April 27, 1965 W. ELEY 3,180,121

CLUTCH

Filed Aug. 2, 1961 4 Sheets-Sheet 1

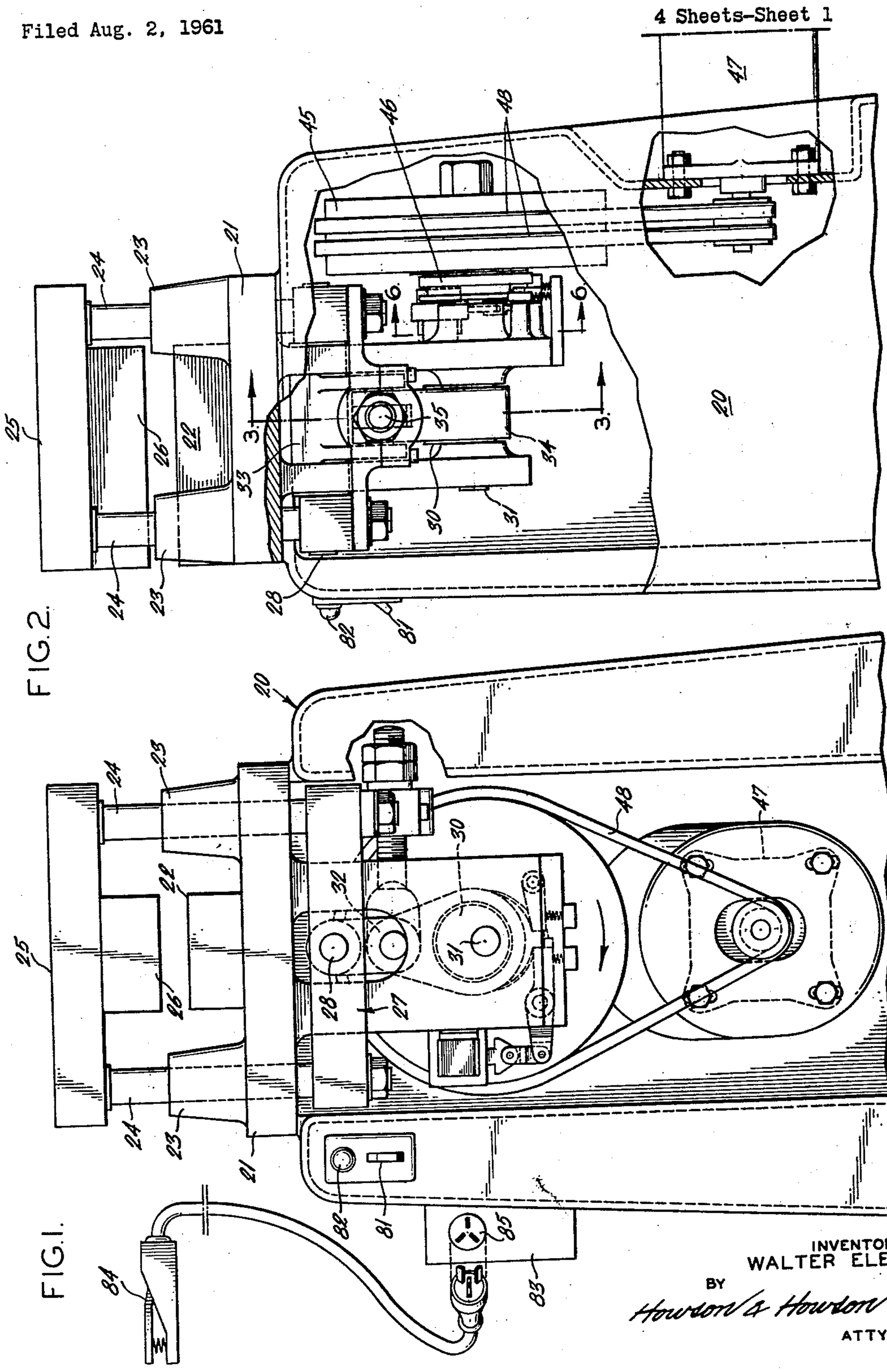


FIG. 2.

