

July 13, 1948.

J. F. MURPHY

2,444,946

PUNCH

Filed Dec. 14, 1945

Fig. 1

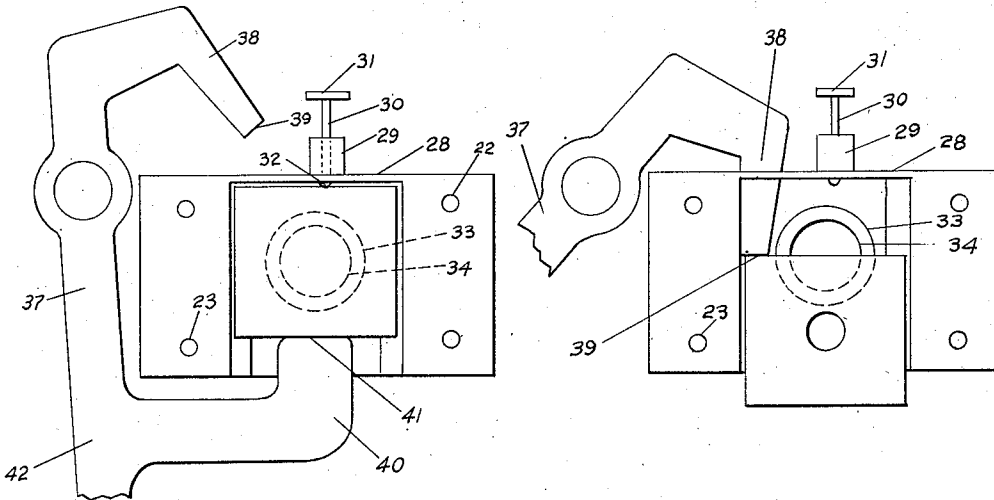
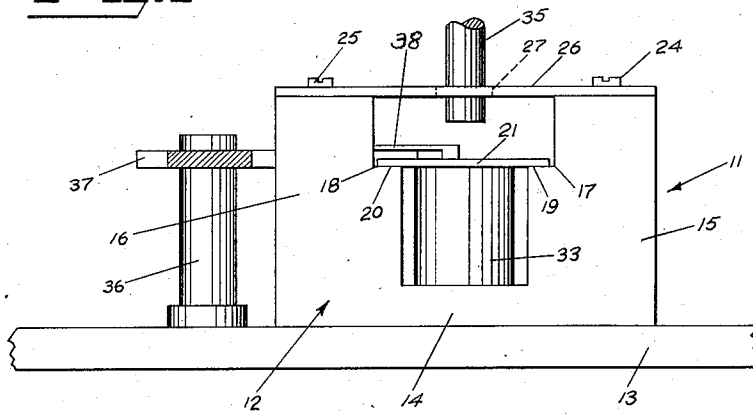


Fig. 2

Fig. 3

INVENTOR.

BY *James F. Murphy*
McHays

ATTORNEY

UNITED STATES PATENT OFFICE

2,444,946

PUNCH

James F. Murphy, Philadelphia, Pa.

Application December 14, 1945, Serial No. 635,134

15 Claims. (Cl. 164—110)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

1

The present invention concerns a punch for forming holes in sheet material, and particularly concerns an attachment for the punch adapted to manipulate a piece of work with respect to the punch.

In forming holes in sheet material such as metal plates, it is conventional to employ a punch that includes a jig for supporting the piece of work, a die having a central opening disposed beneath the work and a punching tool disposed above the work and adapted for downward movement to punch out a piece from the sheet material where it is desired to form the hole. It is conventional in punches of this kind for the operator to manipulate the piece of work relative to the supporting jig with his fingers. Thus, the piece of work is inserted into the jig and is positioned therein relative to the die and punch tool by the operator with the use of his fingers. Likewise, the piece of work is clamped rigidly in position during the punching operation and is later ejected from the jig subsequent to the punching operation by the operator with the use of his fingers.

Such manipulation of the workpiece involving the use of the operator's fingers within the jig and in the area of the die and punch tool is dangerous, since the operator's fingers may be caught inadvertently and injured during the operation. This is especially true when the operator manipulates small pieces of work, which necessitates the presence of his fingers in close proximity to the die and punching tool.

