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M. FRIEDLAND
TURRET PUNCH PRESS

3,049,038

Filed Nov. 19, 1958

2 Sheets-Sheet 1

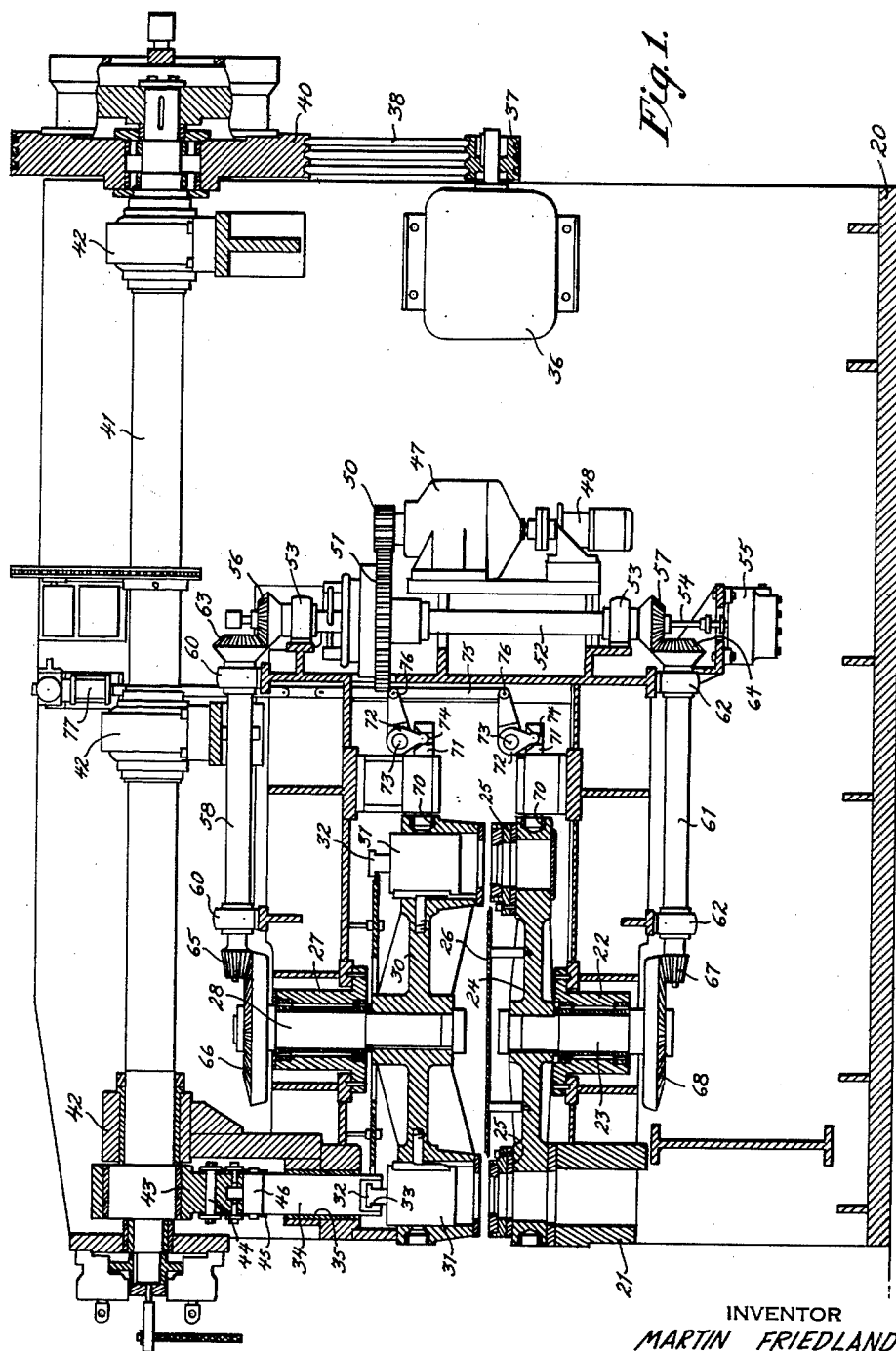


Fig. 1.

