Jan. 18, 1955 H. M. HODGE 2,699,830

UNIVERSAL PUNCH AND DIE EQUIPMENT

Filed April 3, 1950 2 Sheets-Sheet 1

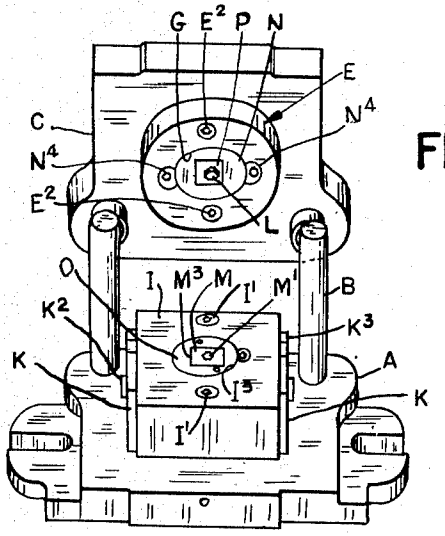


FIG. 1.

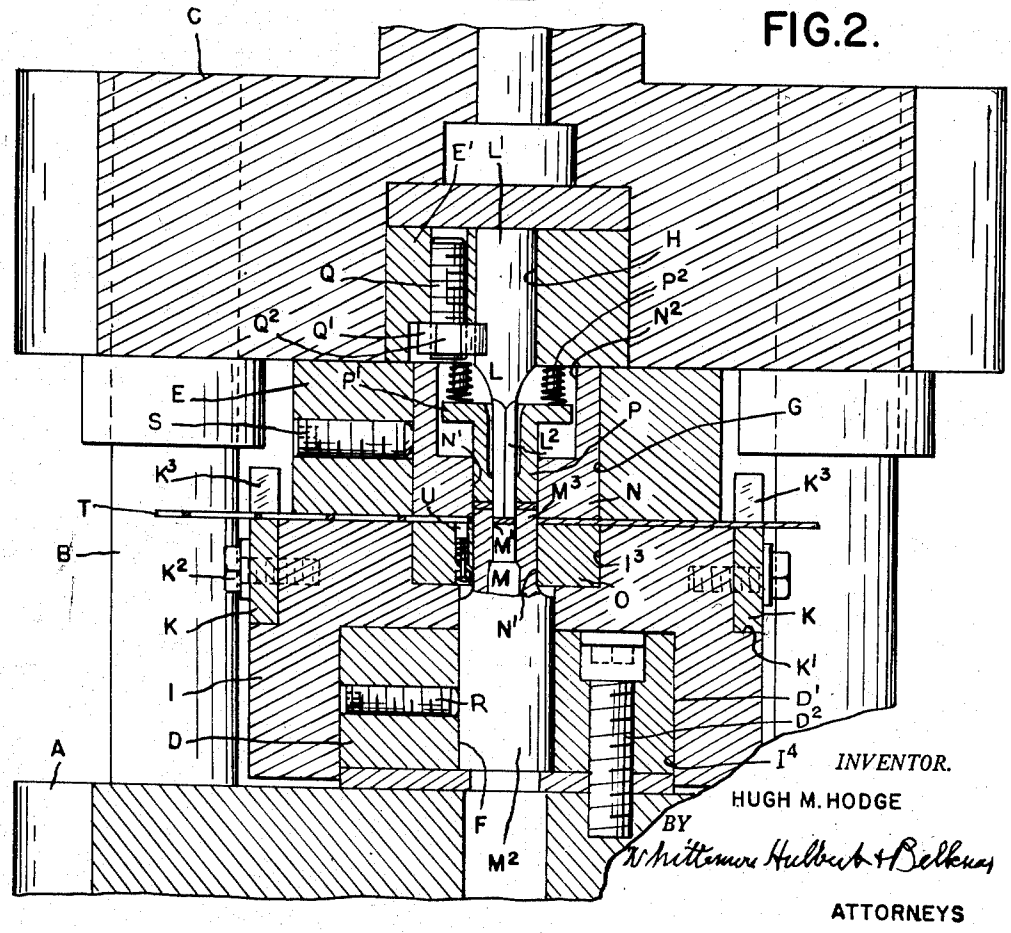


FIG. 2.

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FIG.3.

