Nov. 22, 1938. W. FAAS 2,137,716

PERFORATOR

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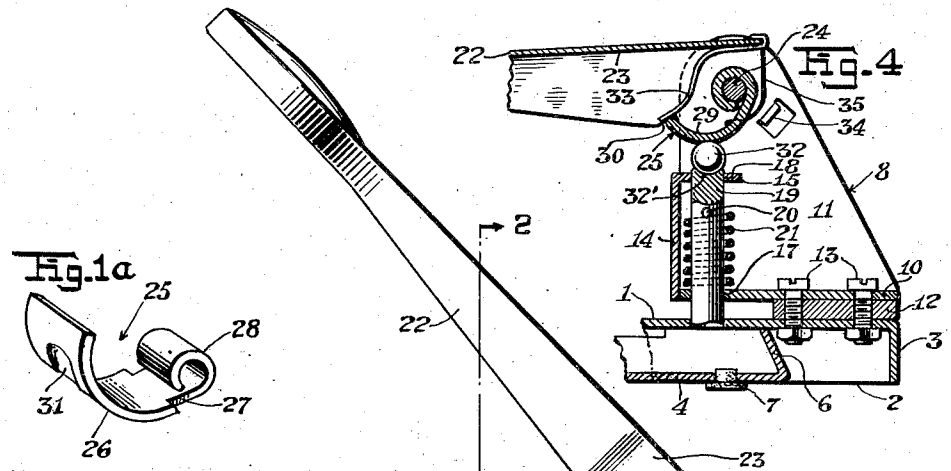


Fig. 1



Fig. 1a



Fig. 4

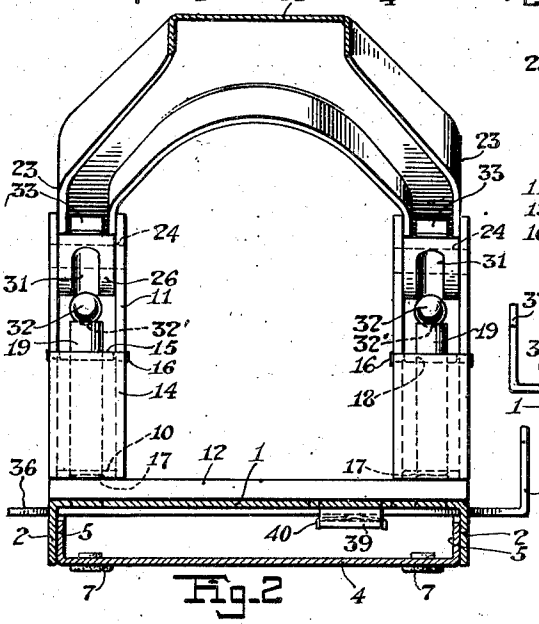


Fig. 2

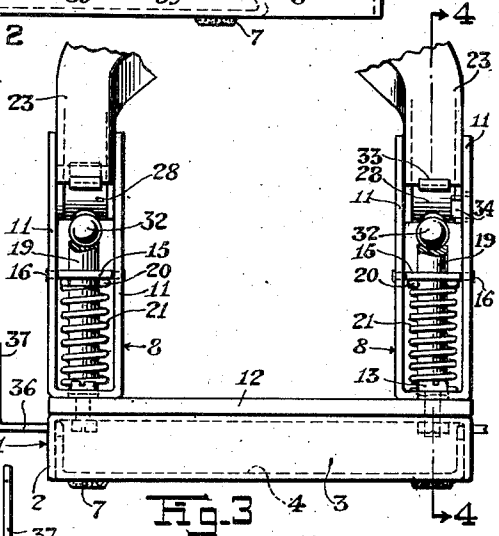


Fig. 3

INVENTOR
Walter Faas
BY
William A. Hardy
ATTORNEY

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## PERFORATOR

Walter Faas, South Orange, N. J., assignor to The Bates Manufacturing Company, West Orange, N. J., a corporation of New Jersey

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9 Claims. (Cl. 164—91)

My invention relates to perforators and more particularly to hand operated perforators designed for perforating or punching holes in sheets to facilitate the binding thereof in files or binders by suitable pronged securing means.

One of the principal objects of my invention is to provide an improved hand-lever operable perforating device characterized by great ease of action and requiring the expenditure of comparatively little energy when operated to perforate or punch a large number of superimposed sheets.

Another object of my invention is to provide a perforating device of this character which is strong, durable and of comparatively small weight; and wherein the majority of the parts may advantageously be, and preferably are, formed of sheet metal.

A further object of my invention is to provide a perforating device which is of simple construction, neat in appearance and effective in operation.

