July 24, 1951 W. KLOCKE 2,562,044

HIGH-SPEED MECHANICAL POWER PRESS

Filed March 12, 1949

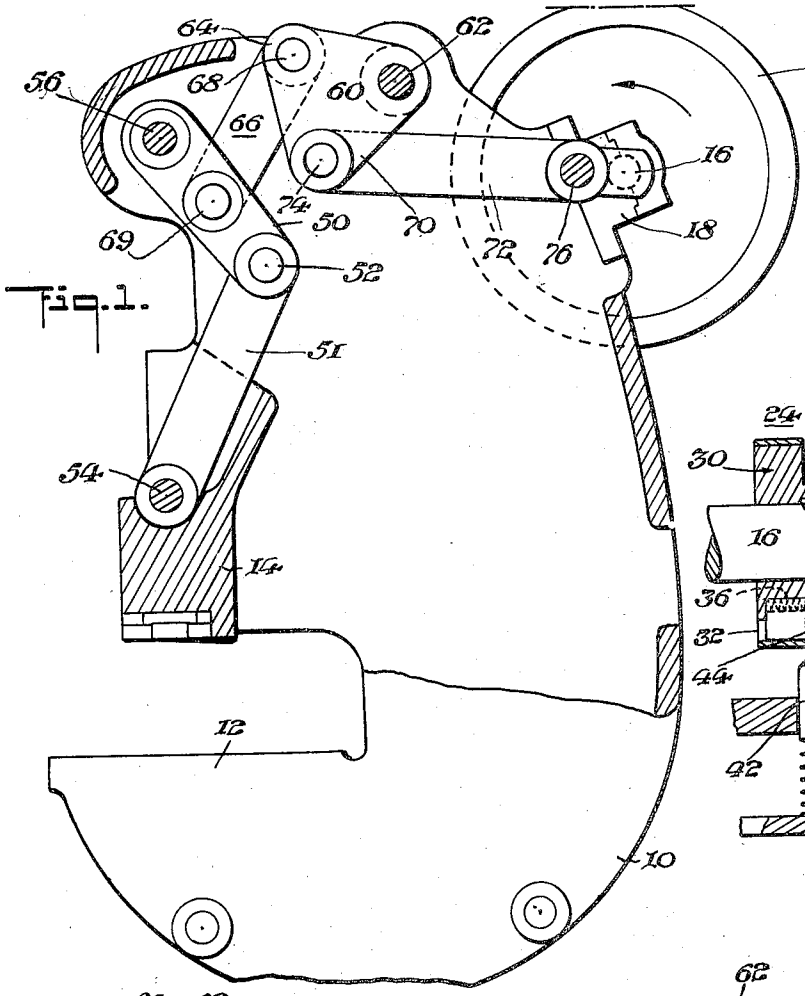


Fig. 1.

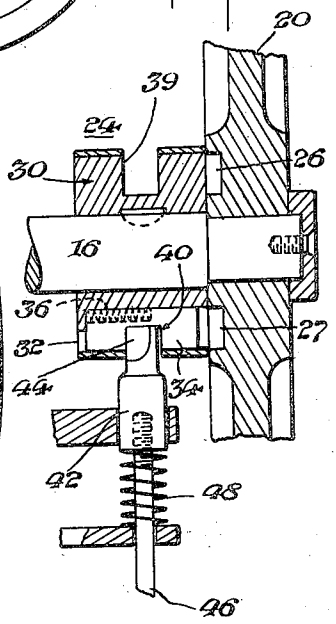


Fig. 5.

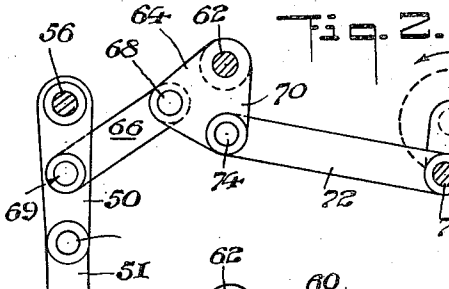


Fig. 2.

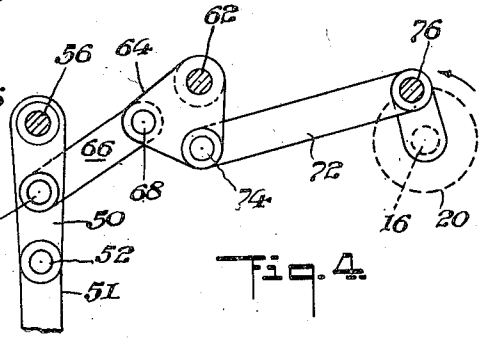


Fig. 4.

