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2,589,849

PUNCHING MACHINE

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Fig. 1.

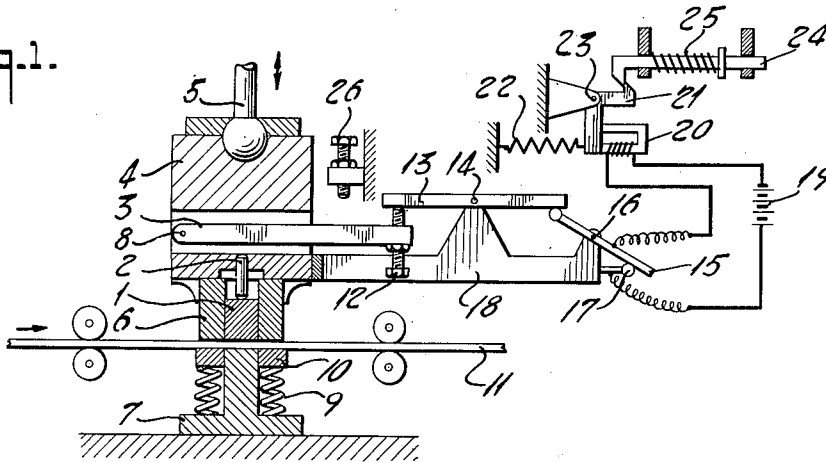


Fig. 2.

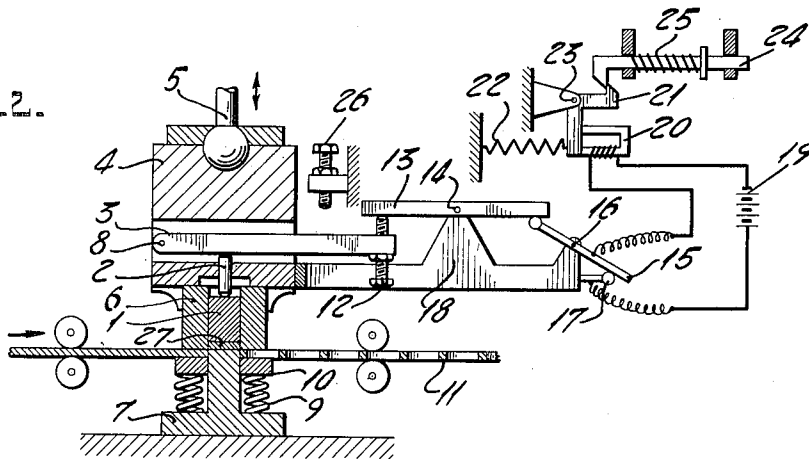
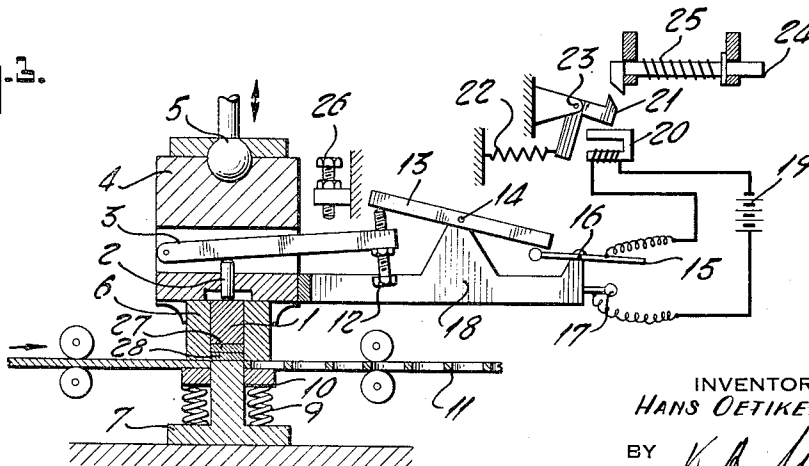


Fig. 3.