Other objects, features and advantages of my invention will be apparent upon consideration of the following detailed description and the appended claims in conjunction with the accompanying drawing, in which

Figure 1 is a view in side elevation of a preferred form of perforating device in accordance with my invention;

Fig. 1*a* is a perspective view of one of the punch actuating cams of the perforating device shown in Fig. 1;

Fig. 2 is a sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a rear elevational view, partly broken away, of the device shown in Fig. 1; and

Fig. 4 is a sectional view taken on line 4—4 of Fig. 3, with parts shown in elevation and with the operating lever depressed.

Referring to the drawing, 1 designates a rectangular base which is preferably formed of a single piece of suitable sheet metal such as steel, and has vertical side and end flanges 2 and 3 to stiffen the same and provide a raised platform or support. A flanged sheet metal tray or box 4 for receiving the small pieces of material cut from sheets in the operation of the perforating device, is normallly mounted within the base 1 in the position shown where it is removably held by frictional engagement of the side flanges 5 thereof with the inner surfaces of the side flanges 2 of the base. The tray is somewhat shorter than the base 1 and its rear end flange 6 is preferably inclined inwardly as shown, so as to facilitate removal of the tray from the base by the hand of a user of the device when it is desired to empty the tray. The base 1 and tray 4 are of substantially the same depth, and the bottom of the tray when the latter is in the normal position shown, is practically flush with the lower edges of the flanges 2 and 3 of the base. Pads 7 of rubber or other suitable soft material are applied to the bottom of tray 4 and constitute supports or rests adapted to engage the surface of a desk or table on which the device may be used so as to prevent such surface from being scratched or marred.

Adjacent its rear edge the base 1 is provided with a pair of similar spaced standards 8 preferably formed of fairly heavy sheet metal. These standards are each U-shaped in vertical cross-section, comprising a base 10 and spaced parallel sides 11. A rectangular spacing bar 12 is disposed between the rear portions of the standard bases 10 and the platform of base 1. The standards 8 and bar 12 are suitably secured, as by bolts 13, to the base 1. With the construction described spaces are provided between the forward portions of the standards 8 and the platform of base 1 for the reception of sheets to be punched.

Front plates 14, preferably formed of sheet metal, are disposed against the lower portions of the vertical forward edges of the sides 11 of standards 8; said plates having at their upper ends, right angular portions 15 of reduced width which extend rearwardly between the sides of the respective standards. The said portions 15 are provided at their side edges with laterally extending rectangular lugs 16 which are respectively engaged with and project through similarly shaped openings in the sides of standards 8 when the latter are bent to form, the projecting ends of these lugs being peaned over or upset. The plates 14 therefore are not only held rigidly in proper position but serve themselves to maintain the sides 11 of the respective standards in proper spaced relation.

The base 10 of each standard 8 and the angular upper end portion 15 of the corresponding front plate 14 are respectively provided with vertically aligned circular guide openings 17 and 18 in which is disposed for reciprocal sliding movement, a cylindrical punch 19. Each of the punches 19 has a pin 20 extending therethrough and projecting laterally therefrom and a coiled compressed spring 21 surrounding that portion thereof between said pin and the base 10 of the corresponding standard 8. The springs 21 bias

the punches 19 to the raised positions shown in Figs. 1, 2 and 3 wherein the pins 20 respectively engage the upper end portions 15 of plates 14 and the lower cutting ends of the punches are respectively disposed within the openings 17 in the bases of standards 8.

The actuating lever, designated by reference character 22, is preferably formed of fairly heavy channeled sheet metal and its inner end portion comprises divergent arms or branches 23. The ends of arms 23 are respectively received between the upper end portions of sides 11 of the standards 8 and are journaled on a pair of horizontally aligned pins 24 which extend between and are secured in the sides of said standards. Lever 22 is thus mounted on standards 8 for pivotal movement about a fixed axis located somewhat above and rearwardly of the punches 19.

To impart downward vertical operative movement to the punches 19 upon depression of lever 22, I provide novel and improved transmitting means comprising a pair of cam elements 25 which are respectively loosely mounted on the pins 24 for pivotal movement. Preferably the said cam elements are formed of stiff heavy sheet metal, and each comprises a main curved or segmental portion 26 of uniform width and an end portion 27 of reduced width terminating in a hollow cylindrical section 28 which is disposed between the sides of the channeled end portion of one of the arms 23 of lever 22 and through which the corresponding pin 24 extends with a loose fit. The reduced portion 27 of each element 25 projects outwardly just beyond the sides of the end portion of the respective lever arm 23, where it joins the segmental portion 26 of said element, the width of the latter portion being substantially equal to the over-all width of the end portion of said arm 23 and to the spacing of the sides 11 of the standard between which such end portion is disposed. The opposite sides of the end portion of each lever arm 23 have convex edge portions 29 which normally engage and which conform to the adjacent inner concave surface of the main segmental portion 26 of the corresponding element 25. At the outer ends of the convex edge portions 29, the sides of each lever arm are provided with shoulders 30 which engage or are closely adjacent the outer end of the corresponding cam element 25 when the latter occupies its normal position relative to the lever. The main segmental portions 26 of the cam elements are provided on their convex faces with central longitudinally extending grooves 31 which are curved in cross-section and are respectively engaged by a pair of balls 32 freely supported for rotary movement on conforming seats 32' in the upper ends of the punches 19.

