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SLIDE ADJUSTMENT CONTROL FOR METAL WORKING PRESS

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FIG. 1

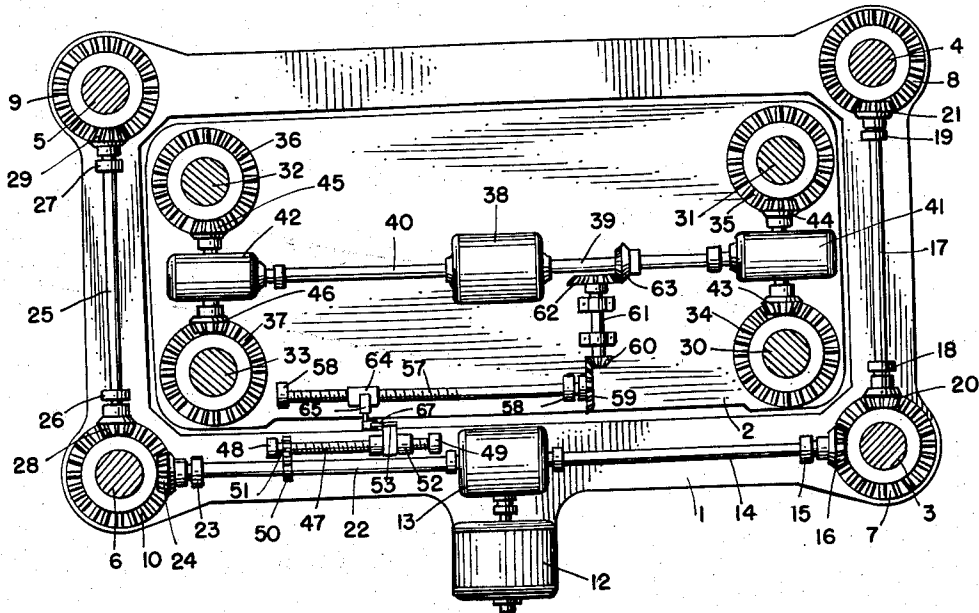
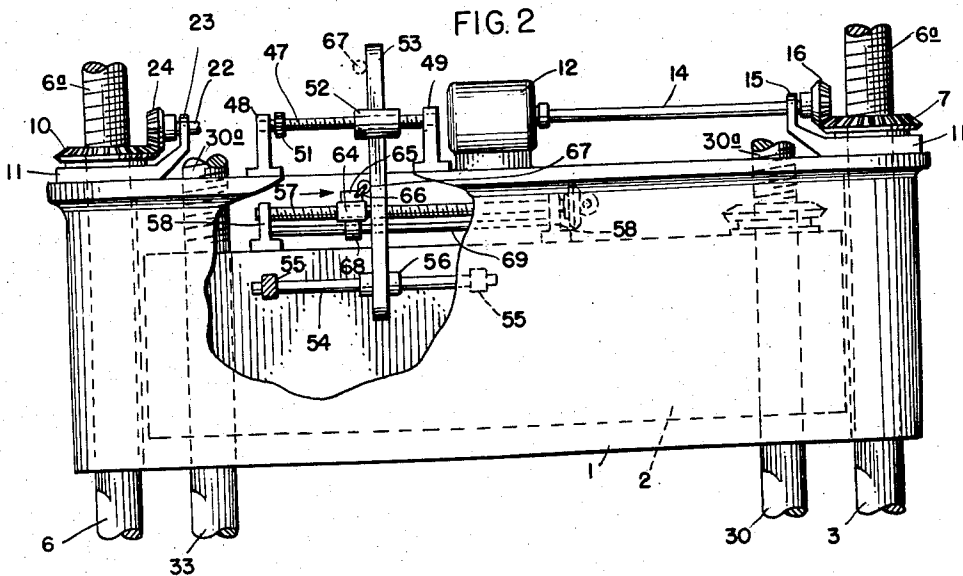


FIG. 2



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SLIDE ADJUSTMENT CONTROL FOR METAL WORKING PRESS

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2 Claims. (Cl. 113—38)

This invention relates in general to an improvement in metal working presses and is particularly directed to a novel form of control means in the slide adjustment mechanism for such presses.

In metal working presses of the double and triple action type there is provided an outer or blank holder slide and an inner draw slide. The blank holder slide reciprocates toward and away from the press bed and holds the work piece in place while the draw slide moves downwardly and performs the drawing operation. A ring member may be mounted on the blank holder slide and is adjustable so that it may be caused to bear upon the work piece with equal pressures at all four corners of the press. This is common practice and such arrangement is well known to those skilled in the art.

