March 22, 1938. A. A. BYERLEIN 2,112,012

PRESS

Filed July 11, 1936 2 Sheets-Sheet 1

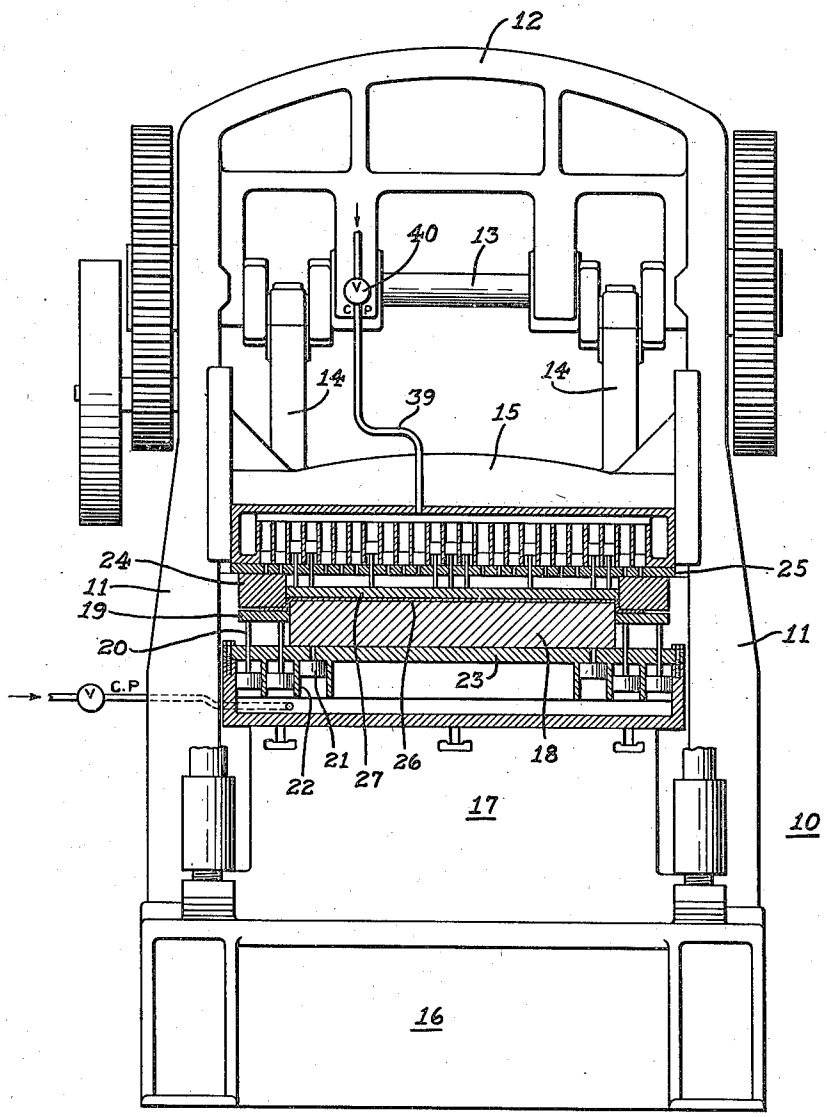



Fig. 1

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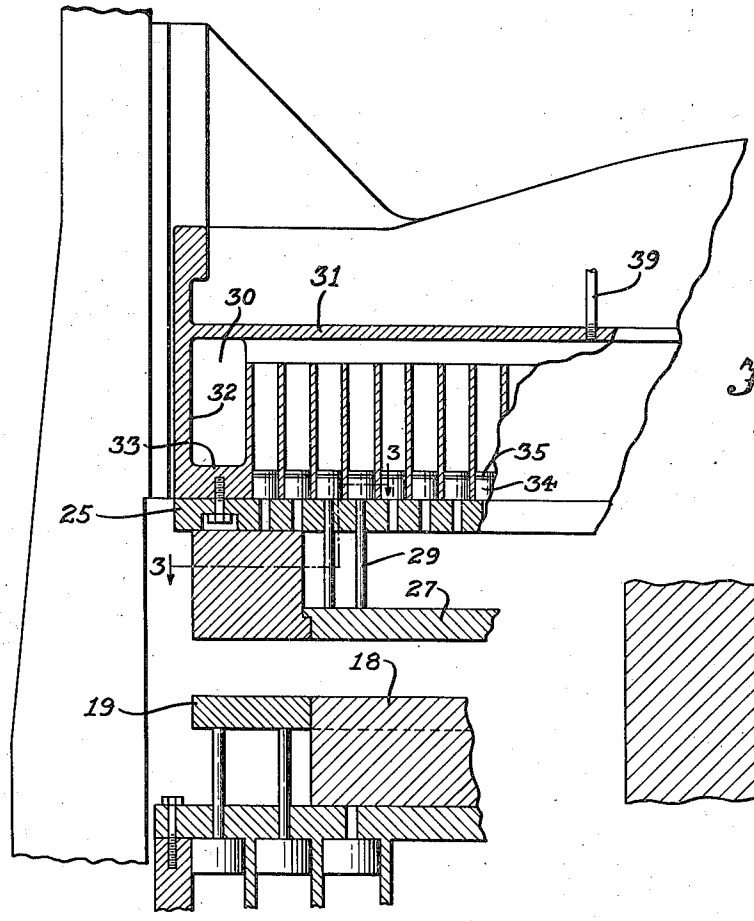



