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3,405,581

HEAVY DUTY PUNCHING MACHINE WITH CARRIAGE MEANS TO SUPPORT  
AND MOVE TOOL HOLDER TRANSVERSELY OF MACHINE

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3 Sheets-Sheet 1

Fig. 1

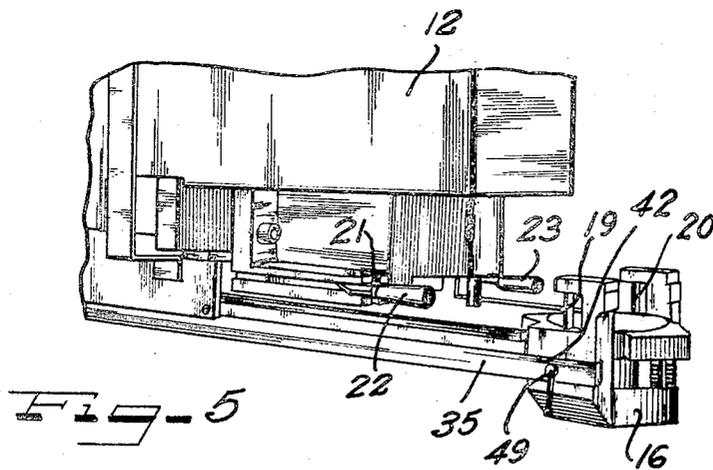
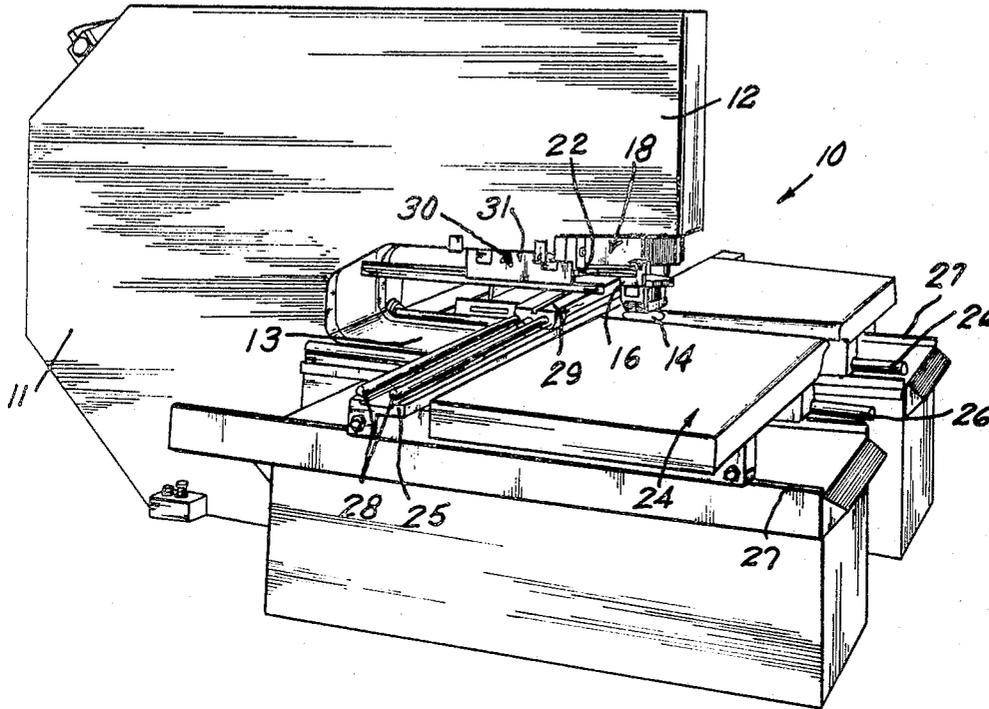


