

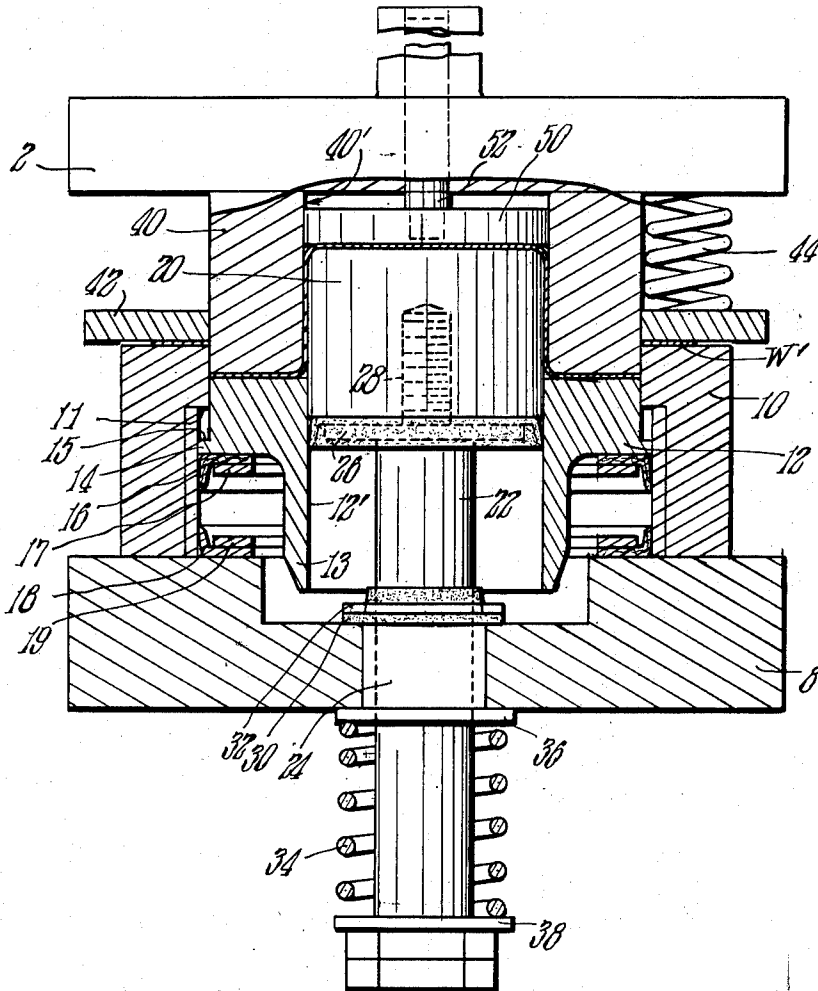
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HYDRAULIC DIE

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HYDRAULIC DIE

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My invention relates to improvements in a hydraulic die and is directed more particularly to a die apparatus for blanking, drawing, and forming a piece of work from a sheet stock.

The principal objects of the invention are directed to the provision of a die apparatus which is adapted for blanking, drawing, and forming a piece of work from a sheet of stock and which is characterized by relatively movable components constructed and arranged whereby one component is actuated by another so that, when the apparatus is associated with the relatively movable parts of a press, a piece of work is blanked, drawn, and formed during a single cycle of operation of the press.

With the above primary object in view, it is another object of my invention to provide a construction of the above described character which is relatively simple and compact in accordance with the demands and desires of the purchasing public as well as of the manufacturers thereof and which is not only attractive in its appearance and practical in its value but also reliable in its operation and thoroughly efficient in its use.

All of the above objects I accomplish by means of such structure and relative arrangement of parts thereof, as will fully appear by a perusal of the description below and by various specific features which will be hereinafter set forth.

To the above cited and other ends and with the foregoing and various other novel features and advantages and other objects of my invention as will become more readily apparent as the description proceeds, my invention consists in certain novel features of construction and in the combination and arrangement of parts as will be hereinafter more particularly pointed out in the claims hereunto annexed and more fully described and referred to in connection with the accompanying drawings wherein:

The figure is a sectional elevational view through a die apparatus embodying the novel features of my invention.

