July 6, 1937. C. G. LINDBOM 2,085,863

PUNCHING MACHINE

Filed Aug. 2, 1934

Fig. 1

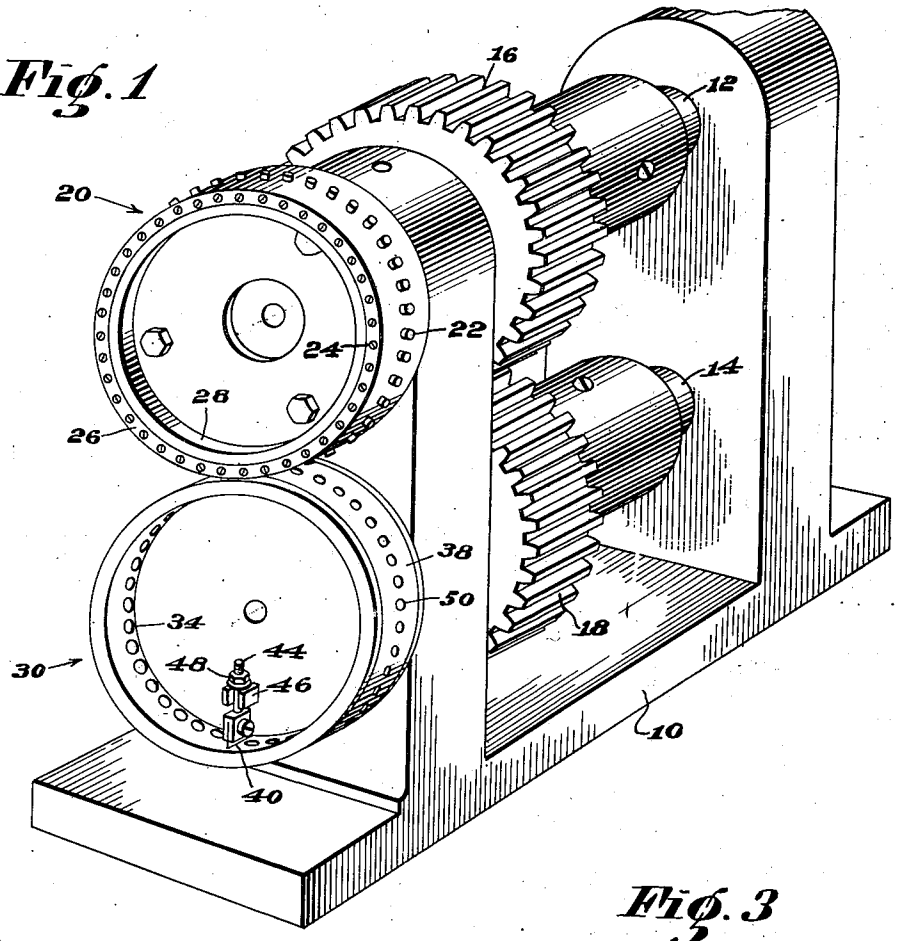
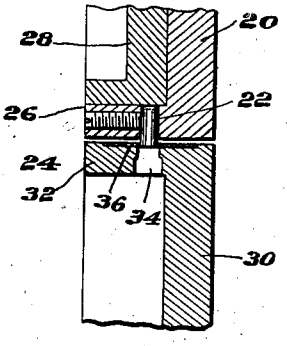


Fig. 3



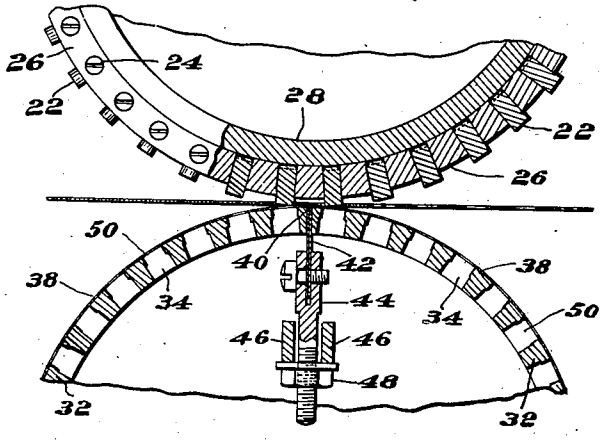


Fig. 2

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PUNCHING MACHINE

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Application August 2, 1934, Serial No. 738,068