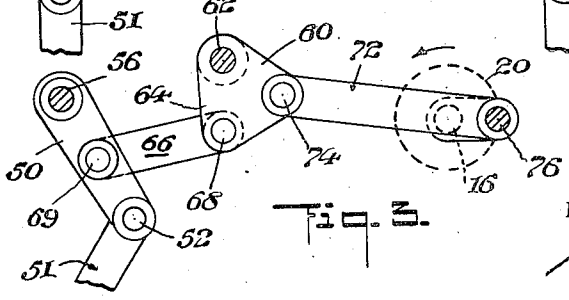
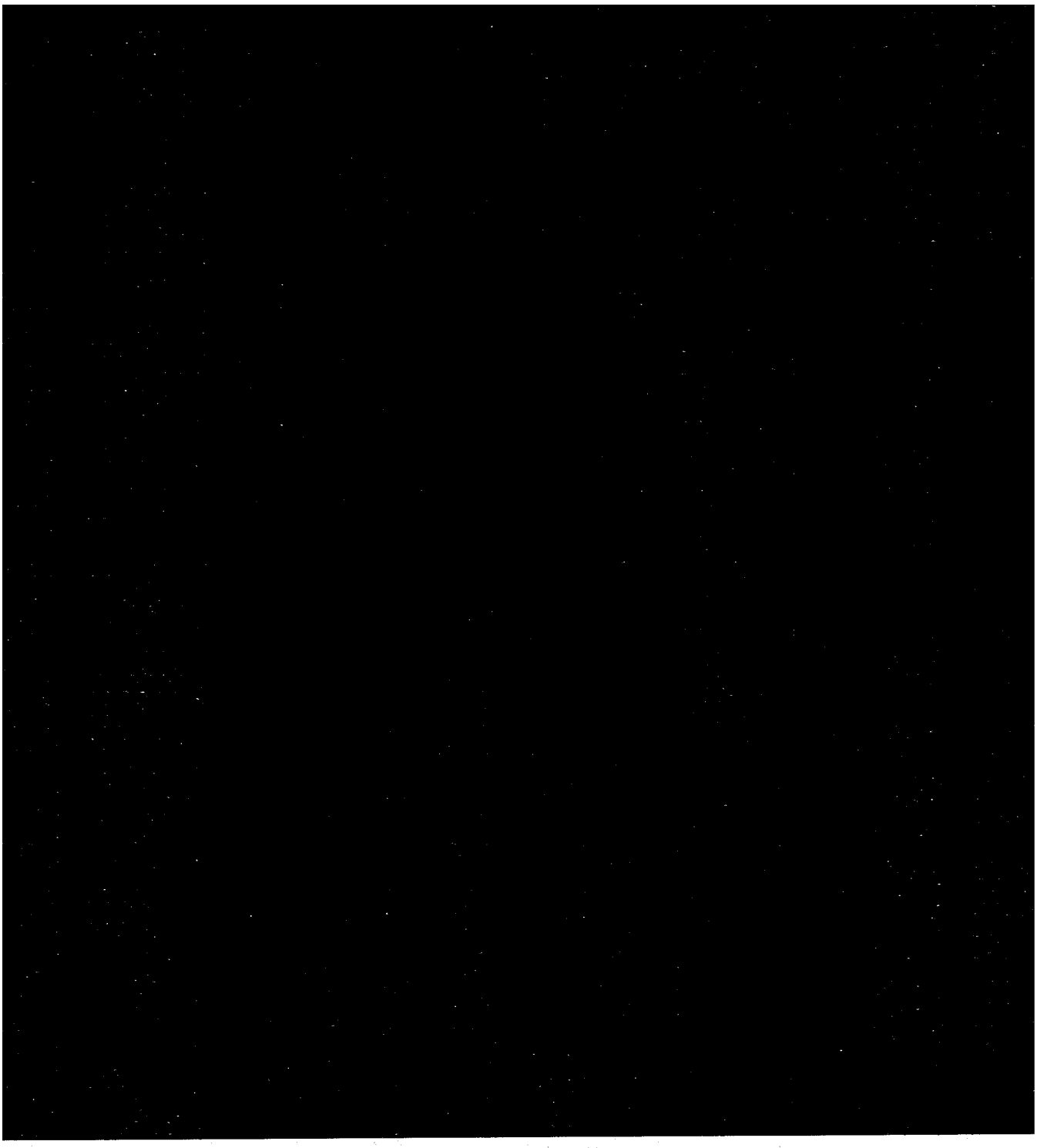


Fig. 3.

