June 12, 1928. 1,673,244

J. E. HIRES ET AL

PUNCH

Filed March 25, 1925

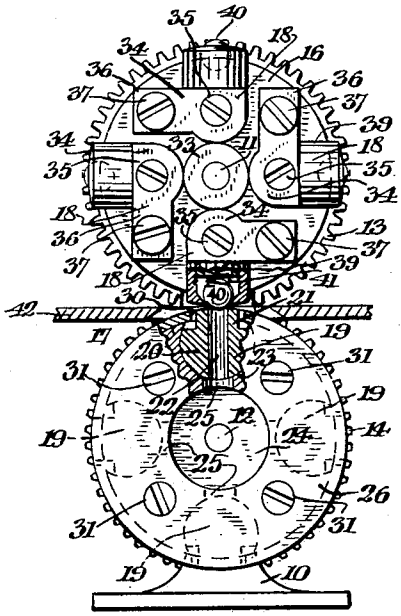


Fig. 1.

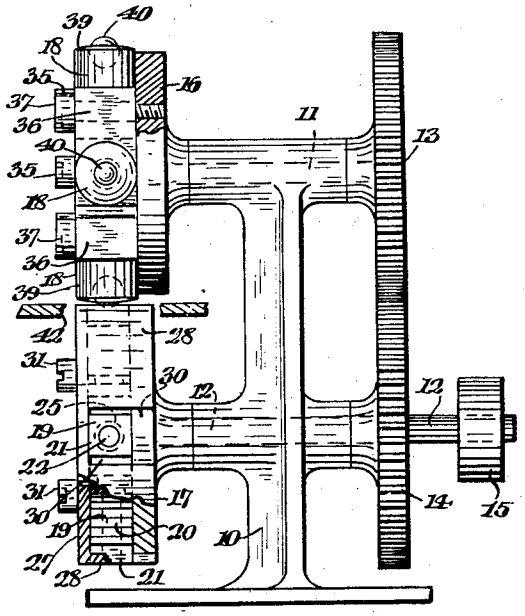


Fig. 2.

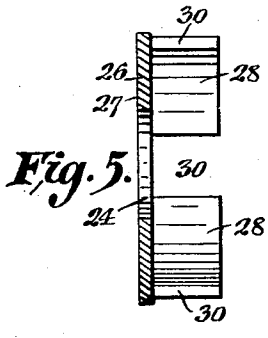


Fig. 5.

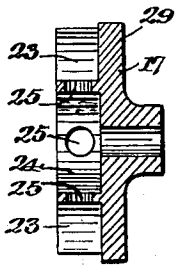


Fig. 4.

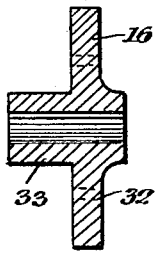


Fig. 3.



Fig. 9.

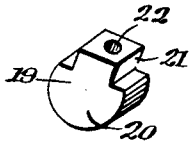


Fig. 6.

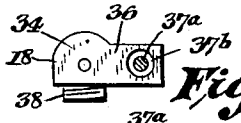


Fig. 7.

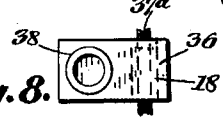


Fig. 8.

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# UNITED STATES PATENT OFFICE.

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## PUNCH.

Application filed March 25, 1925. Serial No. 18,134.

This invention relates to punches for sheets of material, such as paper, celluloid, etc.

Punches which are positioned upon the periphery of synchronously geared wheels, to have a ball male die roll into a sharp edged female die, to shear holes in a sheet of paper, become inoperative from an elongated wearing away of the edge of the hole in the female die, wearing some times in one direction and some times in the opposite direction, due to improper axial alignment in the synchronism of the dies, as they come together. The main object of our invention is to provide a construction which will overcome the elongated wear of the hole in the female die. This we do by holding either the male or the female die fixed on its rotor, and permitting the companion die to yield for self adjustment on its rotor.

One embodiment of our construction for carrying out our invention is illustrated in the drawings, is hereinafter described, its operation is explained and what we claim is set forth.

In the drawings,

Figure 1 is a front elevation of a rotary ball punch embodying our invention.

Figure 2 is a side elevation of the same.

Figure 3 is an axial section of the rotor which holds the male dies.

Figure 4 is an axial section of the rotor which holds the female dies.

Figure 5 is an axial section of a cover holder for the female dies.

Figure 6 is a perspective view of one of the female dies.

Figure 7 is a side elevation of the body of the male die.

Figure 8 is a top plan of the body of the male die.

Figure 9 is a plan of a female die plate fragment, showing the form in which the hole is usually worn.