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PUNCHING MACHINE

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2 Claims. (Cl. 164-105)

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Punching machines are known which are provided with a puncher and die and an automatically operating device for feeding the work piece into the machine. These machines also possess a device for the automatic ejection of the punched-out work piece from the die. Correct and reliable operation of the ejecting device is, however, of great importance because there is danger that when a punched-out piece remains stuck in the die, the machine is not capable of withstanding the increased pressure resulting from the next impact of the punching hammer and bursts. The puncher and die are, however, relatively expensive machine elements and every time they must be replaced it is necessary for the machine to be put out of operation for some time and this results in a loss in production. Since disturbances of this kind occur frequently, the output of the machine and its efficiency are considerably reduced.

The object of the invention is to eliminate the danger of the machine being destroyed or damaged when the ejection device does not operate and thus enable the punching speed to be increased and thereby raise the output of the machine.

The invention concerns a punching machine with a puncher and die and an automatically operating device for progressively feeding the work strip into the machine, as well as a device for automatically ejecting the punched-out pieces from the die, a safety device being provided which, when the ejection device does not function, operates due to a change in the stroke of the ejecting elements produced by the work piece which is stuck in the die, whereby this safety device brings the punching machine to a standstill.

The punching machine according to the invention is thus so constructed that it protects itself against destruction. Once the machine has been stopped, it is an easy matter to remove the jammed work piece from the machine and to start up the latter again. The most important feature of the new machine is, however, that due to the automatic safety device the machine can be operated at a much higher speed than machines which do not have this self-protective device.

A constructional example of the invention is shown diagrammatically in the accompanying drawing, Figs. 1 to 3 illustrating various operational phases of a punching machine according to the invention.

The punching machine shown in the figures

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has an ejecting device comprising an ejection piston 1, an ejection pin 2, and a lever 3. In all three figures, numeral 4 designates the punching hammer which is moved rhythmically up and down by the plunger 5. Numeral 6 designates a die fixed to the hammer 4. Numeral 7 designates a puncher mounted on a baseplate. The ejection piston 1 slides freely inside the die 6 and lever 3 pivotally supported at 8 serves as a stop for the ejection pin. Numeral 9 designates a spring which presses the supporting ring 10 against the work strip 11.

The work strip 11 which is to be punched moves between guide rollers and is moved gradually forward after each punching operation by a feed mechanism not shown in the drawing.

At the end of lever 3 is a set screw 12 which is in contact with the left-hand end of a beam 13 pivoted at 14. The right-hand end of beam 13 rests on one end of a contact lever 15 pivoted at 16, the other end of this contact lever lying on the contact 17. The pivots 14 and 16, as well as the contact 17 are mounted on the frame or arm 18 which is rigidly connected with the punching hammer 4. Contact lever 15 and contact 17 are connected to an electric circuit which is supplied from a battery 19, the current from this circuit being used to excite a magnet 20 whose armature 21 is attracted against the force of a spring 22. The armature 21 can swing about the fixed axis 23 and is provided at its upper end, which is bent at right angles, with a pawl which engages the latch 24 that is pressed against the pawl by a spring 25. When the latch is released, the rod which is connected with it jumps to the right under the action of the spring 25 and puts a conventional mechanism, not shown in the drawing, into operation thus bringing the punching machine very quickly to a standstill. The movement of the actuating lever 3 in an upward direction is limited by a set screw 26 mounted on a stationary support.