It is also common practice to provide adjusting means for each of the slides so that the proper stroke of each slide may be had. The adjustment of the slides takes place usually during the die setting operation and mechanical means are provided to adjust the blank holder slide toward and away from the press bed and with respect to the draw slide so that the proper pressure against the work piece may be obtained. Mechanical means are also provided to adjust the draw slide toward and away from the press bed and with respect to the blank holder slide in order to obtain the proper depth of draw.

A predetermined minimum separation distance should be maintained between the lower ends of the slides. If such distance is not maintained, it is not unusual for a die setter to either run the draw slide downwardly or the blank holder slide upwardly too far, which results in an interference between the die supporting means on the slides. For example, the draw slide may be adjusted downwardly so far that it will come against the ring on the blank holder slide, thereupon causing damage and costly delays and repairs.

Although this seldom occurs with an experienced press man or die setter, it often occurs with an inexperienced operator who, through misjudgment or pure carelessness, does not maintain the minimum separation between the lower ends of the respective slides.

It is, therefore, one of the principal objects of the present invention to provide in a metal drawing press mechanism which will automatically stop operation of the slide adjusting means when the lower ends of the slides reach a predetermined minimum distance apart during the die setting operation.

Another object of the invention is to provide in a metal drawing press cooperating means associated with each of the slide adjusting mechanisms and operable thereby, so that during adjustment of either slide the adjusting mechanisms will become inoperative when the lower ends of the slides have reached a predetermined minimum separation distance.

A further object of the invention is to provide a control mechanism consisting of two movable members, one of which is caused to move by operation of the blank holder slide adjusting means, and the other of which is

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caused to move by operation of the draw slide adjusting means, whereby both adjusting means will become inoperative when the two members operated thereby move into contact with each other.

Still another and more specific object of the invention is to provide control mechanism for the slide adjustment means in a metal working press which includes a first member movable by operation of one of the slide adjusting means, and a second member also movable upon operation of the other slide adjusting means wherein one of said members comprises a switch and the other of said members comprises a bar so that when the switch and bar are in contact with each other the slide adjusting mechanisms for both slides will become inoperative.

Other objects and advantages of the invention will become apparent upon reading the following description taken in conjunction with the accompanying drawing, in which

Fig. 1 is a top plan view of a metal drawing press embodying the present invention, and

Fig. 2 is an elevational view of the upper part of such a press with parts thereof broken away for the sake of clarity.

The invention herein may be briefly described as including a pair of rotatable screw members, one of which is rotatable in synchronism with the movement of the blank holder slide and the other of which is rotatable in synchronism with the movement of the draw slide. A switch is mounted on one of the screw members to move longitudinally thereof as the screw rotates, and an elongated bar is mounted on the other screw member to move longitudinally thereof when the screw member is rotated. The arrangement is such that when the draw slide is moved downwardly, the member mounted on its corresponding screw member will move toward the other member, and when the draw slide is moved upwardly, its associated member will move in the opposite direction. Likewise, when the blank holder is moved upwardly, the member associated with it will move toward the movable member associated with the draw slide, but when the blank holder is moved downwardly, its associated member will move in the opposite direction.

The entire purpose of the device embodying the invention is to limit the minimum separation distance between the lower ends of the slides. For example, if it is found desirable that the minimum distance between the lower ends of the draw slide and blank holder slide be, say 10 inches, then whenever this minimum distance is reached, the switch associated with one slide and the bar associated with the other slide will move into contact with each other, whereupon the switch will open the circuit to both slide adjusting mechanisms and stop their operation.

Referring now more particularly to the drawing, the blank holder slide is indicated by the numeral 1 and the draw slide is shown by the numeral 2. The blank holder slide 1 is capable of being adjusted in a vertical direction independently of the draw slide and the draw slide positioned within the blank holder slide is likewise capable of being adjusted in a vertical direction toward and away from the press bed (not shown). The blank holder slide 1 is supported on vertical rods, one at each corner thereof, as indicated by the numerals 3, 4, 5, and 6. The upper end of each rod is threaded as illustrated at 6a and each threadedly engages a bevel gear. As shown in the drawing, each rod 3, 4, 5, and 6, has a bevel gear 7, 8, 9, and 10 mounted thereon and threadedly engaged therewith.

Each of these bevel gears is mounted on the upper side of the blank holder slide 1 in a manner well known to those skilled in the art so that when these gears are rotated with respect to its associated rod, the blank

holder slide will be moved upwardly or downwardly with respect to the rods, depending upon the direction of rotation of the gears.