Fig. 2

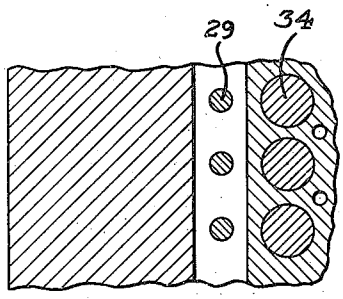



Fig. 3

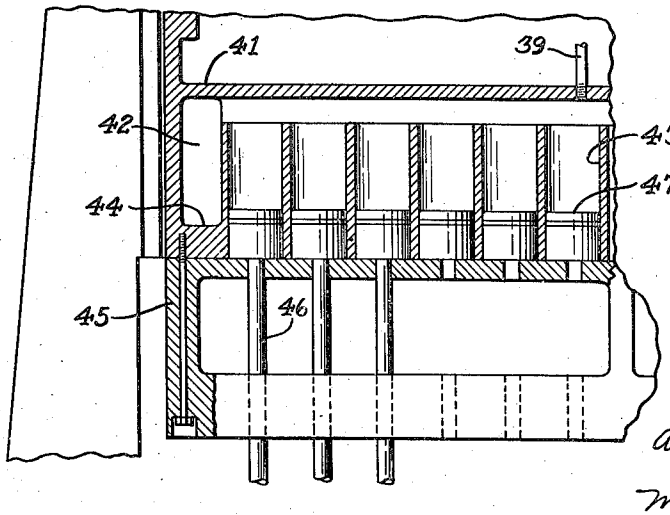



Fig. 4

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# UNITED STATES PATENT OFFICE

2,112,012

## PRESS

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Application July 11, 1936, Serial No. 90,059

9 Claims. (Cl. 113—38)

This invention relates to metal working presses and the like and more particularly to presses for drawing or forming sheet metal.

One object of the invention is the provision of a press slide or other die carrying structure having a number of relatively independent pressure operated means for yieldingly operating different portions of the same work engaging member and arranged so that a desired number of the pressure operated means can be selected in accordance with the needs of any particular operation to be performed.

Another object of the invention is the provision of a press adapted to be readily changed for the support of different dies, and including force transmitting pins which are independently urged in a yielding manner in one direction, and which are directly engageable at different locations with one of the dies or work engaging members.

Another object of the invention is the provision of a press slide providing a fluid pressure chamber and having a wall provided with a number of pressure operated pistons which are independently connected to a common work engaging member.

Other objects and advantages of the invention will be apparent from the following description, the appended claims and the accompanying drawings, in which

Fig. 1 is a front elevation, shown partly in section, of a press embodying the present invention;

Fig. 2 is an enlarged vertical section taken centrally through a portion of the press slide;

Fig. 3 is a horizontal section on the line 3—3 of Fig. 2; and

Fig. 4 is a vertical section of a portion of a modified form of slide.

Referring more particularly to the drawings by reference numerals, 10 generally designates the frame of a press, herein shown in the form of a metal forming or drawing press of the single action type. The press includes side frame members 11, a crown 12, a crank shaft 13, crank driven links 14 and a die carrying slide 15 operated thereby and adapted for vertical reciprocatory movement in suitable guides in the side members 11. The press base 16 supports a suitable bed portion 17, the latter being adapted for the support of a lower die 18. If desired, and as herein shown, the bed 17 may be raised and lowered to different positions of height adjustment by rotatable screws on which the bed is carried.

Surrounding the lower die 18 is a pressure operated work engaging member or blank holder plate or draw ring 19 supported by means of a number of pins 20 which are guided in cylindrical passages in the carrying part 23 on which die 18 rests and which is carried by bed portion 17. The lower ends of the pins 20 are urged upwardly in a yielding manner by pistons 21 operating in cylinders 22 provided in the carrying part 23. Air, or other fluid, under controlled pressure, is maintained in the fluid pressure chamber provided between the upper and lower walls of the carrying part 23.