3 Claims. (Cl. 164—99)

This invention relates to machines for punching precisely spaced holes in sheet material. The holes may be limited in number or even a widely spaced pair, as may be used at the inner margin of loose leaf sheets for account books, or they may be a relatively closely spaced series as may be used for separating salesmen's folded sheet pads or as applied at the margins of motion picture film. This work, generally termed "perforating", may be performed in different instances by a gang-punch machine, by a step-by-step single-punch machine, or by a rotary machine in which the punches and co-operating dies are each in endless series at the circumferential faces of co-acting punch and die wheels.

One object of the invention is to so improve the die members of punching machines as to enable the speedy provision of a new die member whenever needed and at less cost than heretofore.

To the accomplishment of this object and such others as may hereinafter appear, as will readily be understood by those skilled in the art, the invention comprises the features and combinations of parts and methods of manufacture hereinafter described and then particularly pointed out in the appended claims.

The nature and scope of the invention will be best understood from a description of its simplest embodiment illustrated in the accompanying drawing, in which:

Figure 1 is a view, in perspective, of a stand supporting co-acting punch and die wheels as herein improved, that may be employed in rotary punching machines for perforating either sheets or strips in rolls;

Fig. 2 is a view, mostly in section, of portions of the punch and die wheels in operation on a strip of material; and

Fig. 3 is a view, in fragmentary section, showing a shear punch in the act of forming its co-acting die opening at the final stage of the manufacture of the die band used on the die wheel.

The accompanying drawing illustrates a rotary punching machine in its simplest form sufficient for the disclosure of this invention, it being understood that in commercial use feeding or reeling devices for sheets or strips, gages, guides, clearers, starting and stopping mechanism and all other desirable or required adjuncts may be applied from previously known machines in the art.

As illustrated in the drawing a stand 10 provides journals for upper and lower shafts 12 and 14 having intermeshing gears 16 and 18 respectively. A belt pulley (not shown) or any other convenient power device will rotate one shaft and, the two gears each having the same number of teeth, the other shaft will be driven at the same rate of speed as the driving shaft.

The upper shaft 12 is provided at one end with a punch wheel 20 secured to the shaft in any suitable manner to be rotated therewith. The punch wheel may consist of a flanged disk having a circumferential series of pins forming shear punches 22 said punches being set singly in a series of equally spaced holes in the flange 26 and held at the desired limit of projection from the flange by a series of set screws 24. A second flanged disk 28, dimensioned to fit within the flange of the punch wheel, is bolted in place as shown and forms a backing for the punches. As a punch wears its radial position on the punch wheel may be adjusted after removing the backer and loosening its set screw. The construction of the punch wheel all may be the same as the present practice.

The lower shaft 14 is provided with a die wheel 30 secured to the shaft in any suitable manner. The die wheel may also desirably be a flanged disk, its flange 32 most conveniently being of the same width as the flange 26 on the punch wheel and immediately underlying said flange 26.

Various methods, unnecessary to describe here, have heretofore been employed for forming a circular series of die openings in the die wheel flange 32 with which the punches 22 will exactly register and of such size that each punch will shear through the material to be operated upon without burring or leaving a ragged edge. It is obvious that in operating the machine the gears will wear and thus destroy the registry of the punches and dies. The fitting of a new gear that is slightly irregular or of a new keyway would have the same effect. This means the production and fitting of a new die wheel putting the machine out of commission for possibly half a day according to the size and shape and number of the die openings to be formed. Replacement of a die wheel runs to considerable expense in dollars.

By practising the method of manufacturing die members according to this invention a correction of any error of registry can be effected within a few minutes and at a cost of a few cents as will be understood from the following description.