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HIGH-SPEED MECHANICAL POWER PRESS

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of the annular slot 39 in the hub 30. Attached to the dog 42 is a treadle rod 46, and reacting on the dog 42 is a spring 48 normally pressing the dog 42 toward the slot 39. When the dog 42 is removed from the notch 40 in the clutch pin 34, the spring 36 presses the pin 34 toward the fly-wheel pulley 20 and into one of the notches 26 or 27, whereupon the clutch is engaged, causing the fly-wheel pulley to rotate the crank-shaft 16. When the treadle rod 46 is released, the dog 42 enters the slot 39, and the wedge-shaped end 44 of the dog 42 enters the notch 40 in the clutch pin 34 and moves the clutch pin out of the slot 26 or 27 in which it was lodged. Thereupon, the crank-shaft 16 is disengaged from the fly-wheel pulley 20, and comes to a stop. The notches 26 and 27 are so located that at the time of disengagement of the clutch, the slide 14 is at the top of a stroke. As usual, the engagement and disengagement of the clutch is done at the top of the stroke.

Between the crank-shaft 16 and the slide 14 are driving connections which effect two strokes of the slide for each rotation of the crank-shaft.

These driving connections consist of a slide toggle embodying a pair of links 50, 51 pivotally connected at 52. One end of the lower link 51 is pivotally connected to the slide 14, as indicated at 54, and an end of upper link 50 is pivotally connected to the upper part of the frame 10, as indicated at 56. Between the crank-shaft 16 and the pair of links 50, 51 is a bell crank 60, which is pivotally connected to the upper part of the frame, as indicated at 62. The best position of the pivotal connection 62 is somewhat above the pivotal connection 56. One arm 64 of the bell crank is pivotally connected to a secondary driving link 66, as indicated at 68. Link 66 is also pivotally connected to the upper link 50 of the slide toggle, as indicated at 69. The other arm 70 of the bell crank 60 has a primary driving link 72 pivotally connected thereto, as indicated at 74, and the other end of link 72 is connected on the crank-shaft 16, as indicated at 76.

The length of the link 72 is such that the pivotal connection 74 of the bell crank 60 is swung through an arc of 90° bisected by a vertical line passing through the pivotal connection 62 of the bell crank 60 to the press frame 10, for each 180° of rotation of the crank-shaft 16. That is, the action of the rotating crank-shaft 16 is always to swing the connected links 50, 51, from a position of alinement, toward the back of the press.

The positions of the driving connections, through one full rotation of the crank-shaft 16 and two strokes of the slide 14, are illustrated in Figs. 1 to 4 of the drawings. In Fig. 1 the press slide 14 is at the top of its stroke, the pivotally connected links 50, 51 are bent inwardly toward the back of the press, the pivotal connection 74 of the bell crank 60 is 45° to the left of a vertical line passing through the pivotal connection 62 of the bell crank to the frame, and the pivotal connection 76 of the crank-shaft 16 is at the left hand extreme of its throw. Fig. 2 shows the position of the parts when the crank 76 on crank-shaft 16 has moved through an arc of 90°. At this time, the press slide 14 is at the bottom of its stroke, the pivotally connected links 50, 51 of the slide toggle are in alinement, or on dead centers and the same condition is simultaneously true of the secondary link 66 and the arm 64 of the bell crank. At the same time the driving crank is midway of its backward throw and the pivotal connection 74 of the bell crank 60 is at the vertical line which passes through the axis of the pivotal connection 62 of the bell crank to the frame. The next 90° of movement of the crank 76 of the crank shaft 16 is shown in Fig. 3. Here the pivotally connected slide toggle links 50, 51 are again bent inwardly toward the back of the frame, lifting the press slide 14 to the top of its stroke (the same position shown in Fig. 1), the pivotal connection 74 of the bell crank is 45° to the right of the vertical line passing through the pivotal connection 62 of the bell crank 60 to the press frame, the crank 76 of the crank-shaft 16 is at the right hand extreme of its throw, and the pivotal connection 68 of the bell crank 60 is at the vertical line which passes through the pivotal connection of the bell crank 60 to the frame. The position of the slide driving parts at the next 90° of movement of the crank 76 of the crank-shaft 16 is shown in Fig. 4. The slide 14 is at the bottom of its stroke, with the pair of pivoted links 50, 51 in alinement, i. e., on dead centers and with the pivotal connection 74 of the bell crank 60 at the vertical line which passes through the pivotal connection 62 of the bell crank 60 to the press frame. The link 66 and arm 64 are also in alinement, i. e., on dead centers and the driving crank is midway of its forward throw. The parts have thus returned to the relative positions of Figure 2. The next 90° of movement of the crank 76 of the crank-shaft 16 brings the slide 14 and its driving parts back to the position shown in Fig. 1, thus completing one full rotation of the crank-shaft 16 and two strokes of the press slide 14.