The slide 15 carries a plurality of work engaging members or dies. One of these dies, 24, is a work engaging or forming die which is bolted or otherwise secured in fixed position on a bottom plate 25 of the slide. This die is adapted for engagement with edge portions of the sheet metal blank 26 and cooperates with the blank holding member 19 which is urged upwardly in a yielding manner under the action of the fluid pressure cushion provided below the bolster plate. The other die member carried by the upper slide is a work engaging pad or plate 27, slidably guided within the die 24, the latter having a suitable stop surface which limits the downward movement of the plate 27 to the position as indicated in Fig. 2. The plate 27 is urged downwardly in a yielding manner by means of steel pins or rods 29 which contact with the upper side of the plate 27 and which are independently urged downwardly, in a yielding manner, under the action of the fluid pressure which is maintained in the fluid pressure chamber 30 provided in the slide. The fluid pressure chamber 30 is defined by the horizontally extending upper wall 31, side walls 32, and a lower comparatively thick wall 33 to which the plate 25 is detachably bolted. The wall 33 is provided with a large number of cylindrical passages, the axes of which are parallel to the direction of slide movement. In each of these cylinders is a piston 34, preferably having suitable packing 35 to prevent leakage of fluid along the side walls of the cylinders. The pistons 35 are limited in their downward movement by the bottom plate 25, which is provided with a pin guiding passage centered with each piston. As will be apparent from Fig. 3, the cylinders are rather closely spaced in the bottom wall of the slide, and are arranged in rows throughout substantially the entire lower side of the slide.

The fluid presure is independently transmitted from the pistons 35 to different points on the work engaging plate 27 by the pins 29, which may be readily removed and replaced so that a desired number of pins, and pins of the required length,

can be employed. With air supplied through the flexible pipe 39 to the chamber 30, a certain pressure is created on the pistons 35, maintaining the pistons against the plate 25 or against the pins 29. The air pressure supplied to the fluid pressure chamber may be regulated by a pressure regulating valve 40 of any suitable character adapted to maintain the pressure up to some predetermined minimum, while preventing return flow from the air cushion back to the supply line. When the press is operated the slide 15 descends carrying both the die members 24 and 27 with it until these members contact with the blank 26 on the blank holding die or draw ring 19 and the bottom die 18. The dies 24 and 19 then descend together, operating against the pressure of the bottom fluid pressure cushion, while the plate 27 is yieldingly urged against the top of the lower die 18 under the pressure of the chamber 30 in the slide. The continued downward movement of the slide thus forms the sheet metal blank around the lower die, the drawing operation being carried out while the metal is being held under the desired pressure between plate 27 and the lower die 18.

When the slide moves upwardly after the draw is completed the draw ring 19 operates as a stripper and the plate 27 operates as an ejector, facilitating the removal of the formed work.

As there are a very large number of holes for the reception of the pressure pins, and a correspondingly large number of pistons 35 throughout practically the entire length and width of the slide 15, it will be apparent that the latter is adapted for the support of dies of many different kinds, and is adapted to carry either the inner or the outer work engaging member in a yielding manner, and adapted for the effective transmission of forces of widely differing values without unduly straining any particular part, since the forces transmitted by the various independent pins are always equalized.

It will also be understood that the fluid pressure supplied to the plate 27 depends on the number of pins employed. Consequently on work requiring high pressure a large number of pins may be used whereas in drawing comparatively small pieces only a few of the pins need be used.

These pins, moreover, need not be of exactly the same length. Great care was required to have the pins of exactly the same length, in prior constructions, but in accordance with the present invention if one of the pins is considerably longer than the others it would not assume the entire load but the pressure would be equalized automatically.

The number of pins employed, and the particular arrangement with respect to one another and with respect to the die can be readily changed, depending upon the shape of the die. It is sometimes desirable to use pistons and pins that are quite uniformly distributed, but at other times a group of holes only in the center or a group of holes at one corner only can be used. When it is necessary to use pins only on one corner or only one end there is a tendency to bind the pressure plate in the operation of the die in the prior constructions, and this is quite objectionable as the plate creates an undue amount of wear on its guides and when the guides become excessively worn the plate will tip somewhat, causing the pins to bend. This trouble is avoided in accordance with the present invention, no matter whether all of the pins are used or only a portion of the pins are used and regardless of the pin location.