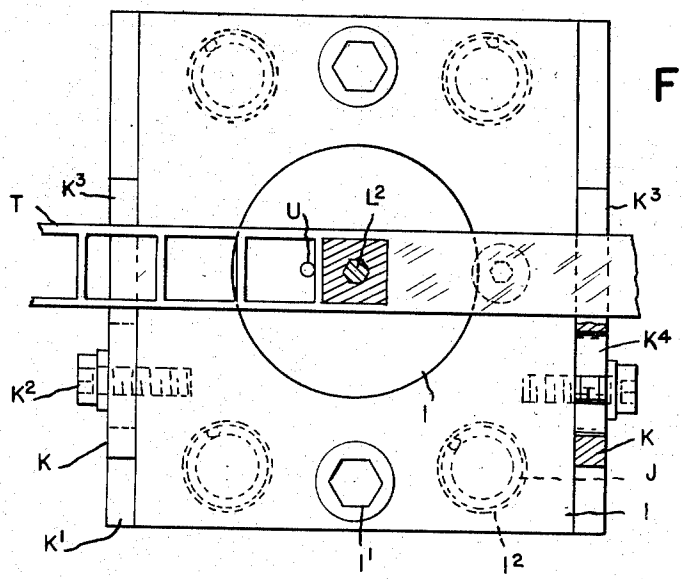


FIG.4.

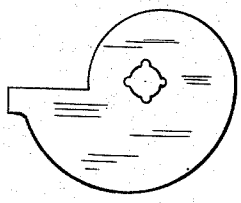


FIG.5.

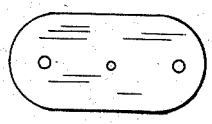


FIG.6.

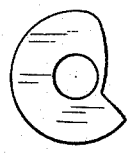


FIG.7.



FIG.8.



FIG.9.

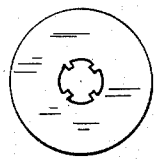
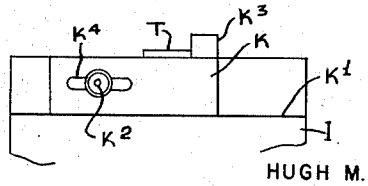


FIG.10.



FIG.11



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UNIVERSAL PUNCH AND DIE EQUIPMENT

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Application April 3, 1950, Serial No. 153,729

4 Claims. (Cl. 164—13)

The invention relates to punch and die equipment, and it is the object of the invention to obtain a universal construction capable of being quickly changed to adapt the same for the forming of various different specific products.

To this end the invention consists in a pair of relatively reciprocatable die-holding elements and guiding means therefor, together with a plurality of exchangeable pairs of cooperating die members engageable with and exactly positioned by said holding elements.

In the drawings:

Fig. 1 is a perspective view of the master die members detached from each other;

Fig. 2 is a vertical central section through the master members in engagement with each other and with sub-die members and showing the sub-die members also in engagement therewith;

Fig. 3 is a plan view of the lower master die member showing in horizontal section the cooperating sub-die members of the upper main die member; and

Figs. 4, 5, 6, 7, 8, 9 and 10 are plan views of stampings of different contours adapted to be formed by exchangeable sub-die members of corresponding contours.

Fig. 11 is a side elevation of the work guiding means at right angles to the plane of Fig. 2.

Generally described my improved construction comprises a pair of master die holding members mounted and guided for relative reciprocation through a rectilinear path and a plurality of exchangeable sub-die members for alternative engagement with said master members and adapted to fashion the specific products. The master die holding members include a lower member A adapted to be mounted on the bed of a press and provided with upwardly extending guide posts B for engagement with an upper master die holding member C, which latter may be attached to or actuated by the plunger of the press. Each of the die members A and C is further provided with a portion having a cylindrical surface which is in exact axial alignment with the corresponding portion of the other die member. As specifically illustrated in Fig. 2, the lower member A is provided with an upwardly projecting cylindrical positioning block D rigidly attached thereto by screws D^2, and the upper member C is similarly provided with a downwardly projecting cylindrical positioning block E rigidly attached thereto by screws E^2. Each of these blocks D and E is further formed with a cylindrical recess, respectively, F and G, and the block E is still further provided with a cylindrical recess H of smaller diameter in the portion E' above the recess G. The members D and E may either be formed integral with or separate from the master members A and B, but in either case they are rigidly secured to said members and as shown they are separate members secured by the screws D^2 and E^2 respectively.

The sub-die members are attached to the master members A and C through engagement with the recesses or sockets in the positioning blocks D and E. When thus attached the sub-die members will be exactly axially aligned with each other and the positioning blocks D and E but, except as hereinafter described, will be independently rotatably adjustable in their sockets. This permits the registration of the contour of each male member with that of the corresponding female member, after which they are locked to be retained in such relative positions.

