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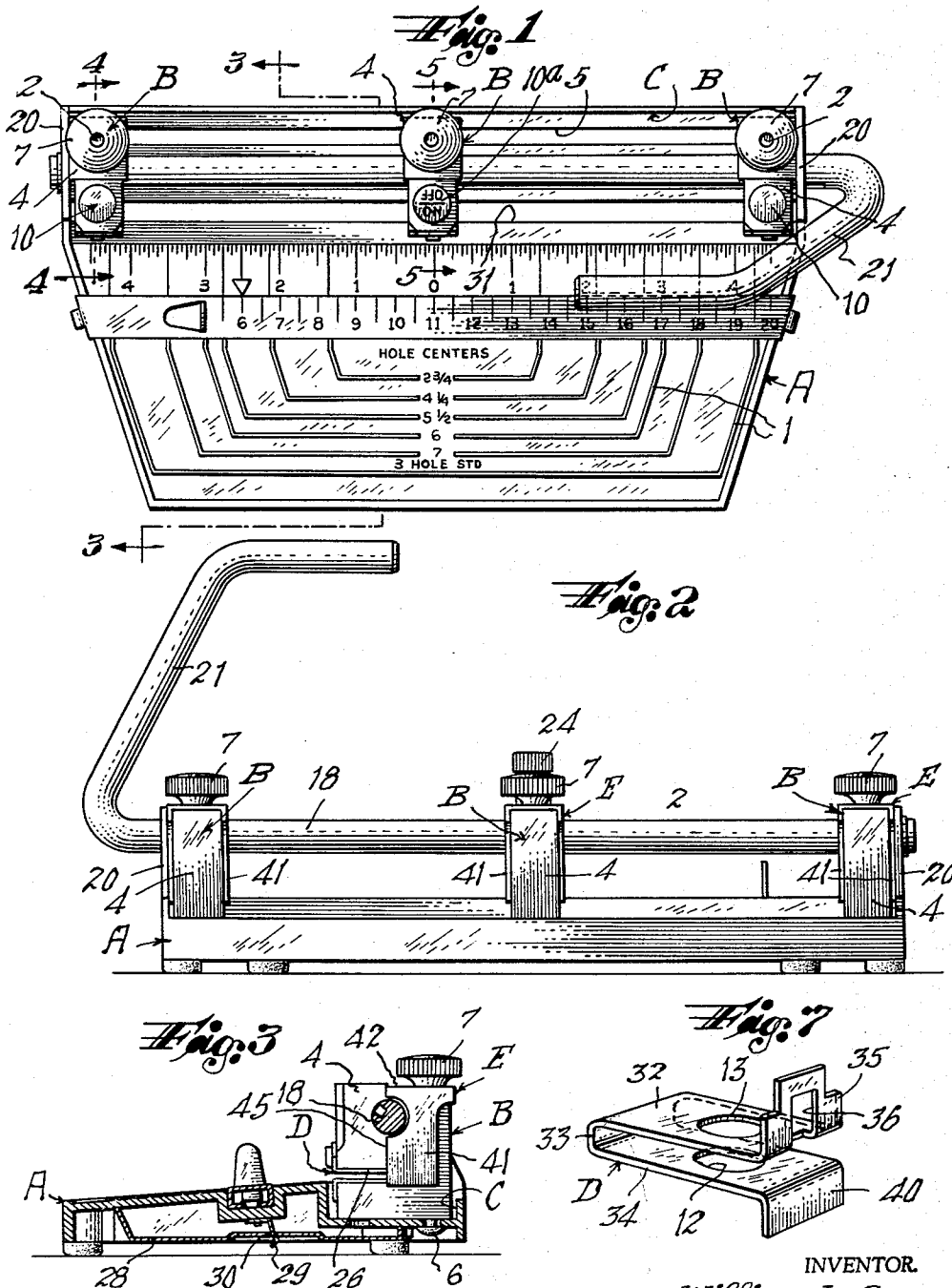
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MULTIPLE PUNCH