It will be seen that the springs 21 normally act through punches 19, balls 32 and cam elements 25, to bias the lever 22 to the normal raised position thereof, as shown in Fig. 1. The cam elements 25 are biased not only by their own weight but by two flexed leaf springs 33, to engagement with the respective balls 32; the said leaf springs being bent at one end and frictionally engaged respectively with the ends of lever arms 23 and respectively bearing at the other end against the outer free ends of the cam elements. The major portions of springs 33 are hidden from view, being disposed within the channels of lever arms 23.

The construction just described ensures the retention of the balls 32 at all times on their seats 32' in the upper ends of punches 19. This is important, for one or both of the punches upon being forced through a plurality of superimposed sheets in operating the perforator, will sometimes become jammed and stick at or adjacent the lowermost position thereof despite the upward biasing action thereon of the corresponding spring or springs 21. Under such circumstances, if the cam elements 25 were not movable relatively to lever 22 and were not biased to engagement with the balls 32, one or both of the latter would be likely to become dislodged from the respective seat or seats 32' upon movement of lever 22 towards its raised or normal position. The cam elements 25 are of such length that they are adapted to remain in engagement with the balls 32 when the punches become stuck as described and the lever is then moved to its fully raised position, shown in Fig. 1. The weight of elements 25 is sufficient to maintain them biased to engagement with balls 32 at all times when the perforator is in its normal or horizontal position, as shown. But if one or both of the punches become stuck in depressed position, the user in attempting to loosen the same is likely to move the perforator to a tilted or even an inverted position, and accordingly I preferably provide the springs 33 so as to insure the biasing of elements 25 to engagement with balls 32 regardless of the position which the perforator as a whole may occupy or to which it may be moved.

Suitable means is preferably provided for limiting upward movement of lever 22, this means as shown comprising a stop lug 34 which is struck in from one side of a standard 8 and with which the rear edge or heel 35 of one side wall of the corresponding channeled lever arm 23 is adapted to coact.

A gauge bar 36 having an upstanding end portion 37 is mounted on the base 1 for adjustment transversely thereof, said bar constituting means for locating sheets to be punched so that the perforations made therein will be relatively positioned with respect to one edge of the sheets as may be desired. The bar 36 extends through aligned openings 38 provided in the opposite side flanges 2 of base 1 just beneath the top of the latter over a pair of opposed adjacent angular portions 39 struck down from said top intermediate the flanges 2. A bent leaf spring 40 supported on the portions 39 between the horizontal sections of the latter and the bar 36 serves to yieldingly hold the latter in adjusted position.

The operation of my improved perforating device is believed to be obvious, but may be briefly described as follows:

With the gauge bar 36 adjusted to the desired position and with the punches 19, lever 22 and associated parts in their normal positions, as shown in Fig. 1, sheets to be perforated are disposed on top of base 1 with one edge against the front face of bar 12 and with an adjacent and relatively right angular edge against the upstanding end portion 37 of gauge bar 36. The lever 22 is then depressed to the position shown in Fig. 4, whereupon the punches are forced downwardly through the sheets and the springs 21 are compressed. The lever is then released, the springs 21 return the punches, actuating lever and associated parts to their normal positions, and the perforated sheets are removed from the device.

It will be noted that in my improved device, there is no positive connection between the punches 19 and the actuating lever and that the latter is movable about an axis which is fixed with respect to the supporting standards 8.

Upon the depression of the punches 19 by actuation of lever 22, the balls 32 will partake of movements which are mostly rotary but partly sliding with respect to the grooves 31 in cam elements 25, such sliding movements compensating for the gradually increasing radial distance from the fixed pivotal axis of the lever at which downward force is applied to the punches as the actuation of the lever progresses. Very little resistance is therefore encountered in imparting reciprocal movement to the punches by pivotal movement of the lever despite the fact that the axis of the latter is fixed, and the action of the device is extraordinarily smooth and easy. Also with my improved construction and arrangement, but a comparatively small pressure on the actuating lever is necessary in order to effect the application of a great downward force to the perforating punches. Accordingly a device in accordance with my invention is capable of easily perforating thick stacks of sheets.

In addition to its novel mechanical features, my improved perforating device presents a neat and attractive appearance. In this connection, it is to be noted that the plates 14, besides serving as guides and limit stops for the punches 19, also partly cover the spaces between the sides of standards 8 and conceal the springs 21 and the major portions of the punches when the device is viewed from the front.