FIG. 1.

INVENTOR:
WALTER ELEY

BY
Howson & Howson

ATTYS.

April 27, 1965 W. ELEY 3,180,121

CLUTCH

Filed Aug. 2, 1961 4 Sheets-Sheet 2

FIG. 3.

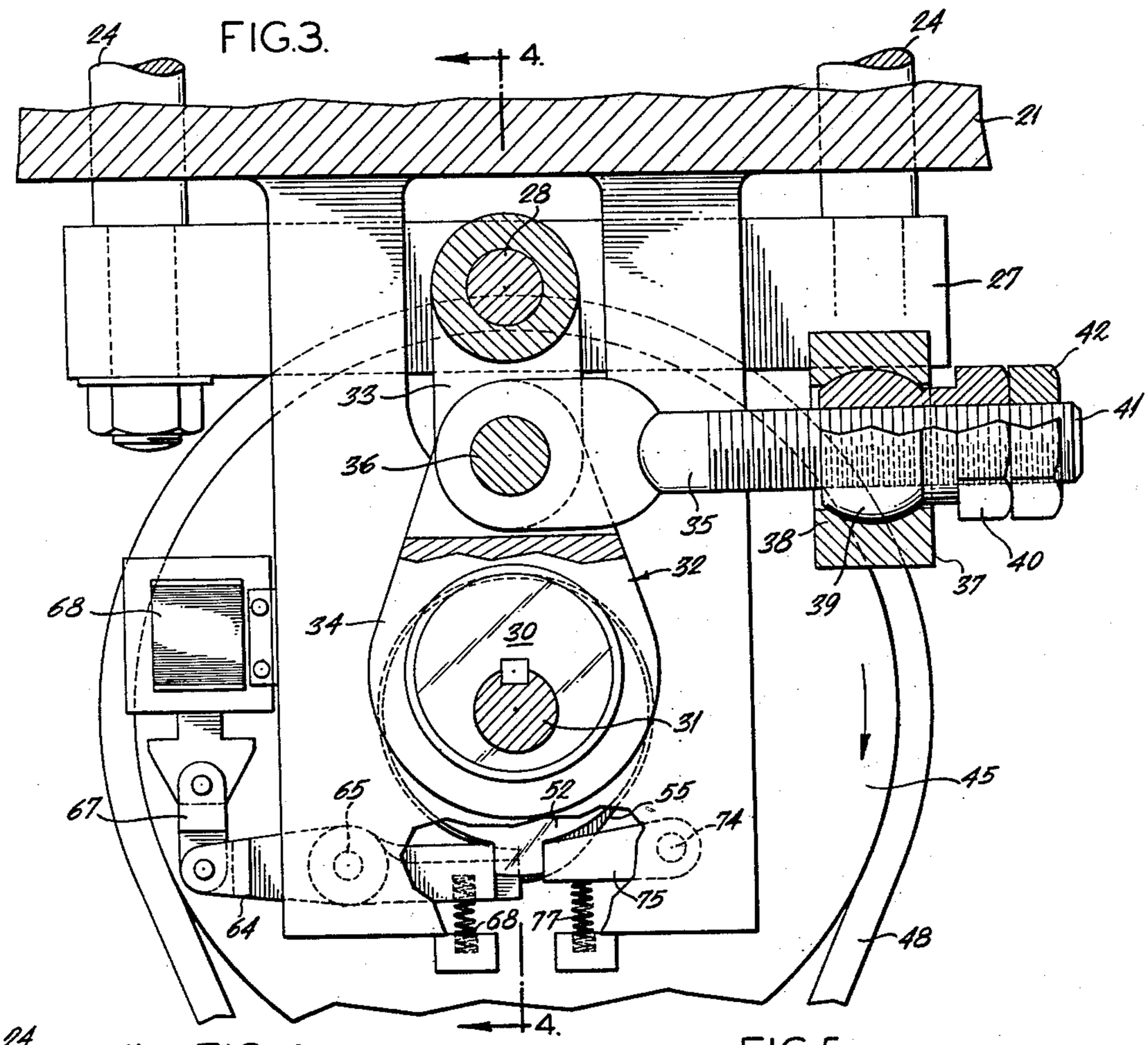


FIG. 4.