A further objection to manual manipulation of the workpiece arises from the fact that precision is not achieved in the punching operation because correct positioning of the workpiece and rigid clamping thereof during the punching operation depend upon the dexterity of the operator. Human error, variations in dexterity between different operators, and variations in manipulation of different workpieces by the same operator, cause erratic results.

Many defective pieces are thus produced in which the hole that has been punched is located incorrectly upon the piece of work, and, even among the pieces of work that are acceptable, many are inferior in quality because of a lack of precision. Production of defective pieces of work results in loss of material, since the defective pieces must be discarded. Furthermore, the erratic results that are produced require an inordinate amount of time and labor to be consumed by inspectors in order that defective pieces can be detected and rejected. An additional loss of time and labor is generated by the erratic re-

2

sults since it is necessary to punch additional workpieces to replace the defective ones that are discarded.

5 An object of this invention is to provide a mechanical attachment for a punching machine adapted to manipulate a workpiece within the machine and eliminate the need for using an operator's fingers for such purpose.

10 Another object is to provide a mechanical attachment for a punching machine adapted to position work within the machine.

15 Another object of this invention is to provide a mechanical attachment for a punching machine adapted to clamp a piece of work in position rigidly during the punching operation.

20 Another object is to provide a mechanical attachment for a punching machine adapted to eject a piece of work from the machine after the punching operation.

25 Another object is to provide a mechanical attachment for a punching machine comprising a clamp mechanism and ejector mechanism for manipulating the piece of work so that during the operation of either mechanism the other mechanism is automatically inoperative.

30 Another object is to provide a safety device for a punch machine whereby the manipulation of the workpiece in the machine is performed mechanically by an attachment on the machine, thus eliminating the need for the operator to use his fingers in the dangerous area in the machine.

35 Another object is to provide a mechanical attachment for a punching machine comprising a combined manipulator clamp and ejector mechanism whereby the punching operation can be performed with maximum speed and precision and a minimum amount of labor and loss of material.

40 Further objects and advantages of this invention, as well as its construction, arrangement and operation, will be apparent from the following description and claims in connection with the accompanying drawing, in which,

45 Fig. 1 is a fragmentary front elevational view, partly in section, of a preferred embodiment of the invention;

50 Fig. 2 is a fragmentary top plan view of the embodiment shown in Fig. 1 with the cover plate removed, showing the manipulator attachment in position to clamp a piece of work during the punching operation;

Fig. 3 is a view similar to Fig. 2 but with the manipulator attachment in position to eject a piece of work.

55 Punch 11 comprises a jig 12 having a base 13

and a U-shaped work support 14 provided with upstanding parallel legs 15 and 16. The opposed faces of legs 15 and 16 are provided with notches 17 and 18 forming guide tracks 19 and 20 for supporting a workpiece 21 and for guiding said workpiece into and out of support 14.

The tops of legs 15 and 16 are provided with threaded holes 22 and 23 accommodating screws 24 and 25 for holding in place a cover plate 26 having a central opening 27. (Cover plate 26 has been shown as removed in Figs. 2 and 3 for clarity of illustration.) Work support 14 is provided with a rear wall 28 extending between legs 15 and 16 and provided with an opening 29 therein for a purpose hereinafter described.

Mounted on rear wall 28 with its center line in the plane including workpiece 21 is a lug 29, which is threaded internally to accommodate a positioning screw 30 having a head 31 for manual adjustment thereof, and at its opposite extremity formed into a stop 32 for positioning workpiece 21 and limiting reciprocation thereof along guide tracks 19 and 20 toward wall 28.

Mounted centrally within work support 14 between legs 15 and 16 is a female die 33 having a central cylindrical opening 34, the center line of which defines the line of punch. Die 33 can be secured rigidly in place as, for example, by welding or the like. The top surface of die 33 is flush with the surface of guide tracks 19 and 20 so that workpiece 21, when in position for punching, will have its bottom surface flush with the top surface of die 33.

Disposed above die 33 and workpiece 21 is a male punch tool 35 adapted for reciprocation downwardly through opening 27 in cover plate 26 to punch workpiece 21 and slide into opening 34 of die 33.