It is to be understood that the device shown and specifically described herein is subject to various modifications without departure from the spirit of my invention or the scope of the appended claims.

I claim:

1. In a device of the character described, a support, a punch element mounted on said support for reciprocal movement and normally biased to inoperative position, a movably mounted lever, and means for actuating said punch towards its operative position upon movement of said lever in a given direction, said means comprising a cam element operable by said lever and mounted for movement independently thereof and an element rotatably seated on one end of the punch element and to engagement with which said cam element is constantly biased regardless of the position of said lever relative to said punch element.

2. In a device of the character described, a support normally occupying a substantially horizontal position, a punch element mounted on said support for vertical movement and biased to a raised inoperative position, a ball resting on a spherical seat provided in the upper end of the punch element, and means operable to depress the punch element comprising an actuating lever mounted for movement about an axis fixed with respect to said support and a cam element mounted for movement independently of said lever and interposed between the latter and said ball, said cam element whenever said support is in its normal position, being constantly biased to engagement with said ball regardless of the position of said lever relative to said punch element.

3. In a device of the character described, a support, a punch element mounted thereon for vertical movement, and biased to a raised inoperative position, a ball resting on a spherical seat provided in the upper end of the punch element, and means operable to depress the punch element comprising a lever mounted above the punch element for pivotal movement about an axis fixed with respect to said support and a member disposed between said lever and ball and mounted for movement independently of the lever, said member having an eccentric cam portion provided in the surface thereof adjacent the upper end of the punch element with a longitudinally extending groove adapted for engagement with said ball, said member being constantly biased to maintain such engagement of said groove regardless of the position of said lever relative to said punch element.

4. In a device of the character described, a support, a punch mounted on said support for vertical movement and biased to a raised inoperative position, and means operable to depress said punch comprising a lever mounted for movement about an axis fixed with respect to said support and a member actuatable by said lever and mounted for pivotal movement independently thereof, said member having an eccentric cam portion constantly biased to operative association with the upper end of said punch regardless of the position of said lever relative to the punch.

5. In a perforator, a support, a punch mounted on said support for vertical movement and biased to a raised inoperative position, and means operable to depress said punch comprising a lever mounted for movement about an axis fixed with respect to said support and a member actuatable by said lever and mounted for movement independently thereof, said member having an eccentric cam portion which when the perforator is in its normal position of use, is constantly biased to operative association with the upper end of said punch regardless of the position of said lever relative to the punch.

6. In a device of the character described, a support, a punch mounted on said support for vertical movement and biased to a raised inoperative position, an actuating lever mounted on said support for movement about a fixed axis, and a swingable member having a fixed pivotal axis about which it is adapted to move independently of said lever, said member comprising an eccentric cam portion interposed between said punch and lever, said cam portion being adapted to impart downward movement to said punch upon movement of said lever in one direction, said lever and member being free from positive connection with each other and with the punch, said member when the device is in its normal position of use, being biased so that the cam portion thereof is constantly maintained in operative association with and adjacent the upper end of said punch regardless of the position of said lever relative to the punch.

7. In a device of the character described, a support, a punch mounted on said support for vertical movement and biased upwardly, said support having means for limiting upward movement of the punch, an actuating lever mounted on said support for movement about a fixed axis, and a member also mounted on said support for movement about a fixed axis and about which it is movable independently of said lever, said member having a cam portion interposed between said lever and punch and adapted to impart downward movement to the latter upon movement of the lever in one direction, said lever and member being free from positive connection with each other and with the punch, said member being biased so that the cam portion thereof is constantly maintained in operative association with and adjacent the upper end of the punch regard-

less of the position of said lever relative to the punch.

8. In a device of the character described, a base, a pair of spaced standards on said base, punches respectively mounted on said standards for vertical movement and biased upwardly, an actuating lever having branches respectively connected to said standards for swinging movement about a fixed axis, and members respectively interposed between the lever branches and the punches, said members being respectively mounted on said standards for movement about such fixed axis and adapted for such movement independently of said lever, said lever and members being free from positive connection with each other and with the punches, said members when the device is in its normal position of use, being constantly biased to operative association with the upper ends of the punches respectively regardless of the position of said lever relative to the punches.

9. In a device of the character described, a standard adapted to support and guide a punch and comprising a bottom with a guide opening therein and spaced sides projecting upwardly from said bottom, a punch disposed between said sides and engaging said guide opening, a member comprising a portion securing said sides together in fixed spaced relation at a point above the bottom of the standard and having a guide opening upwardly through which said punch projects, and a spring biasing said punch upwardly and surrounding a portion thereof which is between said bottom and the point where said sides are secured in spaced relation, said member having a portion which closes that portion of the space between said sides corresponding to the location of said spring.

WALTER FAAS.