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METAL WORKING PRESS WITH SLIDE ALIGNING MECHANISM

Filed Sept. 20, 1950

3 Sheets-Sheet 1

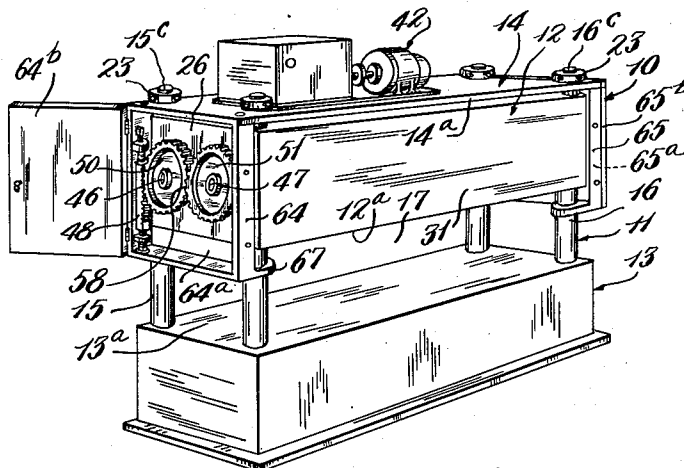


FIG. 1

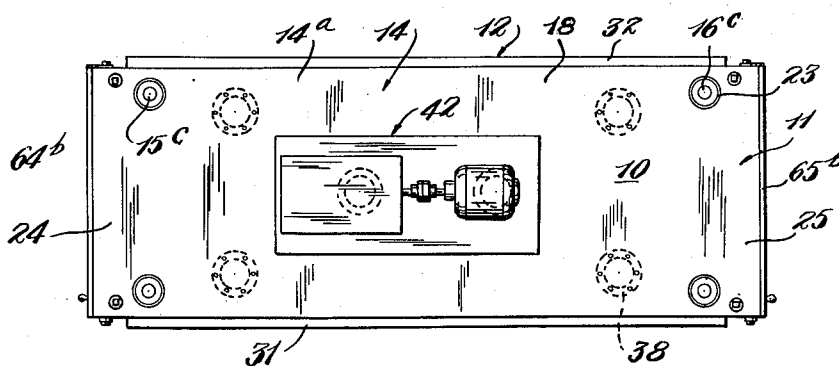


FIG. 2

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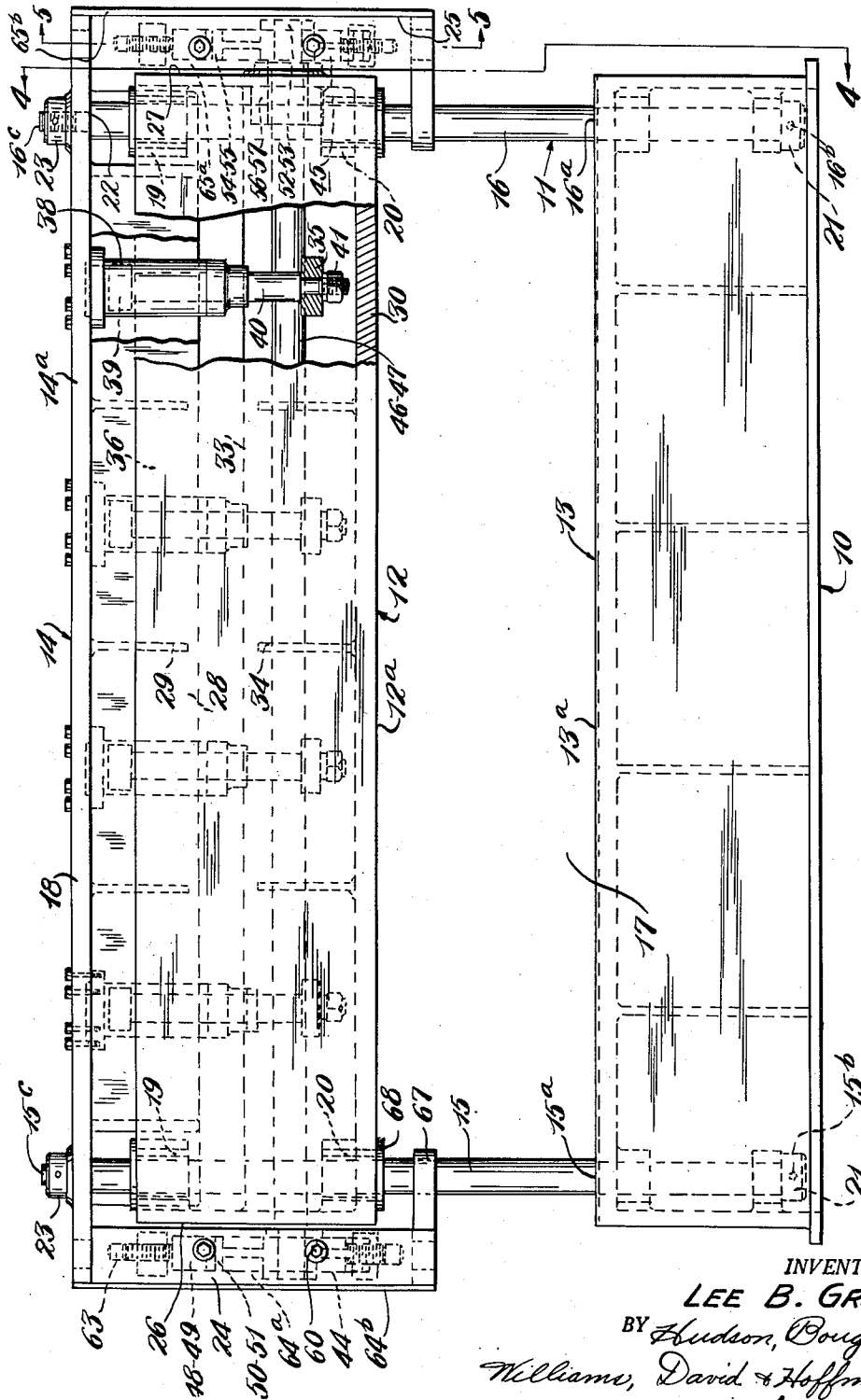