There are, of course, various specific mechanical arrangements which can be utilized for the purpose of adjusting the slides, all of which have been used heretofore and form no part of the present invention. For purposes of illustration there is shown a bracket or supporting member 11 associated with each of the rods 3 and 6 and mounted upon the upper surface of the blank holder slide. The gears 7 and 10 are associated with these brackets and in this way are mounted on the blank holder slide and are also permitted to rotate. The drive means for operating the blank holder slide adjusting mechanism may include a motor 12 connected to a suitable gear reduction means indicated at 13 which is adapted to rotate an elongated shaft 14 extending outwardly at one side thereof. The shaft 14 is journaled at its outer end in a bearing 15 formed integral with the bracket 11. The outer end of shaft 14 has mounted thereon a bevel gear 16 in mesh with the gear 7. Another shaft 17 is suitably mounted in bearings 18 and 19 between the gears 7 and 8 and is provided at the ends thereof with bevel gears 20 and 21. The bevel gear 20 is in mesh with gear 7 while bevel gear 21 is in mesh with gear 8 so that it will be clear that rotation of shaft 14 will rotate both of the bevel gears 7 and 8 with respect to the rods 3 and 4 with which they are threadedly engaged.

Another shaft 22 extends outwardly at the opposite end of the gear box 13 and is rotatably supported at its outer end in a bearing 23 formed as an integral part of the bracket 11. A bevel gear 24 is mounted on the outer end of shaft 22 and meshes with the bevel gear 10.

Another shaft 25 rotatably supported in the spaced bearings 26 and 27 extends between the bevel gears 9 and 10. This shaft 25 is provided with the bevel gears 28 and 29 at the ends thereof which mesh with the bevel gears 10 and 9 respectively. Thus, operation of the motor 12 through the gear reduction means will rotate the shafts 14 and 22, thereupon causing the proper rotation of the bevel gears 7, 8, 9 and 10 to raise or lower the blank holder slide with respect to the rods 3, 4, 5 and 6.

The draw slide 2 is likewise mounted on similar rods 30, 31, 32 and 33 and is movable on these rods toward and away from the press bed during the adjustment thereof. In a similar manner, as heretofore described and as well known to those skilled in the art, each of the rods 30-33 is threaded at its upper end as at 30a. The rod 30 has a bevel gear 34 threadedly engaged therewith. The other rods 31, 32 and 33 have similar bevel gears 35, 36 and 37 associated therewith and mounted upon the upper side of the draw slide so that rotation of these bevel gears will cause the draw slide to be raised or lowered with respect to the rods on which it is mounted.

The drive means for the draw slide adjusting mechanism may include a motor 38 mounted on the draw slide which has the shafts 39 and 40 extending in opposite directions therefrom. The outer end of shaft 39 is connected to suitable gear reducing means within a gear box 41 and the shaft 40 is likewise connected to similar gear reducing means in the gear box 42. Bevel gears 43 and 44 are suitably connected to the gear reducing means in box 41 and are in mesh with the larger bevel gears 34 and 35 respectively. Similar bevel gears 45 and 46 are connected with the gear reducing means in gear box 42 and are in mesh with the larger bevel gears 36 and 37 respectively.

It is thus apparent that operation of motor 38 to rotate shafts 39 and 40 will cause rotation of the smaller bevel gears 43, 44, 45 and 46 which in turn will cause the larger bevel gears 34, 35, 36 and 37 to rotate on the threaded shafts 30, 31, 32 and 33, thereupon raising or lowering

the draw slide, depending upon which direction such gears are caused to rotate.

The foregoing slide adjusting means for both slides have been used heretofore and the details thereof are well known. They are described herein because of the close association which they have with the present invention. Without a control means it is possible to lower the draw slide or raise the blank holder slide an amount to cause interference between the respective slides and the die supporting means thereon.

The control means associated with and operated by the movement of the blank holder slide, disclosed herein as illustrative of the preferred embodiment of the invention, includes an elongated screw member 47 mounted for rotation in bearing members 48 and 49 located on top of the blank holder slide for movement therewith. A gear 50 on shaft 22 meshes with gear 51 on the screw member 47 so that operation of motor 12 to rotate shaft 22 will also rotate the screw member 47.

An internally threaded sleeve 52 engages the threads on the screw member 47 and has secured thereto or made integral therewith an elongated bar 53. It will be evident that if the sleeve 52 is held against rotation during rotation of screw 47 it will be caused to move lengthwise thereof. One manner of mounting the sleeve 52 and bar 53 to hold it against rotation is as illustrated in Fig. 2 wherein a rod 54 is mounted in the supporting means 55 on the inner side of the blank holder slide 1, which acts as a guide for the sleeve 56 to which the lower end of the bar 53 is attached. Thus, as the screw member 47 is caused to rotate during the adjusting movement of the blank holder slide, the bar 53 will move either toward the right or toward the left, depending upon the direction in which the blank holder slide is being adjusted.