Mounted on jig base 13 to one side of work support 14 is a vertical shaft 36 that is secured to base 13 in any suitable manner. Mounted for rotation upon the upper end of shaft 36 is a manipulator arm 37 that rotates in the plane of workpiece 21. One extremity of manipulator arm 37 is formed into an ejector finger 38 having a contact surface 39. As seen in Fig. 3, when manipulator arm 37 is rotated in a clockwise direction, contact surface 39 of ejector finger 38 swings through a suitable opening in wall 28 and reciprocates workpiece 21 along guide tracks 19 and 20, and as manipulator arm 37 is moved to its extreme position workpiece 21 is ejected.

Formed on manipulator arm 37 in spaced relation to ejector finger 38 is a clamp finger 40 having a contact surface 41 that is disposed in opposed relation to contact surface 39. As seen in Fig. 2, when manipulator arm 37 is rotated in a counter-clockwise direction, contact face 41 of clamp finger 40 abuts workpiece 21 and causes reciprocation thereof along guide tracks 19 and 20 toward stop 32 of positioning screw 30. As manipulator arm 37 reaches its extreme position, clamp finger 40 rigidly holds workpiece 21 against stop 32. A handle 42 is provided on manipulator arm 37.

Operation of the punch machine is as follows: When it is desired to perform a punch operation, manipulator arm 37 is first adjusted into the position indicated in Fig. 3. Positioning screw 30 is then regulated until stop 32 thereof is properly disposed so that when a workpiece is subsequently inserted into the machine, stop 32 will position the workpiece correctly relative to die 33 and punch tool 35. A workpiece 21 is then inserted partially into support 14 upon guide

tracks 19 and 20 by an operator with the use of his fingers or in any suitable manner. Manipulator arm 37 is then rotated in a counter-clockwise direction until contact surface 41 of clamp finger 40 abuts and moves workpiece 21 along guide tracks 19 and 20. Continued counter-clockwise rotation of manipulator arm 37 causes the workpiece to be brought into contact with stop 32, and the operator by exerting pressure upon handle 42 of manipulator arm 37 clamps workpiece 21 in place rigidly between stop 32 and clamp finger 40. The punching operation is then performed by causing punching tool 35 to move downwardly through workpiece 21, and the punching operation is completed by withdrawing punch tool 35 from workpiece 21.

After the punching operation is completed, manipulator arm 37 is rotated in a clockwise direction to withdraw clamping finger 40 from workpiece 21 and cause ejector finger 38 to move through the opening in wall 28 until contact surface 39 abuts workpiece 21. Further rotation of manipulator arm 37 into its extreme position as seen in Fig. 3 causes reciprocation of workpiece 21 along guide tracks 19 and 20 until workpiece 21 is ejected from the machine.

As described above, clamping finger 40 is designed to clamp workpiece 21 in place rigidly during the punching operation and ejector finger 38 is designed to eject workpiece 21 from the machine. However, clamping finger 40 and ejector finger 38 can by proper rotation of manipulator arm 37 be used to manipulate workpiece 21 into any desired position within work support 14 relative to die 33 and punching tool 35. For example, in setting up a job where numerous pieces of work of the same size are to be punched in the same manner, the pilot workpiece can be inserted manually partway into work support 14 upon guide tracks 19 and 20, and proper operation of manipulator arm 37 can then be effected to cause clamp 40 to move the pilot workpiece toward wall 28 or to cause ejector finger 38 to reciprocate the pilot workpiece away from wall 28 until the workpiece is brought into the desired position. Position screw 30 is then adjusted until stop 32 thereof is in contact with the pilot workpiece so that subsequent workpieces can be brought into the desired position by being reciprocated into contact with stop 32.

For special punch jobs, a workpiece 21 can be inserted manually by the operator into work support 14, and manipulator arm 37 then rotated so that clamp finger 40 reciprocates workpiece 21 into a predetermined position not in contact with stop 32. Clamping finger 40 can thus be used rather than stop 32 for determining the correct position for workpiece 21. The operator then holds manipulator arm 37 stationary while positioning screw 30 is tightened into contact with workpiece 21 to lock workpiece 21 in position for punching.

Various modifications and changes can be made in the subject device without departing from the scope of the invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. A punch for forming a hole in a workpiece comprising a die having a central opening defining the line of punch, a jig for supporting the workpiece in the line of punch and relative to said

die, a pair of opposed notches in said jig serving to support the workpiece for reciprocation relative to said jig and said die, an adjustable screw in said jig having an extremity designed to serve as a stop for limiting reciprocation of the workpiece in one direction, and an arm mounted on said jig for rotation in a plane transverse to said line of punch and including the workpiece, a finger on said arm adapted upon rotation of said arm in one direction to cause reciprocation of the workpiece toward said stop and adapted upon rotation of said arm to its extreme position to clamp the work piece against said stop to prevent movement thereof in said jig, a second finger on said arm spaced from said first finger and in opposed relation thereto adapted upon rotation of said arm in the other direction to cause reciprocation of the workpiece away from said stop and to eject the workpiece from said jig.