Filed March 7, 1963

2 Sheets-Sheet 1



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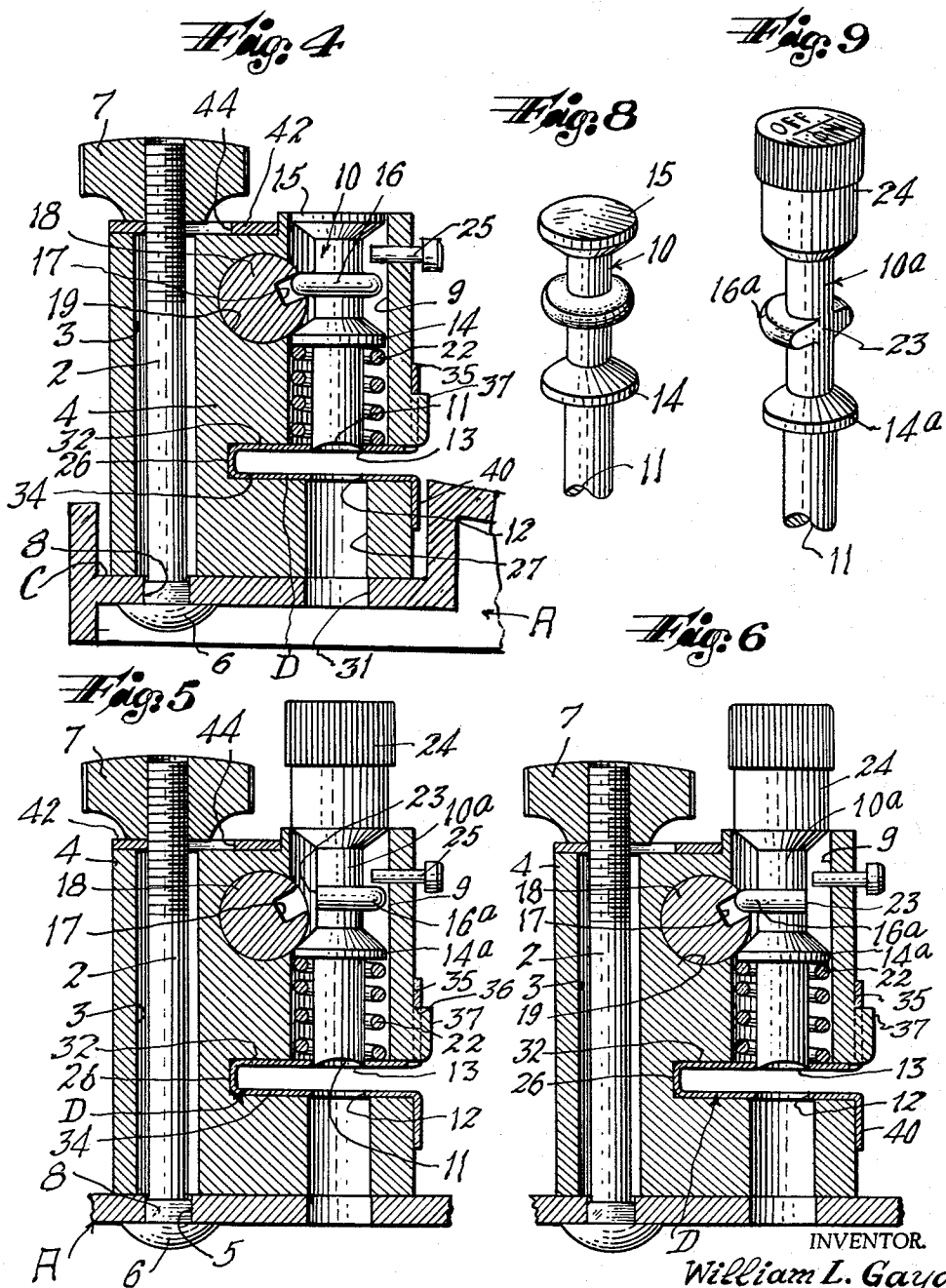
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2 Sheets-Sheet 2



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3,176,570

MULTIPLE PUNCH

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3 Claims. (Cl. 83-571)

This invention relates in general to apparatus for punching simultaneously a plurality of holes in sheets of paper, cardboard or similar material, for example, for the purpose of allowing insertion of paper fasteners or for insertion of papers in loose-leaf books and similar uses. For different purposes, the number of holes required may vary as may also the spacing of the holes in the papers, which generally requires a plurality of punches.

One object of the invention is to provide a punching or perforating apparatus which includes a novel and improved construction and combination of a base, a plurality of punches adjustably mounted on said base for variations in the spacing of the punches and simultaneously operable by the same manually manipulated handle, and means for at will connecting and disconnecting one or more of said punches to and from said handle, respectively, whereby selectively certain of the punches can be utilized for punching operations while other punches are out of operation and are at rest.

It is desirable that the cost of manufacture of such punching apparatus shall be as low as possible and at the same time the apparatus shall be strong, reliable and durable. Therefore, another object of the invention is to provide a punching apparatus which shall be simple, sturdy and capable of being manufactured at low cost and yet shall insure clean-cut and accurate perforations of paper sheets and the like.

It is another object of the invention to provide a punch comprising a novel and improved construction and combination of a die cast standard or block and a hardened steel die unit separably connected to the block so that the openings in the block for the cylindrical perforating elements can be cast to close tolerances thereby to eliminate machining operations, and the necessary close tolerances between the perforating elements and the die openings can be achieved by machining operations.