FIG. 3

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3 Sheets-Sheet 3

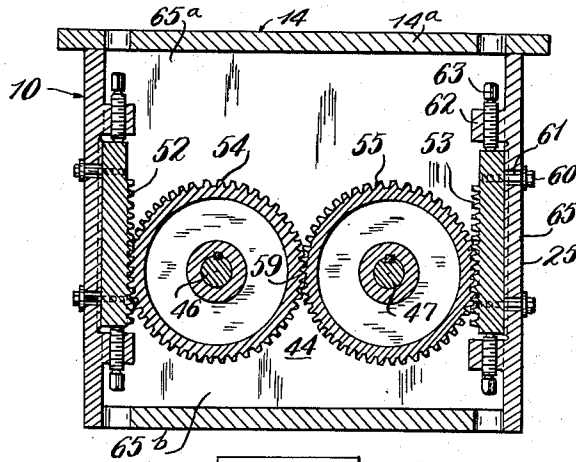


FIG. 5

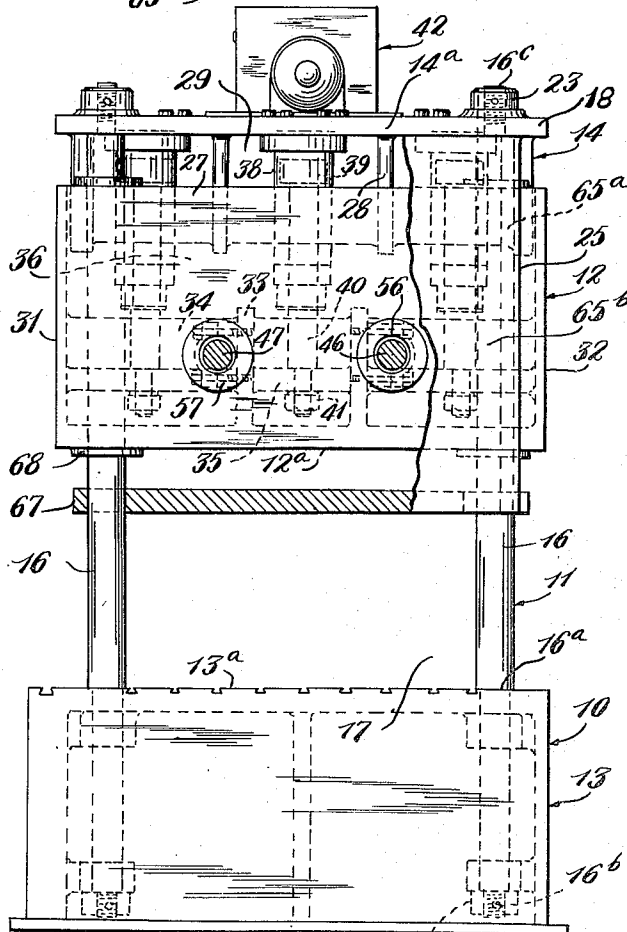


FIG. 4

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METAL WORKING PRESS WITH SLIDE
ALIGNING MECHANISM

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Application September 20, 1950, Serial No. 185,878

2 Claims. (Cl. 100—258)

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This invention relates to metal working presses of the type having a reciprocable punch slide and, more particularly, to a press of this kind having novel mechanism for insuring a parallel characteristic in the movement of the slide.

In metal working presses having a long punch slide, and particularly in hydraulic presses, it has been found necessary to provide mechanism for controlling the movement of the slide so as to prevent tilting or misalignment thereof and, as one of its objects, the present invention provides a novel arrangement of gearing constituting a simple, rugged and dependable mechanism for this purpose.

Another object of this invention is to provide slide alignment mechanism for a metal working press in which pairs of gears and pairs of racks form sets of gearing at opposite ends of the press and are connected by torque transmitting shaft means, and in which the gears of each pair are in mesh with each other and are disposed between and having meshing engagement with a pair of the racks.

A further object is to provide an improved metal working press of this character having housings at opposite ends thereof in which the sets of gearing of the slide alignment mechanism are located.

The present invention also provides an improved press construction in which the slide is guided on upright columns of the frame and depending end portions of the head of the frame have lateral projections extending into embracing relation to the columns and form stops for the downward movement of the slide.

Still another object is to provide a metal working press in which the depending end portions of the head of the frame define gear chambers at opposite ends of the slide and in which the sets of gearing of the slide alignment mechanism are located in such gear chambers.

The invention can be further summarized as consisting in certain novel combinations and arrangements of parts hereinafter described in detail and particularly set out in the claims hereof.

In the accompanying sheets of drawings,

Fig. 1 is an end and front perspective view of a metal working press embodying the slide alignment mechanism of the present invention;

Fig. 2 is a top plan view of the press;

Fig. 3 is a front elevation of the press with portions thereof broken away;

Fig. 4 is a vertical section taken through the press substantially as indicated by section line 4—4 of Fig. 3; and

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Fig. 5 is another vertical section taken through the press on section line 5—5 of Fig. 3.

As one practical embodiment of the present invention, the drawings show the improved slide alignment mechanism applied to a metal working press 10. The press 10 is hydraulically actuated and is of the long bed type in which such an alignment mechanism is especially useful for preventing tilting or misalignment of the slide during a working stroke thereof. The press 10 comprises, in general, an upright frame 11 and a slide 12 reciprocably operable in such frame.