The die wheel flange 32 is provided with a number of radial holes 34 equal in number to

the punches 22 but having a larger diameter. A shallow groove 36 is cut in the rim of the die wheel. A steel strip 38, that may be any hard or semi-hard steel, for example Swedish and somewhat longer than the circular length of the floor of the groove, is laid in the groove and its ends, having first been annealed or otherwise treated to permit of bending, are turned inward through a slot 40 (Fig. 1) cut through the flange 32 as far as the outer edge of the groove 36. The groove and strip are so dimensioned that the latter fills the former leaving a smooth rim on the die wheel after the strip has been drawn taut and locked in position. A groove prevents displacement of the endless die band formed by the tautly drawn strip.

To retain the band on the die wheel a draw-pin lock may be used. The inturned ends 42 of the band are securely held in a slot at the inner end of a draw-pin 44 which lies between fixed posts 46 rising from the inner face of the die wheel. A nut 48 is threaded on the outer end of the draw-pin and bears against the posts 46. Turning up the nut tensions the band and draws it snugly into its groove.

Having applied the band 38, the die wheel is mounted on its shaft beneath the punch wheel and the machine is turned over thus causing the punches 22 to punch their own series of die openings 50 in the band (see Fig. 3) having exact registry with the series of punches. The machine thus equipped with a hardened die and a hardened punch is now ready for perforating any material which it is designed to handle.

Those skilled in the art will recognize the ease with which replacement of a hardened die member may be made should this become necessary. All that is required is to loosen the band 38 from its locking device, remove and replace it with a new imperforate band and then cause the punches to punch their own hardened die openings in this band as above described. The clearance provided by the excessive diameter of the rim holes 34 gives a tolerance that provides for any angular shift of the die openings relatively thereto that may occur in effecting corrections. These holes also provide for discharge of the punchings from the machine.

The method of making die members as herein disclosed is claimed in a divisional application Serial No. 33,508, filed July 27, 1935.

It will be seen from the foregoing description that in its broader aspects the invention resides in a simple and inexpensive provision for a hardened die as well as a hardened punch in a punching machine. This is highly important in perforating for certain uses where it is essential that the perforations be punched clean, for example the punched paper used in connection with precision instruments such as recorders. The burring of the die, which cannot be avoided with the use of soft metal, prevents the use of soft dies for such work and the production of accurate work has heretofore been both difficult and expensive. This invention makes readily available a hardened die for such precision work adaptable to any type of punching machine.

The preferred embodiment of the invention having been thus described, it is to be understood that the inventions are not limited to the described details the true scope thereof being set forth in the appended claims.

What is claimed as new, is:—

1. A punching machine having, in combination, a plurality of spaced shear punches, a die member consisting of a piece of thin hard metal having a plurality of holes forming hardened die openings, one for receiving each punch and spaced precisely with the punch spacing, a support for said die member constructed to support the entire width of the die member intermediate its die openings, and means for securing the ends of the thin metal piece to its support with said die openings maintained in exact position for clean shearing by the punches when the machine is operated, and each die opening having an underlying waste discharge hole through the support for the die member.

2. A rotary punching machine having exact matching and mating hardened punches and hardened dies comprising a punch wheel supporting a circumferential series of spaced hardened pins forming shear punches, a die wheel supporting at its circumference a removable flexible die band of thin hardened metal having a series of holes of the same angular spacing as the pins of the punch series forming hardened die openings and said die wheel having also waste discharge passages below said band one for each die opening through the band, means for drawing said band taut on the die wheel and for maintaining its hardened die openings in exact matching and mating relation to said hardened punches, and means for rotating said two wheels to cause said punches successively to enter said die openings.

3. In a rotary punching machine a shear punch couple comprising a punch wheel having a plurality of circumferentially arranged hardened punches and a die wheel having a like number of circumferential holes larger than the punches and serving to receive the punches and to discharge waste, and a die band consisting of a flexible strip of thin hardened metal wound around the die wheel intermediate said holes and punches and having a hardened die opening therethrough at each waste discharge hole, said hardened die openings having exact registry with the hardened punches, and means for removably holding said band in position on the die wheel for exact matching and mating of its hardened die openings with the hardened punches.

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