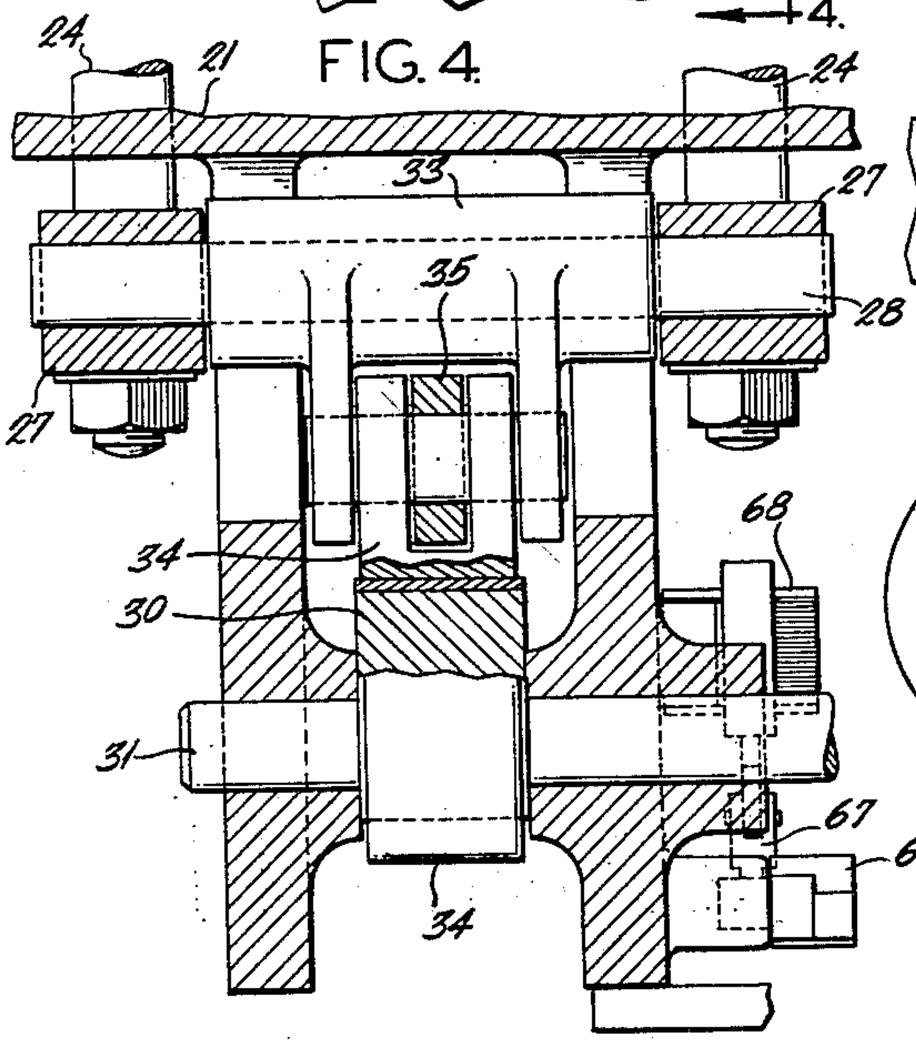