In the present instance the arrangement is such that when the blank holder moves upwardly, bar 53 will be caused to move toward the left.

A similar arrangement is provided for controlling the draw slide adjusting means. In the embodiment of the invention disclosed there is illustrated an elongated screw member 57 mounted in bearings 58 on the top of the draw slide. The screw 57 on the draw slide is mounted in substantial parallelism with and adjacent to the screw member 47 on the blank holder slide. The screw 57 is caused to rotate in synchronism with movement of the draw slide. Although this may be accomplished in a number of different ways, a preferred arrangement is illustrated herein which consists of a bevel gear 59 mounted on one end of the screw 57. The bevel gear 59 meshes with a smaller bevel gear 60 mounted on a shaft 61 which has a second but larger bevel gear 62 mounted on the other end thereof. This latter gear meshes with another bevel gear 63 on shaft 39. Thus, when motor 38 drives shafts 39 and 40 for adjusting the draw slide as above described, the screw member 57 will also rotate in synchronism therewith.

An internally threaded sleeve 64 engages the screw member 57 and has mounted thereon a suitable form of switch 65 adapted to be operated by movement of a switch arm 66 which has a roller 67 attached thereto. The sleeve 64 and switch mounted thereon are held against rotating with the screw member 57 by means of an extension 68 thereon having an opening therethrough to receive a guide bar 69 also supported in the bearing members 58. Thus, rotation of screw member 57 will move switch 65 and its associated parts longitudinally of the screw member as the draw slide is raised or lowered. In the present instance the arrangement is such that the switch will move toward the right and toward the bar 53 when the draw slide moves downwardly and will move away from the bar 53 when the draw slide moves upwardly.

The relative positions between the switch and the bar may be adjusted if desired, but ordinarily the parts will be assembled in accordance with the minimum separation

distance required and requested by the purchaser of the machine. If it is assumed that the minimum separation distance between the lower ends of the draw slide and blank holder slide is to be say 10 inches, then the relative positions of the switch 65 and bar 53 will be adjusted so that the roller 67 on switch arm 66 will contact the bar 53 to actuate the switch when the lower ends of the two slides are 10 inches apart.

Since the two slides move in a vertical direction with respect to each other, there will be a corresponding relative movement between the two members consisting of the switch and bar. In order, therefore, for these members to be capable of contacting each other at any given distance apart of the lower ends of the slides, the bar must extend downwardly a sufficient distance and at all times be in the path of movement of the switch.

Suitable electrical connections are made between the switch 65 and the motors 12 and 38 so that when the minimum separation distance is reached, the switch will open the circuit to these motors and stop further movement of either or both slides. Since these motors are both reversible, it will still be possible to operate the motors to move either slide in the opposite direction so that the two members consisting of the switch and bar will move away from each other.

The invention, however, will operate to stop all adjusting movements of the slides when the minimum separation distance therebetween has been reached. It will be evident that the switch and bar can be reversed in their positions or that they may assume other positions than that shown herein as long as the movement of one slide or the other will move one member or the other so that they will eventually contact and open the circuits to the motors at the moment minimum separation distance is reached.

Changes may be made in the form, construction and arrangement of parts from those disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claims appended hereto.

The invention is hereby claimed as follows:

1. In a metal drawing press, a blank holder slide, a draw slide reciprocable within said blank holder slide, screw means on said blank holder slide for adjusting the slide with respect to the press bed, a motor for driving

said screw means, a second screw means on said draw slide for adjusting the slide with respect to the press bed, a second motor for driving said second screw means, an elongated screw threaded member mounted for rotation on said blank holder slide, means for rotating said member in timed relation with the operation of said first named screw means, a second elongated screw threaded member mounted for rotation on said draw slide, means for rotating said second member in timed relation with the operation of said second screw means, means threadedly engaging each of said members and adapted to move toward and away from each other upon operation of either screw means, and means for stopping operation of both of said screw means when the means on each of said members contact each other.

2. In a metal drawing press, a blank holder slide, a draw slide reciprocable within said blank holder slide, screw means on said blank holder slide for adjusting the slide with respect to the press bed, a motor for driving said screw means, a second screw means on said draw slide for adjusting the slide with respect to the press bed, a second motor for driving said second screw means, an elongated screw threaded member mounted for rotation on said blank holder slide, means for rotating said member in timed relation with the operation of said first named screw means, a second elongated screw threaded member mounted for rotation on said draw slide, means for rotating said second member in timed relation with the operation of said second screw means, a limit switch mounted on one of said members and movable lengthwise thereof when said one member is rotated, and an arm mounted on the other of said members and movable lengthwise thereof toward and away from said switch when said other member is rotated, said switch being operable to stop said motors when in contact with said arm.

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