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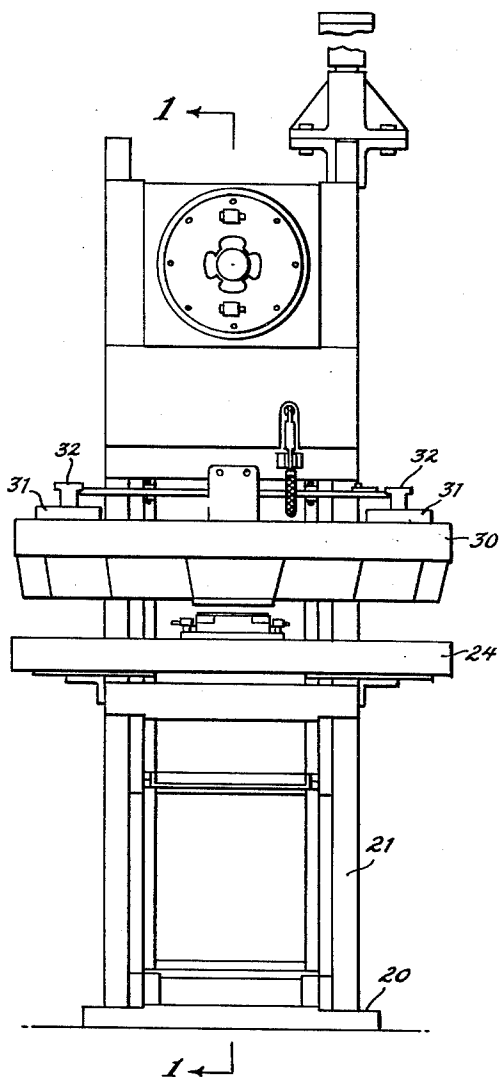


Fig. 2.

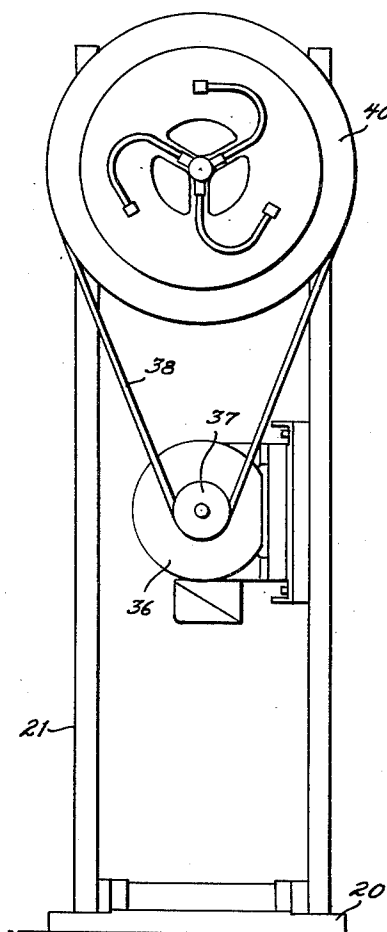


Fig. 3.

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3,049,038

TURRET PUNCH PRESS

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1 Claim. (Cl. 83-552)

The present invention relates to turret punch presses.

A purpose of the invention is to produce a drive for a turret punch press which will more quickly and reliably align up the turrets.

A further purpose is to reduce the amount of misalignment in turret punch press turrets.

A further purpose is to reduce the torsional deflection in drives for turrets of turret punch presses, and to permit the torsional deflection of both turrets to equalize.

Further purposes appear in the specification and in the claim.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which the invention may appear, selecting the form shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

FIGURE 1 is a central vertical section of the turret of the present invention, the section being taken on the line 1-1 of FIGURE 2.

FIGURE 2 is a left end elevation of FIGURE 1.

FIGURE 3 is a right end elevation of FIGURE 1.

Describing in illustration but not in limitation and referring to the drawings:

In previous constructions of turret punch presses, the time required for moving the turrets to new positions and to align the turrets for operation in such new positions has often been excessive, because of the fact that the turrets, being of unequal weight, have not responded alike to the drive, and it has not been possible to make the turrets behave alike in their rotational behavior and particularly in the deflection of the drive before they are almost stationary. Since many turret punch presses are relatively large and expensive and the machine charge rate is high, efforts have been made to accelerate the motion of the turrets between operating positions, but such efforts have resulted in only limited improvements, because of the delay incident to stopping to align the turrets.

The present invention is concerned with a turret punch press provided with a greatly improved drive, so that the turrets respond alike during rotation and more quickly can be brought to a position at which they are in alignment for operation of the press.

In the prior practice, it was common to drive the turrets by chain drives. This was not only unsatisfactory because of the deflection occurring in the chain drive, but also, because of the fundamental frequency of the chain drive, did not adapt itself to remote control operation.

In the present invention this is overcome by providing drive elements operating the two turrets which respond alike to torsional deflection, and which inherently have a fundamental frequency which is more suitable for remote control operation.

Considering now the drawings in detail, I illustrate a punch press having a base support 20 and a frame 21 which supports a bottom trunnion bearing 22 which provides journal and thrust bearing support for a vertical die turret shaft 23 which has keyed thereon at the upper end die turret 24 which mounts at circumferentially spaced positions in a circular path a series of dies 25. The die turret 24 also carries a work support 26.

Positioned coaxially with the die turret trunnions 22 and above it is a punch turret trunnion 27 supported on the frame and providing thrust and journal bearing sup-

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port for a punch turret shaft 28 which is coaxial with the die turret shaft 23. On the lower end of the punch turret shaft 28 there is keyed a punch turret 30 which mounts in cooperating position with the dies around a circumferentially spaced circular path a series of vertically slidable punches 31 of well known character in the art, provided at their upper ends with key heads 32 which at the operating position mesh in key slot 33 mounted in the lower end of a vertically movable ram 34 which is guided on the frame by vertical guideways 35.