As shown in the drawings, the frame 11 comprises an elongated bed 13 of a generally rectangular plan shape and a correspondingly elongated crown or head 14 connected with the bed and supported thereabove by means of pairs of upright columns 15 and 16. The slide and bed 12 and 13 have adjacent substantially flat faces 12a and 13a defining therebetween a die space 17 in which suitable die mechanism (not shown) may be located, including die and punch members adapted to be connected respectively with the bed and slide. The pairs of upright columns 15 and 16 connect the bed and head 13 and 14, as mentioned above, and also form guide members on which the slide 12 is slidable.

For this purpose the slide is provided adjacent the ends thereof with upper and lower guide sleeves 19 and 20 through which the pairs of columns 15 and 16 extend. At their lower ends the columns 15 and 16 are rigidly connected with the bed 13 by being provided with shoulders 15a and 16a which are drawn into clamped engagement with the upper surface 13a of the bed by means of nuts 21 applied to the threaded lower ends 15b and 16b of the columns. At their upper ends the columns 15 and 16 are provided with shoulders 22 having supporting engagement with the plate portion 14a of the head 14 and clamped thereagainst by means of nuts 23 applied to the threaded upper ends 15c and 16c of the columns.

The head 14 comprises an elongated top portion 18 extending laterally between the pairs of upright columns 15 and 16 and end portions 24 and 25 depending from said top portion and located outwardly of the pairs of columns and also outwardly of the end faces 26 and 27 of the slide 12. The laterally extending top portion 18 of the head 14 constitutes a beam or truss formed by the substantially horizontally extending plate portion 14a and the spaced longitudinal and transverse ribs 28 and 29 integrally connected with such plate portion and depending therefrom.

The slide 12 is here shown as comprising a laterally elongated box-like metal member hav-

ing a bottom wall 30 whose lower face forms the above-mentioned punch engaging surface 12a. The slide 12 also includes the above-mentioned upright end walls 26 and 27 and a pair of upright front and rear walls 31 and 32, and all of which walls are integrally connected with the bottom wall 30. This slide is also provided with longitudinal and transverse ribs 33 and 34 internally thereof and integrally connected with the side walls. In addition to these ribs the slide is provided with a plurality of longitudinally spaced bars 35 extending laterally between the front and rear walls 31 and 32 and to which further reference will presently be made. As shown in Figs. 3 and 4, the ribs 33 and 34 of the slide 12 are located only in the lower portion thereof such that the upper portion of the hollow interior of the slide will define a clearance space or chamber 36 into which the depending rib portions 28 and 29 of the head 14 may extend when the slide is in an elevated position.

For actuation of the slide 12 the press 10 is provided with a plurality of cylinders 38, in this instance six such cylinders, having their upper ends attached to the plate portion 14a of the head 14 and fluid pressure responsive pistons 39 operable in such cylinders and connected with the transverse bars 35 of the slide by means of the piston rods 40 and the clamping nuts 41 applied thereto. Hydraulic fluid is adapted to be supplied to the cylinders under pressure by any suitable hydraulic pressure generating means, such as the motor driven pumping apparatus 42 shown in Figs. 1, 2 and 4 and which, in this instance, is mounted on the top surface of the plate portion 14a of the head.

The slide alignment mechanism which constitutes the main feature of the present invention will be described next. This mechanism comprises sets of gearing 44 and 45 located at opposite ends of the press and torque transmitting shaft means operably connecting these sets of gearing and here shown as comprising a pair of substantially parallel shafts 46 and 47 extending through the slide 12 longitudinally thereof. The gear set 44 comprises a pair of racks 48 and 49 mounted on the depending end portion 24 of the head 14 and a pair of gears 50 and 51 cooperating with these racks. Similarly, the gear set 45 at the opposite end of the press comprises a pair of racks 52 and 53 mounted on the depending portion 25 of the head 14 and a pair of gears 54 and 55 cooperating with such racks.