In the figures, 10 is a frame in which are journaled two shafts 11 and 12. Equal meshing gears 13 and 14 are fixed to the respective shafts 11 and 12. A pulley 15 is fixed upon the shaft 12. At the opposite ends of the shafts 11 and 12 are fixed respectively, the rotors 16 and 17. The rotor 16 is shown to have mounted upon the face thereof, the four male dies, 18, while the rotor 17 has mounted upon its face, the female dies 19. Each female die 19 has a cylindrical base 20, the body of which is larger than a half cylinder of the same. There is a neck 21 extending therefrom. A central hole 22 passes through the die. The bases 20 of the female dies 19, fit the cylindrical pockets 23 in the rotor 17. A central, open, cylindrical pocket 24 is provided in the face of the rotor 17, into which open holes 25, which are larger than and communicating with the holes 22, of the dies 19. A cover holder 26 has a plate portion 27, covering the dies 19, and has a flange 28 extending over the dies 19 and the periphery of the disc portion 29, of the rotor 17. Wide slots 30, are provided in the flange 28, which are loosely engaged by the necks 21, of the dies 19, permitting the die 19 to turn a little in the pocket 23, when the die is self aligned by the ball of the male die. The cover holder 26 is secured by screws 31, to the rotor 17.

The rotor 16, which holds the male dies, has a disc portion 32 and a central cylindrical extension 33, against which bear the four male die bodies 34, each held upon a screw 35. An extension 36, of the body 34, is secured to the disc portion 32, by a screw 37. The sides of the die bodies 34 are flat, with the exception of the tubular extension 38, having its outside threaded, to engage the thimble 39, for retaining the ball 40. Within the extension 38 is a compression spring 41 to keep the ball 40 protruding through a hole in the end of the thimble 39, the hole being smaller than the ball 40. The male ball dies 18 are positioned peripherally to co-ordinate with the female dies 19, as the rotors 16 and 17 roll together. If it is desired to have the female dies 19, radially fixed upon the rotor 17, while permitting self adjustment to the male dies 18, then the slots 30 in the flange 28, of the cover holder 26, are made to fit the necks 21 of the female dies 19, to hold them from turning within their respective cylindrical pockets 23, and the screw 37 has its shank smaller than the hole in the extension 36, as shown in Figure 7, wherein the shank $37^a$, of the screw 37 is shown smaller than the hole $37^b$. This permits an oscillation of the die body 34 about the pivotal screw 35, giving play to the ball end of the die 18 for self alignment with the female die 19, when the same is held from turning on the rotor 17.

The self alignment feature of the dies just explained, overcomes any excess pressure of ball 40 at either side of the hole 22, while at the same time in no way interfering with the rolling-in shearing action of the ball 40, with the die 19. The amount of movement of the oscillatory die is limited in practice to only that required for self alignment, and is so small as not to materially change the radial distances of the operating part of the die from the center of the shaft of the rotor carrying the oscillatory die. The spring 41 permits any radial adjustment required while maintaining a shearing pressure between the ball 40 and the hole 22 of the female die 19. A table top 42 or any other suitable means may be provided to guide the material to the punch to be perforated.

In regard to the mounting of the dies on the rotors, the female die may have a spherical or ball base end, instead of the cylindrical one shown, in which case the shape of the pocket in the rotor would be changed to adapt it to fit the ball base. It is possible to fit the male ball die on a round end body adapted to turn in a pocket, like shown for the female die, and have an ordinary fixed female die in the lower rotor.

Other changes in construction differing from those shown and described might be made without departing from the spirit and scope of our invention. We therefore do not wish to be limited to the one embodiment shown and described.

We claim:

1. In a rotary punch having two rotors, upon which are mounted co-ordinating dies, adapted to perforate sheet material, a die fixed on one rotor, a co-ordinating die pivotally mounted on the other rotor for self alignment with and by the die fixed on the other rotor.

2. In a rotary punch having two rotors, upon which are mounted co-ordinating dies, adapted to perforate sheet material, a die fixed on one rotor, a co-ordinating die pivotally mounted on the other rotor for self alignment with and by the die fixed on the other rotor, and means limiting the oscillatory movement of the pivotally mounted die.

3. A rotary punch comprising a frame, two spaced shafts journaled on the frame, a rotor mounted on each shaft, dies on each rotor, said rotors being positioned, relative to each other, to have the dies on one rotor roll into the dies on the other synchronously, gears fixed to the shafts meshing and adapted to cause the said dies to turn synchronously, the dies on one rotor being fixed thereon, the dies on the other rotor having round ends, round pockets in said last named rotor fitting said round end of said last named dies and permitting said dies to freely turn therein, a cover holder for holding the round end dies on their rotor and flange to said holder having slots therein loosely engaging the outer ends of the round end dies, permitting a partial swinging movement to the said outer ends.

4. A rotary punch comprising a frame, two spaced shafts journaled on the frame, a rotor mounted on each shaft, dies on each rotor, said rotors being positoned relative to each other to have the dies on one rotor roll into the dies of the other synchronously, means connected with said shafts adapted to turn said dies to co-ordinate in rolling action, the female die being fixed on its rotor, the male die comprising a die body, pivoted on its rotor, an extension on said body having a hole therethrough transverse to the face of the rotor upon which the male die is mounted, and a screw loosely engaging said hole and fixed in said last named rotor, the difference in size between the screw and the said hole permitting sufficient oscillation to the male die and limiting the same for self alignment of said male die with said female die during the turning of the rotors.

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