While my equipment may be used for the forming of a great variety of different specific products, I will confine this description to the forming from sheet stock of punchings of various contours such as metal washers. As shown in Fig. 2 there is placed upon the lower die member A, a rectangular member I which has a cylindrical recess I^4 slidably engaging the external cylindrical surface D' of the member D. Headed screws I' passing through countersunk bores in the member I on opposite sides thereof engage threaded apertures in the member A and permit a limited vertical movement of the member I thereon. A plurality of recesses I^2 in the underside of the member I receive springs J, which normally yieldably support the member I in raised position. The member I is further provided with adjustable guide members K, which are in the form of plates slidably engaging grooves K' in the opposite sides of said member I and clamped in various positions of adjustment by headed screws K^2 passing through slots K^4 therein into threaded engagement with the member I. The portions K^3 on the members K, which project above the top surface of the member I, are adapted to engage with the sheet stock and guide the same to the stamping dies as hereinafter explained.

The sub-die members are fashioned to the particular contours to be imparted to the stampings and, as shown in Fig. 3, the external contour of the stamping is rectangular with the central aperture hexagonal in contour. The sub-die members include a pierce punch member L having a cylindrical shank L' for engaging the cylindrical recess H in the portion E' of the positioning block E. The cutting portion L^2 of the punch is hexagonal and corresponds to a hexagonal recess M' in a sub-die member M which is a combined blank punch and pierce die. The latter has a cylindrical shank portion M^2 fitting within the recess F in the portion D of the member A. The external contour of the upper portion or blank punch M^3 of the member M is square and corresponds to a similar blank die contour N' in a sub-die member N which fits within the recess G. The member I is provided with a cylindrical recess I^3 in its upper portion in which is placed a sub-die member O constituting a stripper bushing which is apertured to receive the blank punch portion M^3 of the member M. There is also a stripper member P fitting within the rectangular blank die recess N' of the member N and having an enlarged flange or headed portion P' within a recess N^2 in the member N. Springs P^2 also within the recess N^2 yieldably force the stripper downward.

It is essential that each of the sub-die members should be rigidly secured to the main member to which it is attached, and it is also necessary that it should be held from rotation when in operative position. Some of these sub-die members are thus held by screw members Q having head portions Q' of larger diameter but provided with segmental recesses Q^2 in a portion thereof. Each screw Q is so located in the member to which it is attached that the head portion Q' thereof will overlap the sub-die receiving socket but, when turned to register the segment Q^2 therewith, will completely clear the socket. The die member engaging the socket has a cutaway segment for receiving the head Q' of the screw and thus after said die member is engaged with the socket the screw may be turned to lock it against disengagement or rotation within said socket (see my Patent 2,017,247 issued October 15, 1935). Such a construction is used for locking the sub-die member or punch L in the socket H, this being the first of the sub-die members to be placed in the assembly. The sub-die member M is the second to be placed but this must be rotatably adjusted in the socket F to register the hexagonal recess therein with the hexagonal portion of the member L so that the latter may be engaged therewith. The member M is then non-rotatively locked in such position by a set screw R, which passes through a threaded aperture in the wall of the lower positioning member D to clamp against the portion M^2 of the member M. The next sub-die member to be positioned and locked is the upper blank die member N which together with the follower P is placed within the recess G, which is then rotated to place its rectangular recess in registration with the rectangular portion M^3 of the member M, after which it is engaged with said member and is non-rotatively locked in its socket by a set screw S in the wall of the member E. The upper blank die member N is further secured to the upper posi-

tioning block E by locking screws N^4 of the same type as the screw member Q above described. Similarly the lower combined blank punch and pierce die member M may be further secured to the lower positioning block D by locking screws of the same type as the screw member Q. This completes the assembly and places the device in condition for operation. During operation a strip of stock T, either sheet metal or any other suitable sheet material, is fed over the member I being directed by the guides K^3. Each reciprocation of the master die members will punch out a rectangular stamping having a hexagonal central hole therein. The stock strip is preferably slightly wider than the diameter of the stamping so as to cut all of the sides of the latter. After the withdrawal of the upper master die member, a strip is advanced to engage a stop pin U which positions it for another stamping, and the stripper P will disengage the stamping from the dies.