Fig. 5

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3 Sheets-Sheet 2

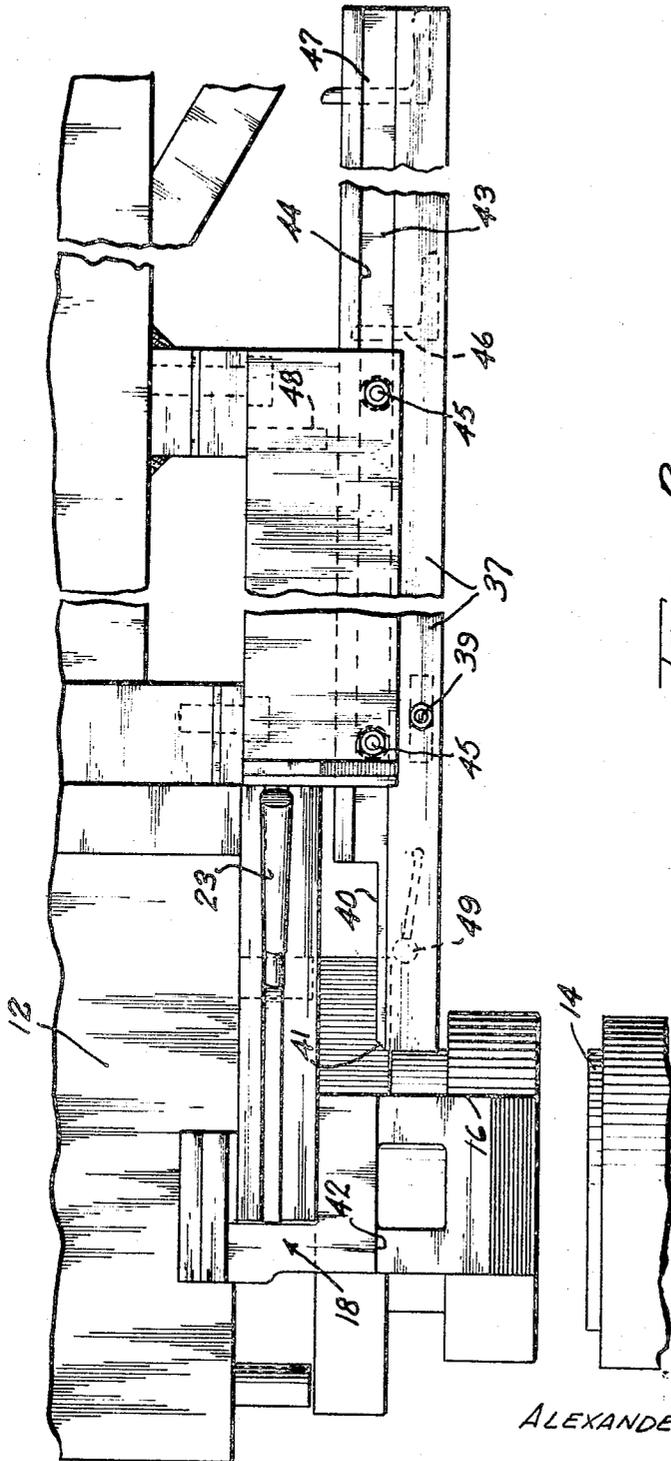


FIG-2

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**HEAVY DUTY PUNCHING MACHINE WITH CARRIAGE MEANS TO SUPPORT AND MOVE TOOL HOLDER TRANSVERSELY OF MACHINE**

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11 Claims. (Cl. 83—563)

This invention relates generally to punching machines, and more specifically the invention relates to a heavy duty punch press.

Punch presses have heretofore been provided which employ interchangeable punch and die tools of various sizes and shapes. As the tonnage capacity of a press increases to handle thicker workpieces, and as the tonnage capacity increases to handle larger size tools, the weight of such tools and their supporting structure also increases, eventually reaching a point where it becomes difficult to handle such components manually. A heavy duty punch press may be employed with relatively light duty tooling for lighter punching, and to this end, relatively light punch support structure may be employed in the press. However, to employ larger punches, it is necessary to replace such punch support structure, herein also called a tool support holder, by one of somewhat larger and heavier size.

Accordingly, it is an object of the present invention to provide a heavy duty punching machine.

A further object of the present invention is to provide a punching machine having means by which handling of relatively heavy tool support means is facilitated.

A still further object of the present invention is to provide means by which the operator of a punch press may have convenient access to relatively heavy tooling for interchange thereof, such access being at a position remote from the operating position of such tooling.

Many other features, advantages and additional objects of the present invention will become manifest to those versed in the art upon making reference to the detailed description and to the accompanying sheets of drawings in which a preferred structural embodiment incorporating the principles of the present invention is shown by way of illustrative example.

On the drawings:

FIG. 1 is a perspective view of a heavy duty punch press having a carriage assembly for the upper tool support holder provided in accordance with the principles of the present invention;

FIG. 2 is an enlarged fragmentary elevational view of a portion of the machine shown in FIG. 1, as viewed from the opposite side;

FIG. 3 is an enlarged fragmentary front elevational view of a portion of the machine shown in FIG. 1;

FIG. 4 is a fragmentary view of the structure shown in FIG. 2, but with the carriage assembly interlocked with the tool support holder; and

FIG. 5 is a fragmentary enlarged perspective view of a portion of FIG. 1, but showing the carriage assembly in an extended position.