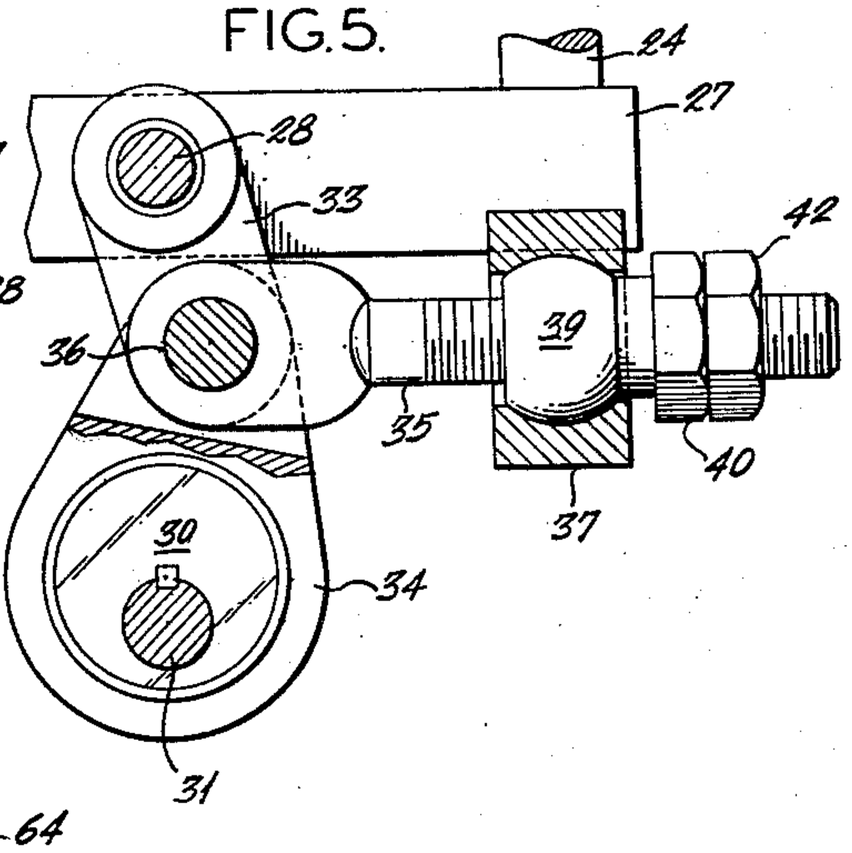