The ram is moved in any suitable manner, desirably by a motor 36 turning a sheave 37 which drives V-belts 38 turning a sheave 40 which is keyed on a crankshaft 41 journaled on pillow blocks 42 and which operates a connecting rod 43 which makes pivotal connection at 44 with operating links 45 which pivot at 46 on the head of the ram.

The drive of the turrets from one position to another in response to any suitable remote control device is made effective by a speed reducer 47 driven by a hydraulic motor 48. The speed reducer 47 drives a spur gear 50 which intermeshes with the spur gear 51 keyed on back shaft 52 journaled at 53 in the frame.

The back shaft 52 is interconnected coaxially with a pickup shaft 54 which drives a Selsyn or similar pickup unit 55 whose position is used to control the turret position in any suitable manner, not important in the present invention.

The back shaft has keyed thereon at the upper and lower ends bevel gears 56 and 57. Parallel with one another and at right angles to the back shaft 52 located near the ends of the back shaft are a punch turret cross shaft 58 journaled on pillow blocks 60 on the frame and a die turret cross shaft 61 journaled on pillow blocks 62 on the frame. The punch turret cross shaft 58 has keyed at one end a bevel gear 63 meshing with bevel gear 56. The die turret cross shaft 61 has keyed on the end adjoining bevel gear 57 and meshing with it, bevel gear 64. Cross shafts 58 and 61 are of the same length and the same dimensions, so that their torsional deflections will be similar.

At the ends adjoining the turrets, punch turret cross shaft 58 has keyed thereon a bevel gear 65 which meshes with a bevel gear 66 keyed on the top of the punch turret shaft 28. Similarly the end of the die turret cross shaft 61 joining the die turret has keyed thereon a bevel gear 67 which meshes with bevel gear 68 keyed on the bottom of die turret shaft 23.

Corresponding to each one of the turret positions each turret has a registry pin opening 70 which, when the turrets are in correct alignment, receives a registry pin 71 which is moved into engagement in any suitable manner, as by a bell crank 72 pivoted on the frame at 73, journaling at one end in a recess in the registry pin at 74 and pivoting at the other end on pull rod 75 by pin 76. The pull rod is actuated in any suitable manner as by double acting hydraulic cylinder 77.

In operation, with the punch retracted, the operator manipulates the control to cause the hydraulic motor 48 to move the turrets to a new position. This rotates back shaft 52 and through the appropriate bevel gears turns cross shafts 58 and 61 in the proper direction to move the turrets together through the appropriate bevel gears connecting with the turrets. This causes uniform deflection, since the cross shafts are similar and the turret shafts are similar. The registry pins will then relatively quickly be able to enter registration in the opening in each one of the turrets, and will not encounter a condition which has previously occurred in which one turret would register quickly and there would be a lag before the other turret would register.

In the preferred embodiment of the invention, the posi-

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tion of placing the spur gear 51 on the back shaft 52 with respect to the ends of the back shaft is adjusted in respect to the relative weight of the turrets including all tools carried thereon. Since the punch turret is usually the heavier, the spur gear 51 is placed nearer to the punch turret bevel gear drive than to the die turret bevel gear drive. In other words, the distance from the spur gear 51 to each end of the back shaft 52 is inversely proportional to the weight of the turret which is driven from each end of the back shaft.

There is thus a shorter and stiffer shaft driving the heavier turret and a longer and slightly more deflectable shaft driving the lighter turret. Accordingly there is compensation of deflection.

In view of my invention and disclosure, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I, therefore, claim all such insofar as they fall within the reasonable spirit and scope of my claim.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

In a turret punch press, a punch turret turning on a vertical axis and having punches thereon which act vertically downward, an upwardly extending punch turret shaft supporting and rotating the punch turret on its vertical axis, downwardly acting ram means operatively engaging one of the punches in operating relation at a particular position of the punch turret, a die turret rotating on a vertical axis coaxial with the axis of the punch turret, located below the punch turret and cooperating

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with the punch turret, a downwardly extending die turret shaft supporting and rotating the die turret on the coaxis of the punch turret and the die turret, a horizontally extending punch turret cross shaft extending above the punch turret toward the rear of the press, bevelled gearing interconnecting the punch turret shaft with the punch turret cross shaft, a die turret cross shaft extending horizontally below the die turret toward the rear of the machine and having the same length as the punch turret cross shaft, bevelled gearing interconnecting the die turret shaft with the die turret cross shaft, a vertically extending back shaft at the back of the press turning on an axis parallel to the coaxis of the punch turret shaft and the die turret shaft, bevelled gearing interconnecting the back shaft at the top with the punch turret cross shaft, bevelled gearing interconnecting the back shaft at the bottom with the die turret cross shaft, drive means, and gearing interconnecting the drive means with the back shaft the distance of the gearing interconnecting the drive means with the back shaft from the ends of the back shaft being inversely proportional to the relative weights of the punch turret and the die turret.

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