Fig. 1 shows the position of the various elements of the machine before the commencement of a normal punching operation, the ejection elements being in their normal initial position. The ejection pin 2 and the piston 1 are in their lowest positions. If the punching hammer 4 is now moved downwards by the plunger 5, a piece 27 is punched out of the work strip 11 and pushed into the space inside the die 6, as shown in Fig. 2. The ejection pin 2 is now moved out of its initial position by an amount equal to the thickness of the punched-out piece 27, but this displacement is not sufficient to displace

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the lever 3 from its initial position. The beam 13 thus remains immoved, as does contact lever 15. As long as contact 17 is in contact with the contact lever, the circuit of battery 19 will remain closed and the armature 21 will be attracted and the latch 24 blocked. This means that when there is only one work piece in the die, the machine will not be stopped. When the punching hammer moves up again, the lever 3 which moves with the hammer is forced out of its horizontal position by coming into contact with the stationary set screw or stop member 26. The lever 3 which acts as a stop for the ejection pin therefore pushes the latter back into its initial position, whereupon the piece 27 is expelled from the die. By means of a blower which is not shown it is possible to remove the piece 27 entirely from the machine.

In practice, it frequently happens that the work piece is not completely expelled and remains stuck in the die, so that for the next punching operation the ejection pin has a different starting position. This case is illustrated in Fig. 3. The punching hammer when moving down has punched out a further piece 28 and now the two pieces 27 and 28 are stuck in the die one above the other. The ejection pin 3 is thus displaced upwards by an amount equal to the double thickness of the work strip.

In accordance with the invention, the device is so constructed that the displaced ejection pin now turns the lever 3 about its pivot 8. This causes the set screw 12 on lever 3 to change the position of beam 13, whereupon contact lever 15 swings about pivot 16, so that contact lever 15 is no longer in contact with contact 17. The electric circuit of the battery 19 is therefore interrupted by the opening of these contacts. Holding magnet 20 is now no longer excited and spring 22 pulls the armature 21 away from the magnet. The armature revolves about the axis 23 and releases the latch member 24 whose rod actuated by the spring 25 sets the conventional mechanism into operation which immediately stops the punching machine, so that the pieces 27 and 28 which are stuck in the die can be removed.

In the constructional example described above, an electrical circuit is used which operates with a continuous current. It is, however, also possible to utilize a circuit which is interrupted during normal service and closed when a disturbance occurs. Instead of an electric current it is also possible to use a flowing medium, such as compressed air, oil, or the like, for actuating the mechanism which brings the machine to a standstill. In a similar manner it is also possible to provide a purely mechanical system such as a system of levers actuated by springs.

In order that the machine should come to a standstill as soon as possible, it is expedient to

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disconnect it from its driving motor and subject it to a braking action.

With punching machines where the punched-out pieces are conveyed away from the machine by air blasts from a blower, it is an advantage to provide means which, when the machine is brought to a standstill, at the same time cut off the air supply, so that there is no waste of compressed air.

I claim:

1. A punching machine for punching substantially flat work pieces from strip-like work material, comprising means for continuously feeding the work material into the machine, a stationary puncher, a reciprocatingly movable punching hammer having a cavity receiving said puncher, piston means slidable in said cavity and displaceable by the punched work pieces resting on said puncher, a lever pivoted to said reciprocatingly movable punching hammer, a stationary abutment placed in the path of said lever to be abutted by said lever when said punching hammer approaches the end of its idle stroke, said lever being swingable in a plane containing the longitudinal axis of said piston means and abutting against the latter upon abutment of said lever against said stationary abutment and tending to push said piston means out of said cavity during the rest of the idle stroke of said punching hammer to effect the ejection of a punched-out piece, an electric switch mounted on said punching hammer to move therewith and positioned relative to said lever to be actuated thereby upon abutment of said piston means against said lever upon improper displacement, due to the failure of a punched-out piece to be ejected by the action of the stationary abutment, of said piston in said cavity, and stop means for stopping the punching machine connected with and controlled by said switch.

2. A punching machine as defined in claim 1, said stop means comprising a latch member, a spring urging said latch member into position for stopping the machine, and an electric circuit including and being exclusively controlled by said electric switch, said circuit including an electric magnet having an armature in the form of a pawl normally engaging said latch member and holding it in inactive position against the action of said spring.

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