Still another object of the invention is to provide a punching apparatus which shall include a novel and improved construction and combination of a block, a perforating element or plunger, a manually rotatable shaft, wherein the perforating element may be connected to and disconnected from said shaft by simple rotation of the perforating element, thereby to throw said perforating element out of operation.

Other objects, advantages and results of the invention will be brought out by the following description in conjunction with the accompanying drawings in which

FIGURE 1 is a top plan view of a punching apparatus embodying the invention;

FIGURE 2 is a front elevational view thereof;

FIGURE 3 is a transverse vertical sectional view on the plane of the line 3-3 of FIGURE 1;

FIGURE 4 is an enlarged fragmentary transverse vertical sectional view approximately on the plane of the line 4-4 of FIGURE 1;

FIGURE 5 is a similar view on the plane of the line 5-5 of FIGURE 1, showing the perforating element disconnected from the operating shaft and at rest;

FIGURE 6 is a similar view showing the perforating element connected to the operating shaft and in normal position prior to a punching operation; and

FIGURE 7 is a detached perspective view of the hardened steel die unit.

Specifically describing the illustrated embodiment of the invention, the reference character A designates the base plate of the apparatus which preferably is formed of metal, for example, steel or aluminum. The upper surface of the front portion of the base is provided with ribs 1 that facilitate the positioning of punches B the proper distances apart to form holes in the paper sheets or the like at the desired locations.

The upper side of the rear portion of the base has a recess C therein in which the punches B are set. The punches are shown as adjustably secured on the base by a bolt 2 for each punch that passes through an opening 3 in the punch standard or block 4 and a longitudinal slot 5 in the base A at the bottom of the recess and has a head 6 abutting the bottom surface of the base and a nut 7 abutting the top surface of the block 4 as best shown in FIGURE 4. Preferably the bolt has a polygonal portion 8 disposed in the slot 5 to hold the bolt against rotation during adjustment of the nut 7. With this construction, it will be readily seen that by loosening the nut 7 the block 4 can be freely slid along the bottom of the recess C to the desired position, after which the block can be securely fastened in its adjusted position by tightening the nut 7.

Each punch block 4 is preferably formed by a die casting operation and has an opening 9 in which is freely slidable a perforating element 10 one end of which is formed as indicated at 11 to cooperate with an opening 12 in a separable and independent die unit D which also has a die opening 13 to accurately slidably receive the perforating element. The other end portion of the punching element is provided with two circumferential flanges 14 and 15 spaced apart longitudinally of the perforating element between which is a land or outwardly projecting bead 16. The bead or land is received in a longitudinal groove 17 in an operating shaft 18 which freely passes through a transverse opening 19 in each of the punch blocks and has portions journaled in bearing walls 20 at the ends of the recess C of the base A. The shaft has a handle 21 at one end thereof which is shown as comprising an end portion of the shaft bent at an angle to the main portion that passes through the punch blocks. With this construction, it will be seen that upon rotation of the shaft 18, the perforating elements will be reciprocated in their respective punch blocks, and preferably the perforating elements are operated by manual actuation of the driving shaft in the direction to punch the papers or the like, that is, downwardly in FIGURE 4, and the perforating elements are preferably actuated in the other direction by the respective springs 22 that are interposed between the corresponding die unit D and the flange 14 of the perforating element.

In some of the punches, the lands 16 may be circular or extend entirely around the circumference of the corresponding perforating elements, but at least one of the perforating elements has a portion of its land cut away so that upon rotation of the perforating element, the land may be disengaged from the operating shaft 18. For example, as shown in FIGURES 5, 6 and 9, the perforating element 10a has a portion of its land 16a cut away as indicated at 23 so that upon rotation of the perforating element into one position as shown in FIGURE 5, the land will be disengaged from the operating shaft, while upon rotation of the perforating element through an angle of 180°, the land will be moved into the slot 19 in the operat-

ing shaft so as to operatively connect the perforating element to the shaft. Desirably the upper end of the perforating element 10a has an enlarged and extended finger piece 24 to identify the perforating element and facilitate rotation thereof.

Preferably each punch block has a pin 25 slidably mounted or screw threaded therein to normally overlie the land of the corresponding perforating element and prevent the element from being pushed out of the block by the spring 22 when the operating shaft 18 is not present. The punch blocks may be lined up in their desired positions with their openings 19 in alignment to facilitate insertion and removal of the operating shaft into and from the openings 19, and when the shaft is in operative relation to the perforating elements, the springs 22 actuate the perforating elements and the shaft into their normal positions and the lower flanges 14 and 14a of the perforating elements abut the operating shaft so as to prevent the elements from being pushed out of the punch blocks by the springs.