In the above mentioned drawing annexed hereto and forming a part of this specification, I have shown but one embodiment of my invention which is deemed preferable, but it is to be understood that changes and modifications may be made within the scope of the appended claims without departing from the spirit of the invention.

Referring now to the drawing more in detail and referring more particularly to the preferred form of my invention selected for illustrative purposes, I have shown a punch holder 2 which has a shank 4 for securement to the ram of a press (not shown).

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With the punch holder 2 secured to the ram in the conventional manner, the member 2 is moved upwardly and downwardly away from and toward a lower die set member 8 whereby the die construction is enabled to perform the blanking, drawing, and forming operations as will be presently observed.

An outer ring like blanking member 10 is fixed to the member 8 as by bolts (not shown) or the like.

An outer piston member 12 is reciprocable up and down within the bore of and relative to the blanking member 10, as shown.

In cross section, the member 12 is in the shape of an inverted L so as to provide a downwardly extending lip portion 13 or extension therearound as shown.

An offset portion 14 on the outside of the member 12 provides a shoulder 15 which may be brought into abutment with a shoulder 11 on the inside of the member 10 as shown whereby the upward movement of the member 12 relative to the member 10 may be restricted.

A packing 16 is secured to the lower end of member 12 by means of a clamp ring 17 and bolts (not shown) or the like.

A packing 18 is provided on the member 8 within the member 10 and is held in place by a clamp ring 19 and bolts (not shown) or the like.

An inner piston 20 reciprocates up and down within the bore 12' of the member 12.

A shaft 22 is provided which is reciprocable up and down in a bushing 24 of member 8.

The shaft 22 carries a flange 26 and has a threaded upper extremity 23 engaging the piston 20.

A packing 30 around the shaft 22 is clamped to the member 8 by a ring 32 with screws (not shown) or the like holding the ring in place.

A spring 34 is disposed around the lower end of the shaft 22 between spring seats 36 and 38 which urges the shaft 22 and the piston 20 downwardly.

A ring like draw member 40 is secured to the member 2 and the member 20 reciprocates within the bore thereof and relative thereto as well as within the bore of and relative to the member 12, all as is shown.

A stripper 42 is reciprocable up and down on the draw member 40.

One or more springs 44 between the members 2 and 42 urge the stripper downwardly.

A hold down 50 is provided with a stem 52. The member 50 is reciprocable in the bore 40' of the member 40 and the member 52 is reciprocable in the shank 4.

The construction disclosed herein is for producing disc shaped work pieces and for that purpose the parts are circular or ring like in shape. It will be understood however that the parts may be other than circular to produce work pieces other than disc shaped.

The operation of my device will now be described.

The bore 12' is filled with liquid such as oil and with the member 2 in its upper position the spring 34 moves the piston 20 downwardly so that the upper end face of the member 20 is in the plane of the upper end face of the members 10 and 12.

With the piston 20 in the lower position, the liquid displaced thereby acts upon the member 12 to urge the same upwardly to the limit of its stroke which is attained when the shoulders 15 and 11 abut whereby the upper end face of the member 12 is in the plane of the upper end faces of the members 10 and 20.

A piece of sheet stock W is laid upon the upper end faces of the members 10, 12 and 20 by any suitable means.

As the member 2 moves downwardly, the stock W is clamped between the members 42 and 10 and between the members 40 and 12 for the piercing and blanking operations.

The peripheral edge of the member 10 cooperates with the edge of member 40 for the blanking operation so that the desired blank is formed.

With the marginal edges of the work W clamped between members 40 and 12 and as the member 2 continues downwardly, the member 12 is moved downwardly through the action of member 40. The member 12 displaces liquid which acts on the piston 20 to move it upwardly.

As the piston 20 moves upwardly, it cooperates with the member 40 to draw and form the work to the shape as shown.

The member 50 bears on the work and cooperates with the end face of the member 20 to prevent wrinkling of the work.