FIG. 5.



INVENTOR:
WALTER ELEY

BY
Howson & Howson

ATTYS.

April 27, 1965 W. ELEY 3,180,121

CLUTCH

Filed Aug. 2, 1961 4 Sheets-Sheet 3

FIG. 6.

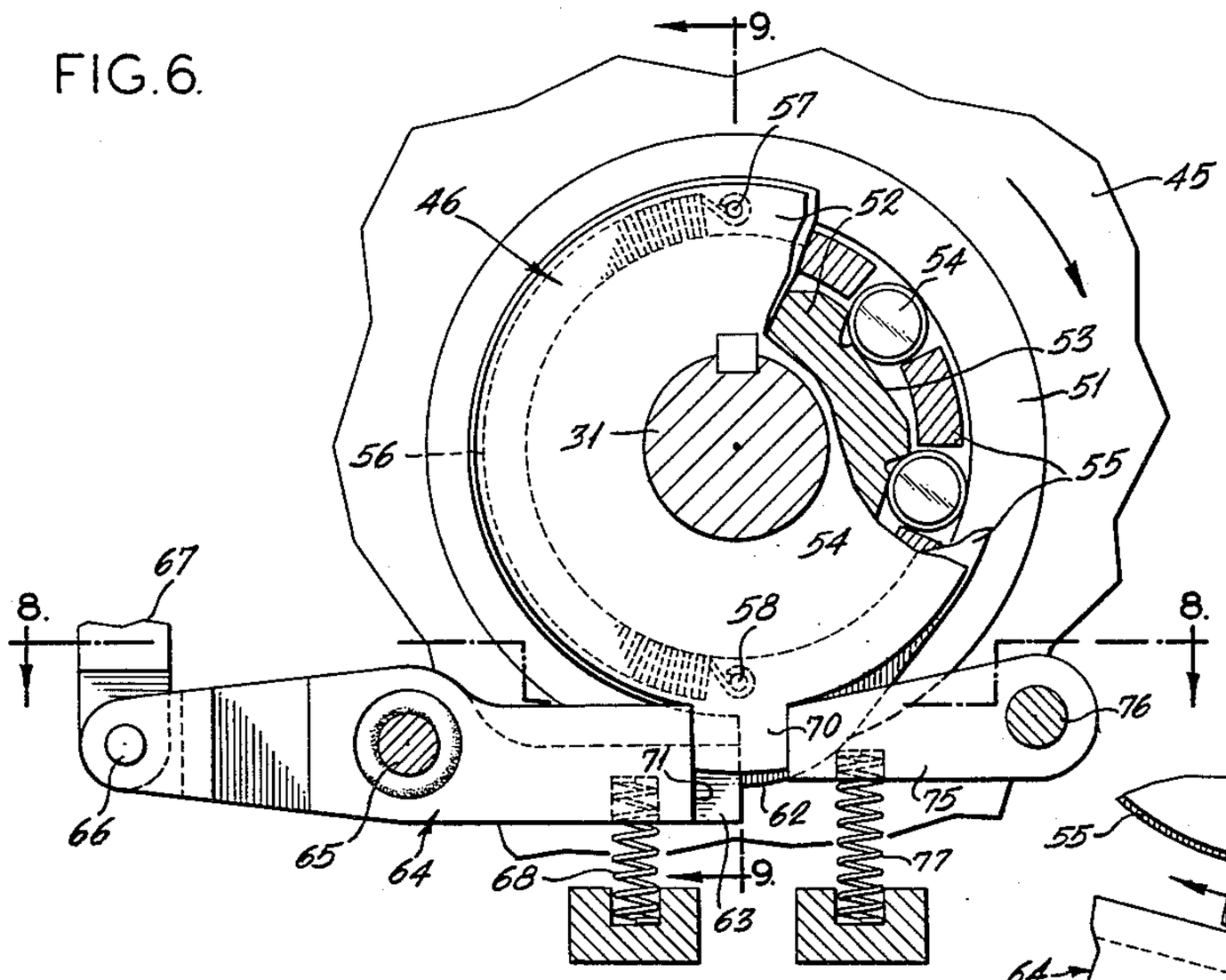


FIG. 7.

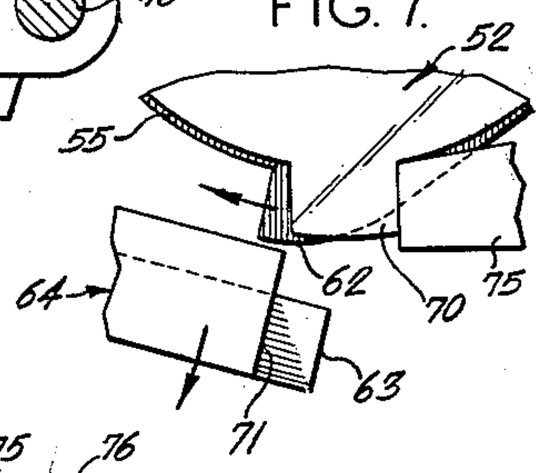


FIG. 8.