As shown on the drawings:

The principles of this invention are particularly useful when embodied in a punching machine such as is fragmentarily illustrated in FIG. 1, generally indicated by the numeral 10. The punching machine 10 includes a rigid frame 11 which, when viewed from the side, is of C-shaped configuration having an upper arm 12 and a lower arm 13, the arms 12 and 13 being rigid with respect to each other. The lower arm 13 supports a lower fixed tool, here comprising a die tool 14. The upper arm

12 extends in a horizontal direction and overlies the lower arm 13.

As best seen in FIG. 3, the punching machine 10 further includes a driven ram 15 which is supported by the upper arm 12 for reciprocation and which is connected to means (not shown) which reciprocates such ram 15. The machine 10 further includes a tool support holder 16 which is releasably fixedly secured to the frame 12 and which holder 16 slidably supports a reciprocable punch assembly 17 in alignment with the ram 15 for being driven thereby into cooperation with the die 14 for joint coaction on a workpiece (not shown) received therebetween.

The structure by which the tool support holder 16 is secured releasably and fixedly to the upper arm 12 is generally indicated at 18 in FIG. 2, such structure being disclosed in detail and claimed in U.S. Patent No. 3,270,605. As best seen in FIG. 5, the structure 18 includes a pair of pins 19, 20 which are carried by the tool support holder 16, and which are received in a pair of slots 21 on the upper arm 12. The structure 18 includes hook means (not shown) under the control of a pair of locking handles 22, 23. When the pins 19 and 20 are in the slots 21, and the handles 22, 23 are moved from the position shown in FIG. 5 to the position shown in FIG. 1, a firm fixed releasable locking is achieved between the tool support holder 16 and the upper arm 12, as explained in the above-mentioned patent. When one of the handles 22 is released, the tool support holder 16 may be swung about the pin 19 or 20 that remains clamped. Such swinging enables access to the punch assembly 17. However, where the user wishes to replace the tool support holder 16 with one of a different size, both handles 22, 23 are moved to the position shown in FIG. 5.

As shown in FIG. 1, the punching machine 10 further includes a workpiece supporting table 24 comprising two sections that are joined together at their rearward edges by a transversely extending cross-member 25. The table 24 is movably supported on a pair of rails 26 and a pair of tracks 27 for front-to-rear movement. The cross-member 25 supports a pair of rails 28, 28, which in turn carry a workpiece holder 29 to which the workpiece (not shown) is clamped for being moved from side to side. The workpiece holder 29 and the structure by which it is supported for movement constitutes a positioning means which is operative in the X-axis and in the Y-axis to position a workpiece as may be desired. The positioning means is thus disposed between the arms 12, 13, with the table 24 being adjacent to the die 14. The table 24, when retracted, extends toward the front beyond the end of the upper arm 12, thereby enabling handling of relatively large area workpieces.

When both of the handles 22, 23 are positioned as shown in FIG. 5, the tool support holder 16 is free to be moved so that the clamping connection 18 separates. When the punch assembly 17 is relatively large, its mass is so great that it becomes difficult or impossible for a workman to handle a tool support holder 16. By way of example, when the largest punch size is 3½ inches in diameter, the holder 16 can be handled fairly readily. However, when the holder 16 is made larger so as to accommodate punches having a size on the order of 5 inches in diameter, the mass is so great as to make such handling difficult or impractical. Therefore, in accordance with the present invention, there is provided a carriage assembly generally indicated by the numeral 30. The carriage assembly 30 includes a pair of brackets 31, 32 secured to the upper arm 12, and on such brackets 31, 32 there are disposed a pair of carriages 33, 34. The carriage 33 includes an elongated rail 35 which is provided

with an anti-friction roller 36, while the carriage 34 similarly includes a rail 37 having an anti-friction roller 38. A spacer 39 joins the carriages 33, 34 together for joint movement or travel in a direction parallel to that direction in which the upper arm 12 extends, namely in a front-to-rear direction. As shown in FIG. 2, the forward end of the rail 37 is cut away to provide an upwardly directed support surface 40 having at its forward edge an elevating ramp 41. When the carriage assembly 30 is manually drawn forward, such as toward the operator, the ramp 41 leads the support surface 40 to a position beneath a laterally projecting shoulder 42 on the tool support holder 16, such relationship being illustrated in FIG. 4. Corresponding structure is provided for the carriage 33 as shown in FIG. 3. In this embodiment, the anti-friction rollers 36, 38 are respectively received in a channel 43 of the rails 37, 35, the channel 43 defining a downwardly directed support surface 44 which is supported on the adjacent roller 36, 38. The rollers 38 are each carried by a stub shaft 45 secured to the brackets 31, 32. As shown in FIG. 2, additional spacer means 46 may be provided which joins the elongated rails 35, 37 together, and one of such spacers 47 may extend upwardly to provide an abutment for coacting with a travel stop 48 secured to the upper arm 12.