Fig. 4 shows a modified form of construction in which the slide 41 is provided with a fluid pressure chamber 42 which communicates with the various cylinders 43 in the lower wall 44. The plate or bottom portion 45, which is detachably bolted to the lower side of the wall 44 is adapted to guide the pins 46 at spaced positions, any desired number of pins being employed. The pins engage the individual pistons 47. In this form of construction as in the embodiment illustrated in Fig. 1, there is an individual piston for each of the independently acting pressure pins 46.

While the forms of apparatus herein described constitute preferred embodiments of the invention, it is to be understood that the invention is not limited to these precise forms of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

What is claimed is:

1. In a press, a die carrying structure providing a fluid pressure chamber and having a wall provided with a large number of cylinders, a series of independent pistons for said cylinders, a fluid pressure operated work engaging member, thrust means independently connecting certain of said pistons to the work engaging member to yieldingly urge said work engaging member in one direction, said thrust means being readily removable from their respective pistons, and means detachably fixed to said structure for guiding said thrust means and engageable with the ends of the pistons for limiting movement thereof in one direction.

2. In a press, a die carrying slide providing a fluid pressure chamber and having a wall provided with a number of cylinders all in free communication with said chamber, a plate fixed to said wall and having a pin receiving hole in line with each cylinder, a piston in each cylinder, a fluid pressure operated work engaging member, and pins guided in said pin receiving holes and connecting certain of said pistons to the work engaging member, said pins being readily removable from their respective pistons and from the holes in which they are guided so that any selected number of pins can be employed.

3. A die carrying press slide having a wall provided with a number of rows of cylinders, a piston operating in each of said cylinders, pins engaging selected ones of said pistons, means for guiding said pins, said pins abutting their respective pistons and being removable therefrom while the pistons remain operably mounted in their cylinders, and a work engaging member operated by said pins.

4. A reciprocable press slide providing a fluid pressure chamber and having a wall provided with a number of openings, a metal forming member fixed to said slide, fluid pressure transmitting pistons operating in said openings and in free communication at one end thereof with said pressure chamber, a plate secured to said wall and having a passage in axial alignment with each of said openings, a fluid pressure operated work engaging member, and means operated by said pistons and operable in said passages for independently exerting equal forces on said work engaging member.

5. In a press, a reciprocably operable die carrying slide having a series of independent fluid pressure operated pistons, a bottom plate detachably connected to said slide and providing a stop

for said pistons to limit their downward travel, a fluid pressure operated work engaging member supported for relative movement with respect to said plate, and means readily separable from said pistons and independently connecting said pistons to the work engaging member.

6. In a press, a die carrying structure having a wall provided with a series of fluid pressure cylinders, means placing one end of all of said cylinders in common communication with a fluid pressure source, a piston for each cylinder, said wall having stop means limiting movement of the pistons towards the outer ends of their cylinders, a die carried by said wall for movement relatively thereto, and a series of pressure pins engaging different selected pistons and interposed between said pistons and said die, said pins having abutting engagement with the pistons so that any pin is readily removable from its respective piston while the piston remains mounted in its cylinder.

7. In a press, a die carrying structure having a wall provided with a large number of fluid pressure cylinders, said structure providing a fluid pressure chamber in direct communication with all of said cylinders, a piston for each cylinder, a die carried by said wall and movable relative thereto, and a series of pressure pins engaging selected different pistons and interposed between said pistons and said die, said pins having abutting engagement with the pistons so that any pin is readily removable from its respective piston while the piston remains mounted in its cylinder.

8. In a press, a die carrying slide adapted for reciprocatory movement therein and having a wall provided with a series of fluid pressure cylinders, means placing one end of all of said cylinders in common communication with a fluid pressure source, a piston for each cylinder, said wall having stop means limiting movement of the pistons towards the outer ends of their respective cylinders, a die carried by said wall and movable relatively thereto, and a series of pressure pins engaging different selected pistons and interposed between said pistons and said die, said pins having abutting engagement with their respective pistons so that any pin is readily removable to render its respective piston ineffective on the die.

9. In a press, a reciprocably mounted die carrying slide having a lower wall provided with a series of fluid pressure cylinders of comparatively small diameter and comparatively closely spaced so that said cylinders extend throughout a large part of the area of said wall, said slide providing a fluid pressure chamber with one end of each of said cylinders opening directly into said chamber, a piston for each of said cylinders, means providing stops limiting movement of the pistons in a downward direction, a work engaging member carried by said slide for relative movement thereon, and pins engaging said work engaging member and abutting selected ones of said pistons and readily removable from said pistons so that any piston can be rendered ineffective and any desired number of pistons may be operably connected to the work engaging member to yieldingly cushion the operation thereof in one direction.

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