The rotation of the crank-shaft 16 at a speed of ½ the strokes per minutes of the slide 14 enables the clutch 24 to operate under conditions of shock and "timing" at which it would not satisfactorily operate on a press having the same number of strokes per minute, as the number of revolutions per minute of the crank-shaft, when the strokes per minute exceeded about 300. In other words, the present invention enables a press to be operated at a number of strokes per minute well exceeding the number of rotations per minute of a crank-shaft at which it is practical to control the operations of the press by means of a positive-type clutch.

Moreover, the movement of the pivotally connected pair of links 50, 51 always toward the back of the press from a position of alinement, is of major importance from the standpoint of the safety and mental comfort of the press operator. If the pivotally connected links 50, 51 darted outwardly toward the head of the press operator, in rapid succession, during the operation of a rapid press, the operator might, in the course of time, be injured, and the operator at all times would be distracted and uneasy in his mind by reason of the slide connections constantly darting towards his head.

The construction and arrangement of the driving connections of the slide are also such that the slide 14 moves much more slowly in the end-part of the working stroke than the slide of the ordinary press. By reference to Figs. 2 and 4, it will be seen that the construction and arrangement of the bell-crank 60, link 66, and the pair of pivotally connected links 50, 51, is such that when the pivotal connections 52, 54, 56 of the pair of links 50, 51 are in alinement at the bottom-of-the-stroke position of slide 14, the pivotal connections 62, 68, 69 of the bell crank 60 and link 66 are simultaneously in alinement. These positions are the same at two positions of the

crank 16, 180° apart, corresponding to two strokes of the slide for each revolution of crank-shaft 16. There is consequently two simultaneously acting toggles (pivoted links 50, 51 which constitute the slide toggle and pivoted link 66 and arm 64 of bell crank 60) approaching and reaching zero motion at the end-part of the slide movement on its working stroke. As a consequence, the slide 14 moves much more slowly as it approaches and moves away from the end of its working stroke, than does the slide of an ordinary press which is directly driven from a crank. With the press of the present invention, therefore, the initial contact of the forming tools on the material operated on is relatively mild, and the force of the press is transmitted to the material more in the nature of a push or squeeze than a sharp blow. By this kind of action in a high speed press, the material acted on by the forming tools has time to set to the contour of the forming tools and the tendency of the material to spring back as the forming tools separate with the lift of the slide is overcome or greatly diminished.

What is claimed is:

1. A power press having a frame, a tool-carrying slide guided for up and down movement, a slide toggle embodying upper and lower links with the upper end of the upper link pivoted to the frame and the lower end of the lower link pivoted to the slide, a driving crank on the frame, a bell crank between the driving crank and said toggle, a primary driving link connecting the driving crank to a primary arm of the bell crank, and a secondary driving link connecting a secondary arm of the bell crank to a pivot on the upper link of the toggle, the bell crank being pivoted to the frame at that point occupied by the axis of the bell crank when the secondary link and the secondary arm of the bell crank are on dead centers with the links of the slide toggle on dead centers and the crank midway of its throw, whereby the slide makes two working strokes for each complete rotation of the driving crank.

2. A power press according to claim 1, wherein the axis of the bell crank pivot is above both the axis of rotation of the driving crank and the pivotal connection between the frame and the upper end of the upper link of the slide toggle.

3. A power press having a frame, a tool-carrying slide guided for up and down movement, a slide toggle embodying upper and lower links with the upper end of the upper link pivoted to the frame and the lower end of the lower link pivoted to the slide, a driving crank on the frame, a bell crank between the driving crank and said toggle, primary driving connections between the driving crank and one arm of the bell crank, and a secondary driving link connecting the other arm of the bell crank to a pivot on the upper link of the toggle, the bell crank being pivoted to the frame at that point where the secondary link and the corresponding end of the bell crank are on dead centers when the links of the toggle are on dead centers and the crank is midway of its throw, whereby the slide makes two working strokes for each complete rotation of the driving crank.

WILLIAM KLOCKE.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
336,978	Adams	Mar. 12, 1886
1,110,977	Welch	Sept. 15, 1914
1,574,465	Beyer	Feb. 23, 1926
2,056,402	Klocke	Oct. 6, 1936
2,161,869	Klocke	June 13, 1939
2,271,771	Klocke	Feb. 3, 1942