because the shifter 32 is more solid and can be moved from one position to the next faster than the rotary table 66 and the two stems 66 and 67 which it carries.

While the various ways in which the invention can be carried out have been described only in their essentials, the skilled tool and die maker will have no difficulty in carrying them out. The necessary pilot punches and pilot pins will be provided, the pattern punches will be divided up between two or more stations in order to simplify the construction and maintenance of the dies, and the necessary strippers will be provided. No attempt has been made to illustrate or describe these refinements, because their addition to the drawings and specification would serve only to make them unnecessarily voluminous.

I claim:

1. The method of making a filter stack which comprises stamping a series of identical patterns in a strip of stock, stamping a second series of identical patterns different from the first in a strip of stock, placing the patterns of the first series successively adjacent a stack assembling position and blanking them out of the stack and transferring them to the assembling position one after another, placing the patterns of the second series successively adjacent a second stack assembling position and blanking them out of the stock and transferring them to the second assembling position one after another, and transferring the assembled portion of the stack back and forth between the two assembling positions so that it has alternately added to it the two different blanked out patterns.

2. A die set for making filter stacks comprising a pattern punch and die and a blanking punch and die disposed along a path along which sheet stock is intended to travel, a second pattern punch and die and a second blanking punch and die disposed along a second path along which sheet stock is intended to travel, said pattern punch and die and a second blanking punch and ceiving pieces blanked out of said stock by said blanking dies, and means for moving said means from a position for receiving a piece from one blanking die to a position for receiving a piece from the other blanking die.

3. A die set for making filter stacks comprising a pattern punch and die and a blanking punch and die disposed along a path along which sheet stock is intended to travel, a second pattern punch and die and a second blanking punch and die disposed along a second path along which sheet stock is intended to travel, said pattern punches and dies producing different patterns, means for receiving the pieces blanked out by said blanking punches and dies, and means for placing said receiving means alternately in receiving relation to said first blanking punch and said second blanking punch, said last-mentioned means being interconnected with said punches so as to move said receiving means from one position to another once during each punching cycle.

4. A die set for forming a series of stamped elements and stacking them in alternate sequence, comprising two separate means for stamping patterns in sheet stock, two separate means for blanking out the pattern-bearing portions of said stock and forming them into finished elements, and means for receiving said finished elements in alternate arrangement in a stack and for preventing them from rotating relative to each other after they are received by said means.

5. A die set for forming a series of stamped elements and stacking them in alternate sequence, comprising two separate means for stamping patterns in sheet stock, two separate means for blanking out the pattern-bearing portions of said stock and forming them into finished elements, and means for receiving said finished elements in alternate arrangement in a stack and for preventing them from rotating relative to each other after they are received by said means, the receiving means including two members for receiving the different elements from the two blanking means, the two receiving members being carried by mechanism which places each one alternately in receiving relation to one blanking means and then to the other.

6. A die set for forming a series of stamped elements and stacking them in alternate sequence, comprising two separate means for stamping patterns in sheet stock, two separate means for blanking out the pattern-bearing portions of said stock and forming them into finished elements, and means for receiving said finished elements in alternate arrangement in a stack and for preventing them from rotating relative to each other after they are received by said means, the receiving means including a stationary receiving member and an oscillating means for transferring finished elements alternately from the two blanking means to the receiving member.

7. A die set for forming a series of stamped elements and stacking them in alternate sequence, comprising two separate means for stamping patterns in sheet stock, two separate means for blanking out the pattern bearing portions of the sheet stock and forming them into finished elements, means for finally receiving the finished elements in alternate sequence in a stack and for preventing them from rotating relative to each other after they are received, and means for receiving the finished elements from the blanking means and transferring them in alternate sequence to the final receiving means.

8. A die set for forming a series of stamped elements and stacking them in alternate sequence, comprising two separate means for stamping patterns in sheet stock, two separate means for blanking out the pattern bearing portions of the sheet stock and forming them into finished elements, means for finally receiving the finished elements in alternate sequence in a stack and for preventing them from rotating relative to each other after they are received, and means for receiving the finished elements from the blanking means and transferring them in alternate sequence to the final receiving means, the transferring means including an oscillating member having a pocket large enough to receive a finished element and movable alternately into receiving relation to one of the blanking means

and into delivering relation to the final receiving means.

9. A die set for forming a series of stamped elements and stacking them in alternate sequence, comprising two separate means for stamping patterns in sheet stock, two separate means for blanking out the pattern bearing portions of the sheet stock and forming them into finished elements, means for finally receiving the finished elements in alternate sequence in a stack and for preventing them from rotating relative to each other after they are received, and means for receiving the finished elements from the blanking means and transferring them in alternate sequence to the final receiving means, the transferring means including an oscillating member having pockets large enough to receive the finished elements and movable alternately into receiving relation to the blanking means and into delivering relation to the final receiving means.

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