An important feature of the invention is the construction and combination of the punch block and the die unit. As shown, the punch block has a deep and narrow slot 26 that opens through the front face of the block and intersects the opening 9 of the block to receive the papers or the like to be punched, and the block also has an opening 27 in alignment with the opening 9 providing a clearance for the punching end 11 of the perforating element and also for dropping of the punched discs from the die unit into a receptacle or pan 28 that is separably connected to the bottom side of the base in any suitable manner, as by a spring clip 29 secured to the base and passing through an opening 30 in the pan. The bottom of the recess C of the base has a longitudinal slot 31 in register with the openings 27 of all of the punch blocks to permit the waste discs to fall into the pan.

The die unit D is removably fitted into the slot 26 and is shown as comprising a single strip of sheet steel bent into approximately U-shape and having two parallel arms 32 and 34 connected at one end at 33 and spaced apart at their other ends to provide an opening for the papers. The unit is slid into the slot 26 before the perforating elements are mounted in their blocks, and preferably the upper arm 32 has its end portion bent upwardly at 35 and provided with a hole 36 the edges of which snugly abut the side surfaces of a lug 37 that is cast on the front surface of the punch block. This upper arm of the die unit also has an opening 13 therethrough of a diameter to accurately slidably receive the end of the perforating element, and the lower arm 34 of the unit has a similar coaxial opening 12 that coacts with the punching end 11 of the perforating element in punching the sheets of paper or the like, this construction providing for close tolerances between the perforating element and the die unit, thereby compensating for the relatively loose or freely slidable mounting of the perforating element in the opening 9 of the punch block. It is desirable that the lower arm 34 also have its free end bent into a common plane with the end portion 35 as indicated at 40 so that both of the end portions 35 and 40 may simultaneously and firmly abut the front surface of the punch block to provide a firm seating of the die unit in the slot 26. It will be observed, however, that due to the slidable relation between the die unit and the punch block, the die unit may slidably move laterally to accommodate itself to any lateral movements of the perforating element in the opening 9 of the block.

Preferably means is provided on the punches to adjust the upper or leading edges of the papers being punched relative to the axes of the perforating elements, and for this purpose, I have shown a sheet metal stop element E that comprises two parallel side arms 41 spaced apart a distance about equal to the thickness of the punch block and connected at their upper ends by a web 42 that rests

on the top of the block beneath the corresponding nut 7 and has an elongated slot 44 through which passes the bolt 2. Upon loosening the nut 7, the stop element may be slid on the punch block to locate the forward edges 45 of its arms different distances from the axes of the die openings, and upon tightening of the nut, the stop element will be clamped in its adjusted position. It will be seen that the arms 41 extend across the slot 26 in the punch block so as to be abutted by the top edges of the papers as the latter are inserted into the die unit.

The die cast block 4 can be economically produced, is strong and durable and provides adequately close tolerances for the shape of the block for holes 9 and for slot 27; and the separate and separable hardened steel die element compensates for the relative softness of the cast metal and provides for easy and quick manufacture and replacement of the die.

While the now preferred embodiment of the invention has been shown and described, it will be understood that this is primarily for the purpose of illustrating the principles of the invention and that modifications and changes in the structural details can be made within the spirit and scope of the invention.

I claim:

1. A perforating device including a base having at least one punch block mounted thereon, said punch block having an opening therein, a perforating element reciprocally and rotatably mounted in said opening, said punch block also having a die opening in axial alignment with said perforating element, said perforating element having a land or tooth projecting therefrom, a shaft rotatably mounted in said punch block perpendicularly to said opening with a portion extending into the opening and having a longitudinal groove receiving said tooth for reciprocation of the perforating element upon manual rotation of the shaft in one direction, said punch having an abutment beneath said shaft to abut the shaft, a spring in said punch block beneath and engaging said abutment to actuate said punch in the opposite direction and to cause said abutment to engage said shaft to limit such movement of the punch, said tooth projecting from one side only of said perforating element and being disengageable from said groove upon rotation of said perforating element so that the perforating element then will be inoperable upon rotation of the shaft.

2. A perforating device as defined in claim 1 with the addition of a pin in said punch block projecting into said opening in the punch block opposite said shaft and above said tooth whereby said tooth when it is disengaged from the shaft will underlie said pin and thereby prevent ejection of the perforating element from the opening in the punch block under the influence of the spring when the operating shaft is removed.

3. A perforating device comprising a base having at least one cast metal punch block thereon that has an opening therein, a perforating element loosely reciprocally mounted in said opening in the punch block, means for reciprocating said perforating element, and a hardened sheet metal die element separably connected to said punch block and having a die opening coactive with said perforating element for punching a sheet of material, said punch block having a horizontal slot that opens through the front face of the block and intersects said opening in the block, and said die element being U-shaped and having upper and lower parallel arms that have axially aligned openings the lower one of which is said die opening, said perforating element being normally located and guided by the opening in the upper arm, and said arms resiliently frictionally engaging opposite side walls of said slot and including portions coactive with portions of the punch block to position said openings in said arms in proper alignment with the perforating element.

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