The torque transmitting shafts 46 and 47 are rotatably mounted in the slide by being journaled in pairs of suitable bearings 56 and 57 incorporated in the slide structure, as shown in Figs. 3 and 4. The gears 50 and 51 of the gear set 44 are mounted in fixed relation on the respective shafts 46 and 47 at one end thereof and the gears 54 and 55 of the gear set 45 are mounted in fixed relation on the respective shafts 46 and 47 at the opposite end thereof.

The gears 50 and 51 have adjacent points of their peripheries in meshing engagement with each other as shown at 58 in Fig. 1, that is to say, these gears have meshing engagement with each other at a point between the axes of the shafts 46 and 47. The gears 50 and 51 also having meshing engagement with the racks 48 and 49 at remote points of their peripheries, that is to say, at points located laterally outwardly of the axes of the shafts 46 and 47. Similarly, the gears 54 and 55 of the gear set 45 have meshing

engagement with each other at a point between the axes of the shafts 46 and 47 as represented at 59 in Fig. 5, and have meshing engagement with the racks 52 and 53 at remote points of their peripheries.

The racks 48 and 49 of the gear set 44 are mounted in relatively fixed upright relation on the depending end portion 24 of the head 14 and the racks 52 and 53 of the gear set 45 are mounted in relatively fixed upright relation on the depending end portion 25 of the head. The mounting means employed for this purpose is substantially the same for both pairs of racks, and comprises a pair of clamping screws 60 for each rack as shown in Fig. 5. These clamping screws extend through slots 61 of an upright side wall of the depending head portion and are threaded into the body of the rack. The mounting means for each rack also includes a pair of vertically spaced internal lugs 62 formed on an upright side wall of the depending end portion of the head and set screws 63 extending in threaded relation through these lugs and engageable with opposite ends of the rack. When the clamping screws 60 have been loosened, the set screws 63 can be adjusted to move the racks up or down individually to thereby produce a desired adjustment of the slide alignment mechanism or to take up lost motion in the gearing.

From the construction and arrangement of the slide alignment mechanism as thus far described, it will be seen that the rack pairs of the gear sets 44 and 45 located at opposite ends of the press are mounted in relatively fixed relation on the frame, whereas the gear pairs of these sets are movable up and down with the slide 12 and during such movement the gears roll on the racks with which they are in toothed engagement. Thus, when the slide 12 is moved downwardly during a working stroke of the die member carried thereby, the gears 50 and 51 will rotate in opposite directions with the gear 50 rotating in a clockwise direction and the gear 51 rotating in a counter-clockwise direction as seen in Fig. 1. At the point of meshing engagement 58 of these gears with each other they will roll on each other as idlers. Similarly, the gears 54 and 55 at the opposite end of the press will roll on the racks 52 and 53 but since they are substantially rigidly connected with the respective gears 50 and 51 through the torque transmitting shafts 46 and 47, it will be seen that both ends of the slide will be constrained by the gears and racks to move at exactly the same rate regardless of an unequal distribution of the force being applied to the slide by the hydraulic cylinders 38.

If one end of the slide has a tendency to move at a faster rate than the other end of the slide, the gears at such fast moving end will be driven at an accelerated rate by their cooperating racks and will therefore transmit torque through the shafts 46 and 47 to the corresponding gears at the other end of the slide and such other gears cooperating with their racks will impart a similar rate of movement to that end of the slide. By such a transmission of torque through the shafts 46 and 47 from one gear set to the other, the two ends of the slide will be constrained to move at the same rate at all times.

As another feature of the present invention, the drawings show the depending end portions 24 and 25 of the head 14 as comprising housings 64 and 65 in which the respective gear sets 44 and 45 are contained. For this purpose the depending head portions 24 and 25 are of a hollow

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box-like form defining gear chambers 64a and 65a in which the gears and racks of the respective gear sets are located. The inner side walls of these gear chambers are formed by the end faces 26 and 27 of the slide 12 and the outer side walls are formed by movable plates or covers 64b and 65b, here shown as hinged covers, which are adapted to be opened to afford access to the gear chambers and the gearing contained therein.