The parts are shown in the lowermost position of member 2 with the work blanked, drawn and formed.

As the member 2 moves to its upper position, the spring 34 moves the shaft 22 and the piston 20 downwardly so that, through the displacement of fluid by this piston, the member 12 is moved upwardly thereby lifting work W from the upper end of the piston 20.

In the upper position of member 2, the members 10, 12 and 20 have their upper surfaces in substantially the same plane and the member 42 is disposed above member 10 so that the part W' and the work W may be removed.

Fluid such as oil may be inserted in the bores through a passageway not shown which may be closed by a plug also not shown.

The invention may be embodied in other specific forms without departing from the essential characteristics thereof. Hence, the present embodiments are therefore to be considered in all respects merely as being illustrative and not as being restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all modifications and variations as fall within the meaning and purview and range of equivalency of the appended claims are therefore intended to be embraced therein.

What it is desired to claim and secure by Letters Patent of the United States is:

1. A die construction comprising in combina-

tion, a lower die-set member, an upper punch holder adapted for movements towards and away from said member, a lower outer blanking member fixed to said die-set member and extending upwardly therefrom having a piston bore for liquid therein closed at its lower end by said die-set member having an upper face and an annular shoulder around said bore and disposed downwardly from said upper face, an outer piston reciprocable up and down in the bore of the blanking member having a piston bore therethrough concentrically related to the bore of the blanking member and provided with an annular shoulder for abutment with the shoulder of the blanking member to limit upward movements thereof and having an upper face arranged for disposition in the plane of the upper face of the blanking member when in upper position, a draw member fixed to said punch holder receivable and reciprocable in the bore of blanking member for depressing the outer piston in downward movements thereof to displace liquid below said piston and provided with a bore in alignment with the bore of the outer piston, an inner piston reciprocable in the bores of the draw member and inner piston having a depending shaft reciprocable in and extending through said die-set member, spring means below said die-set member around said shaft urging said inner piston to lower position and limiting upward movements thereof, said inner piston having an upper face for disposition in the plane of the upper faces of the blanking member and inner piston when in lower position, lower portions of said outer and inner pistons being arranged whereby the bores of the blanking member and outer piston are in communication when the outer and inner pistons are in upper and lower positions respectively whereby liquid displaced by downward movement of the outer piston brings about upward movement of the inner piston, a stripper around and reciprocable on the draw member over said blanking member, and spring means between the punch holder and stripper urging the latter away from the former.

2. A die construction comprising in combination, a lower die-set member, an upper punch holder adapted for movements towards and away from said member, a lower outer blanking member fixed to said die-set member and extending upwardly therefrom having a piston bore for liquid therein closed at its lower end by said die-set member having an upper face and an annular shoulder around said bore and disposed downwardly from said upper face, an outer piston reciprocable up and down in the bore of the blanking member having a piston bore therethrough concentrically related to the bore of the blanking member and provided with an annular shoulder for abutment with the shoulder of the blanking member to limit upward movements thereof and having an upper face arranged for disposition in the plane of the upper face of the blanking member when in upper position, a draw member fixed to said punch holder receivable and reciprocable in the bore of blanking member for depressing the outer piston in downward movements thereof to displace liquid below said piston and provided with a bore in alignment with the bore of the outer piston, an inner piston reciprocable in the bores of the draw member and inner piston having a depending shaft reciprocable in and extending through said die-set member, spring means below said die-set member around said shaft urging said inner pis-

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ton to lower position and limiting upward movements thereof, said inner piston having an upper face for disposition in the plane of the upper face of the blanking member and inner piston when in lower position, lower portions of said outer and inner pistons being arranged whereby the bores of the blanking member and outer piston are in communication when the outer and inner pistons are in upper and lower positions respectively whereby liquid displaced by downward movement of the outer piston brings about upward movement of the inner piston, a stripper around and reciprocable on the draw member over said blanking member, and spring means between the punch holder and stripper urging the latter away from the former, and a hold-down

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reciprocable in the bore of the draw member overlying the inner piston and having a shank reciprocable in the punch holder.

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