2. A punch comprising means to support a workpiece, a female die mounted in said means, a male die in reciprocal relation to said female die, and an arm mounted on said means, said arm including means to position said workpiece between said female die and said male die, and means to eject said workpiece from said position.

3. A punch comprising a jig adapted to support a workpiece, a female die mounted in said jig, a male die in reciprocal relation to said female die, and an arm mounted on said jig, said arm including means to position said workpiece between said female die and said male die, and means to eject said workpiece from said position.

4. A punch comprising a jig adapted to support a workpiece, associated male and female dies mounted in said jig in reciprocal relation, and an arm mounted on said jig, said arm including means to position said workpiece between said male die and said female die, and means to eject said workpiece from said position.

5. A punch comprising a jig adapted to support a workpiece, associated male and female dies mounted in said jig in reciprocal relation, and an arm mounted on said jig, said arm including means to secure said workpiece between said male die and said female die, and means to eject said workpiece from said secured position.

6. A punch comprising a jig adapted to support a workpiece, associated male and female dies mounted in said jig in reciprocal relation, and an arm mounted on said jig, said arm including a plurality of fingers, a selected finger being adapted to secure said workpiece between said male die and said female die and another selected finger being adapted to eject said workpiece from said secured position.

7. A punch comprising a jig adapted to support a workpiece, associated male and female dies mounted in said jig in reciprocal relation, and an arm mounted on said jig, said arm including a plurality of fingers, a selected finger being adapted to position said workpiece between said male die and said female die and to secure said workpiece therebetween and another selected finger being adapted to eject said workpiece from said secured position.

8. A punch comprising a jig adapted to guide a workpiece into operative position and support

said workpiece in that position, associated male and female dies mounted in said jig in reciprocal relation, and an arm mounted rotatably on said jig, said arm including a plurality of integral fingers, a selected finger being adapted upon rotation of said arm in one direction to position said workpiece in said operative position and to secure said workpiece thereat, and another selected finger being adapted upon rotation of said arm in the opposite direction to eject said workpiece from said jig.

9. A punch comprising a jig adapted to guide a workpiece into operative position against an adjustable screw mounted on a wall of said jig, said screw being adapted to proscribe the length of travel of said workpiece relative said jig, associated male and female dies mounted in said jig in reciprocal relation, and an arm mounted rotatably on said jig, said arm including a plurality of integral fingers, a selected finger being adapted upon rotation of said arm in one direction to position said workpiece in said operative position and to secure said workpiece thereat, and another selected finger being adapted upon rotation of said arm in the opposite direction to eject said workpiece from said jig.

10. In a workpiece jig, an arm secured rotatably to said jig, said arm including means to position a workpiece upon said jig and means to eject said workpiece from said position.

11. In a workpiece jig, an arm secured rotatably to said jig, said arm including means to secure a workpiece upon said jig and means to eject said workpiece from said secured position.

12. In a workpiece jig, an arm secured rotatably to said jig, said arm including means to position and secure a workpiece upon said jig and means to eject said workpiece from said secured position.

13. In a workpiece jig, an arm secured rotatably to said jig, said arm including a plurality of fingers, a selected finger being adapted to secure a workpiece upon said jig and another selected finger being adapted to eject said workpiece from said secured position.

14. In a workpiece jig, an arm secured rotatably to said jig, said arm including a plurality of fingers, a selected finger being adapted to position and to secure a workpiece upon said jig and another selected finger being adapted to eject said workpiece from said secured position.

15. In a workpiece jig, an arm secured rotatably to said jig, said arm including a plurality of fingers, a selected finger being adapted to position a workpiece against an adjustable screw mounted on a wall of said jig, said screw being adapted to proscribe the length of travel of said workpiece relative said jig, and another selected finger being adapted to eject said workpiece from said secured position.

JAMES F. MURPHY.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
369,970	Stiles	Sept. 13, 1887
2,229,393	Steffen	Jan. 21, 1941