To ensure that the tool holder 16 will not slip from the carriage assembly 30, if desired there may be provided, a means for releasably locking the tool support holder 16 to such carriage assembly 30, such locking means here comprising a clamp 49 active therebetween.

As best seen in FIG. 1, the carriage assembly 30 is disposed above the positioning means 29, and is at all times out of contact with the positioning means 29 by being vertically spaced therefrom. Thus the provision of the carriage assembly 30 in no way restricts the freedom of movement of the positioning means 29 in each of the X and Y axes.

In summary, the carriage assembly 30 is carried by the upper arm 12 for movement from the retracted position illustrated in FIG. 2 into engagement with the tool support holder 16 as shown in FIG. 4 and is then movable to an extended position as shown in FIG. 5 wherein the tool support holder 16 is readily accessible at the forward edge of the table 24. Similarly, the tool support holder 16 may be disposed on the carriage assembly 30 with the carriage assembly 30 extended as shown in FIG. 5, and then moved to the operating position shown in FIG. 4, after which the carriage assembly 30 may be retracted to the position shown in FIG. 2.

Although various minor modifications might be suggested by those versed in the art, it should be understood that I wish to embody within the scope of the patent warranted herein all such embodiments as reasonably and properly come within the scope of my contribution to the art.

I claim as my invention:

1. A punching machine, comprising in combination:
  - (a) a C-shaped frame including an upper arm extending in a horizontal direction, and overlying a lower arm having means for supporting a die;
  - (b) a driven ram carried by said upper arm for vertical reciprocation;
  - (c) a tool support holder releasably fixedly secured to said upper arm and arranged to support a reciprocable punch in an operating position to be driven by said ram for cooperation with said die; and
  - (d) a carriage assembly supported by said upper arm for movement in said horizontal direction, said carriage assembly including means for temporarily supporting said tool support holder, by which said holder

may be moved horizontally to and from said operating position.

2. A punching machine according to claim 1, including:
  - (a) a workpiece-supporting table disposed adjacent to said die-support means and extending in said horizontal direction beyond said upper arm; and
  - (b) said carriage assembly having a travel in said horizontal direction of such magnitude as to enable said holder to be moved to a position of ready manual access adjacent to the edge of said table.

3. A punching machine according to claim 1, in which said supporting means of said carriage assembly are disconnectible from said tool support holder when said tool support holder is in said operating position to enable said carriage assembly to be retracted.

4. A punching machine according to claim 1, in which said carriage assembly includes a pair of carriages respectively movably secured to opposite sides of said upper arm and having means engageable with said holder.

5. A punching machine according to claim 4, in which each of said carriages comprises an elongated rail having anti-friction rollers.

6. A punching machine according to claim 4, which includes spacer means by which said carriages are joined together for joint movement.

7. A punching machine according to claim 1, including:
  - (a) means for positioning a workpiece in the X-axis and in the Y-axis, said positioning means being disposed between said upper and lower arms of said frame; and
  - (b) said carriage assembly being disposed above said positioning means in vertically spaced relation thereto, and being out of contact therewith for all positions of said positioning means.

8. A punching machine according to claim 1, which includes means for releasably locking said tool support holder to said carriage assembly.

9. A punching machine according to claim 5, including:
  - (a) a workpiece-supporting table disposed adjacent to said die-support means between said upper and lower arms and extending in said horizontal direction beyond said upper arm;
  - (b) means for positioning a workpiece in the X-axis and in the Y-axis and secured to said table; and
  - (c) said carriage assembly including spacer means by which said carriages are joined together for joint travel, said travel being in said horizontal direction and of such magnitude as to enable said holder to be extended to a position of ready manual access adjacent to the edge of said table, said supporting means of said carriage assembly being disconnectible from said tool support holder when said tool support holder is in said operating position to enable said carriage assembly to be retracted, said carriage assembly being vertically spaced above said positioning means and out of contact therewith for all positions of said positioning means.

10. A punching machine according to claim 9, having means for releasably locking said tool support holder to one of said carriages.

11. A punching machine according to claim 4, in which said means engage said holder at opposite sides of said holder.

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