As previously stated the exchangeable subdies may be of any desired contour and in Figs. 4 to 10, inclusive, a number of stampings of different contours are shown, each of which can be fashioned by exchangeable subdies of corresponding contour. In order to adjust the machine for stampings of different contours it is necessary to exchange only five parts, subdie L with portion L′ constituting the pierce punch, subdie N with portion N′ constituting the blank die, stripper P, stripper bushing O, and the combined subdie member M, the outer surface M^3 of which constitutes the blank punch and the inner recess M′ of which constitutes the pierce die. Thus the cost of adapting the dies to produce different stampings is very much less than would be the case if the main die members were used for this purpose.

What I claim as my invention is:

1. A portable precision die unit for producing washers adapted to be mounted on a press comprising a lower die-holding member adapted to be secured to the bed of the press, a pair of parallel posts extending upwardly therefrom, an upper die-holding member slidably engaging said posts with a precision fit to establish an exact path of rectilinear movement, upper and lower positioning blocks secured to the respective die-holding members, said upper block having two concentric inner cylindrical surfaces, the smaller above the larger, an exchangeable pierce punch having a shank engaging said smaller surface, a screw in said upper block for non-rotatively locking said punch, said screw extending parallel to said punch and being operable from within said larger cylindrical surface, an exchangeable blank die having an outer surface engaging said larger inner cylindrical surface for rotative adjustment, a screw extending radially through said upper block into engagement with said die for non-rotatively locking the same, said lower block having outer and inner surfaces coaxial with said surfaces in the upper block, an exchangeable blank punch and pierce die rotatively adjustable in said inner surface of the lower block, a screw extending radially through said lower block into engagement with said blank punch for non-rotatively locking the same, a work-stock supporting member vertically slidable on said outer cylindrical surface of said lower block, springs intermediate said supporting member and said lower die-holding member, the aforesaid pierce punch, blank die, blank punch and pierce die having working surfaces of non-circular contour, an exchangeable annular stripper member vertically slidable between the pierce punch and blank die, said stripper member having non-circular outer and inner surfaces corresponding to the active surfaces of said exchangeable punch and die members, springs within said larger cylindrical surface between said stripper member and said upper block, and an exchangeable stripper bushing insertable in a recess in said work-stock supporting member and secured thereto and having an annular non-circular inner surface corresponding to and slightly engageable with the outer contour of said exchangeable blank punch.

2. A portable precision die unit for producing washers adapted to be mounted on a press comprising a lower die-holding member adapted to be secured to the bed of the press, a pair of parallel posts extending upwardly therefrom, an upper die-holding member slidably engaging said posts with a precision fit to establish an exact path of rectilinear movement, an upper positioning block secured to said upper die-holding member and having two concentric inner cylindrical surfaces, the smaller above the larger, an exchangeable pierce punch having a cylindrical shank rotatively adjustable in said smaller surface, an exchangeable blank die surrounding said punch having an outer cylindrical surface rotatively adjustable in said larger surface, a lower block secured to said lower die-holding member and having outer and inner surfaces coaxial with said surfaces in the upper block, an exchangeable combined blank punch and pierce die beneath and coaxial with said pierce punch and blank die having a cylindrical shank rotatively adjustable in said inner surface of the lower block, a work-stock supporting member vertically slidable on said outer cylindrical surface of said lower block, springs intermediate said supporting member and said lower die-holding member, and means for non-rotatively and positively securing each of the three aforesaid concentric punch and die members to the respective positioning blocks in accurate registration with each other, said securing means including a screw in said upper block for non-rotatively locking said punch, said screw extending parallel to said punch and being operable from within said larger cylindrical surface, a screw extending radially through said upper block into engagement with said blank die for non-rotatively locking the same, a screw extending radially through said lower block into engagement with said combined blank punch and pierce die for non-rotatively locking the same, and an exchangeable annular stripper member vetrically slidable between the pierce punch and blank die.

3. A die unit as set forth in claim 2 in which one of the blank punch and pierce die portions of said exchangeable combined member in the lower block is of non-circular contour and the cooperating member in the upper block is correspondingly non-circular.

4. A die unit as set forth in claim 3 in which said exchangeable stripper member has outer and inner surfaces corresponding to the active surfaces of said exchangeable punch and die members, and the die unit is provided also with springs within said larger cylindrical surface between said stripper member and said upper block, and an exchangeable stripper bushing insertable in a recess in said work-stock supporting member and secured thereto and having an annular inner surface corresponding to and slidably engageable with the outer contour of said exchangeable blank punch.

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