The construction of the frame 11 of the press so that depending end portions 24 and 25 of the head 14 define these gear chambers is an important feature because when the gear sets are housed in these chambers they are protected from damage by stray articles or foreign matter and are shielded against accidental personal contact therewith. In the construction and arrangement above described for these gear chambers, it will be seen that the ends of the shafts 46 and 47 project therinto and when the gear pairs of the respective gear sets are mounted on the ends of these shafts, the gear pairs will be disposed in the gear chambers in proper relation between the paired racks with which they cooperate.

As a further feature of the present invention, the depending end portions 24 and 25 of the head 14 are provided with pairs of laterally inwardly extending projections or lugs 67 which form rests or stops for limiting the downward movement of the slide 12. The lugs 67 are here shown as being formed integrally with the depending end portions 24 and 25 of the head and as extending laterally inwardly into embracing relation with the pairs of columns 15 and 16 in which location they are adapted to be engaged by the pads 68 provided on the lower plate portion 30 of the slide.

From the foregoing detailed description and the accompanying drawings it will now be readily understood that this invention provides an improved metal working press having novel slide alignment mechanism embodied therein and which will effectively prevent tilting of the slide regardless of unequal forces applied to opposite ends of the slide during the working stroke thereof. It will be seen furthermore that the shaft-connected gear gets provided at opposite ends of the press will cause a correcting force to be transmitted through the shafts whenever one end of the slide has a tendency to move at a different rate than the other end of the slide. It will also be seen that since the pairs of gears of the gear sets have the remote or diametrically opposite outer portions of their peripheries in meshing engagement with the paired racks, the maximum leverage will be obtained during the functioning of the alignment mechanism for producing a strong corrective force whenever there is a tendency for a misalignment of the slide during the operation of the press. Furthermore, it will be seen that by the provision of housing portions on the opposite ends of the frame of the press the gearing of the alignment mechanism will be housed and shielded as explained above.

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Although the improved metal working press and the slide alignment mechanism thereof have been illustrated and described herein to a somewhat detailed extent it will be understood, of course, that the invention is not to be regarded as being limited correspondingly in scope but includes all changes and modifications coming within the terms of the claims hereof.

Having thus described my invention, I claim:

1. In a press of the character described, a bed, pairs of columns connected with said bed adjacent the ends thereof and extending thereabove, a head connected with the pairs of columns and supported thereby above said bed, said head having a top portion extending between the pairs of columns and end portions depending from said top portion and located outwardly of said pairs of columns, a slide located beneath said top portion and between the depending end portions of said head and guided on said columns, power means operably connected with said head and slide for actuating the latter, and projections carried by the depending end portions of said head and embracing said columns and forming stops for the downward movement of said slide.

2. In a press of the character described, an upright frame structure comprising connected parts including a laterally elongated bed and a laterally elongated head disposed above and spaced from said bed, a laterally elongated slide in said frame between said head and bed and movable toward and away from the latter, a pair of substantially parallel slide alignment torque transmitting shafts extending longitudinally of said slide and rotatably journaled thereon, a pair of upright racks spaced apart transversely of said head adjacent each end thereof, pairs of gears secured to said shafts and disposed between the paired racks, said gears having meshing engagement with each other at adjacent points of their peripheries and having remote points of their peripheries in meshing engagement with said racks, said head having transversely spaced upright walls thereon located adjacent to but outwardly spaced from said remote points of the gear peripheries and forming seats for said racks, clamping screws holding said racks against said seats and adapted to be loosened to permit endwise adjusting movement of said racks while in mesh with said gears, and adjusting screws effective on said racks adjacent opposite ends thereof for producing said endwise adjusting movement.

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References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,469,639	Prius	Oct. 2, 1923
2,068,840	Bennett et al.	Jan. 26, 1937
2,217,172	Laussucq	Oct. 8, 1940
2,328,258	Cannon	Aug. 31, 1943
2,400,685	Collins	May 21, 1946