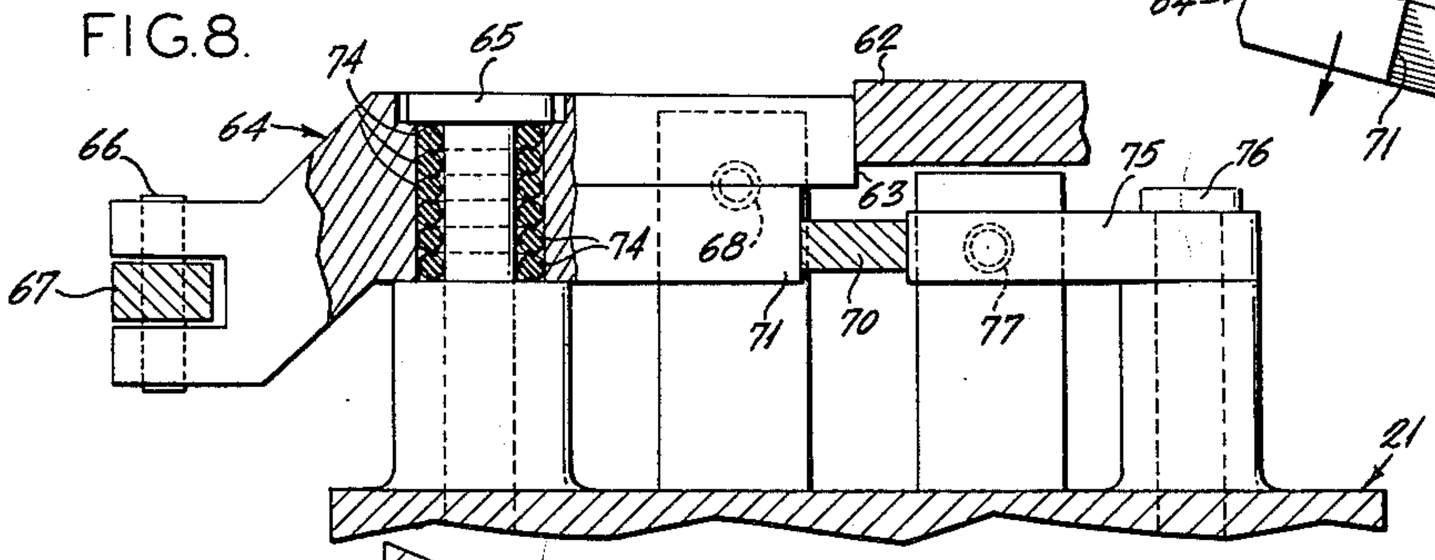
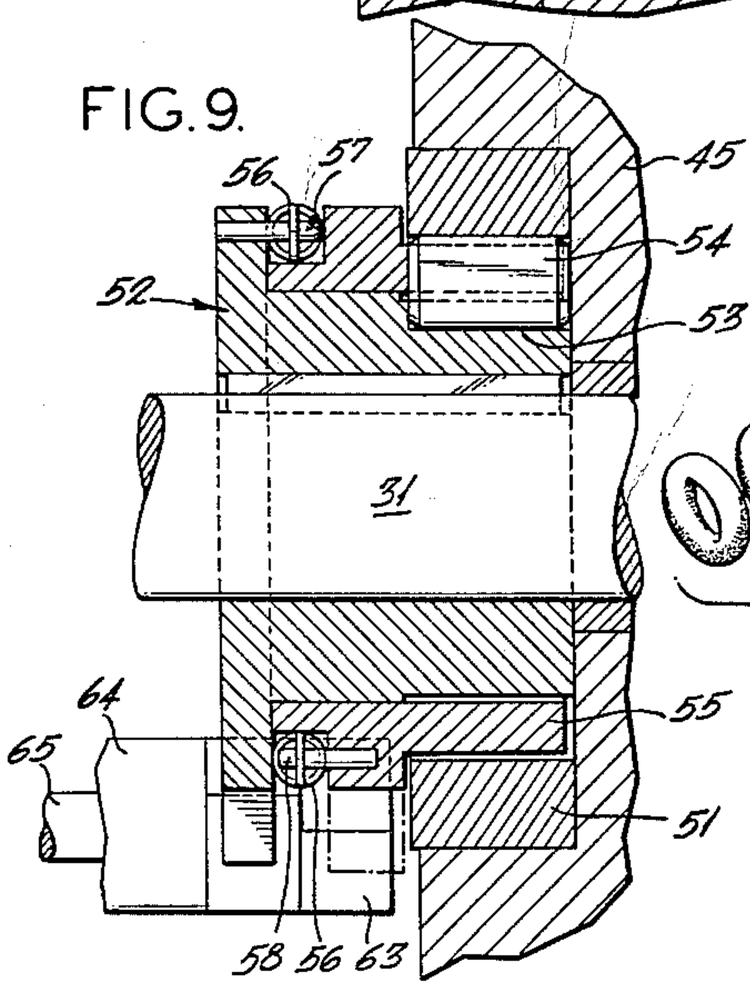


FIG. 9.



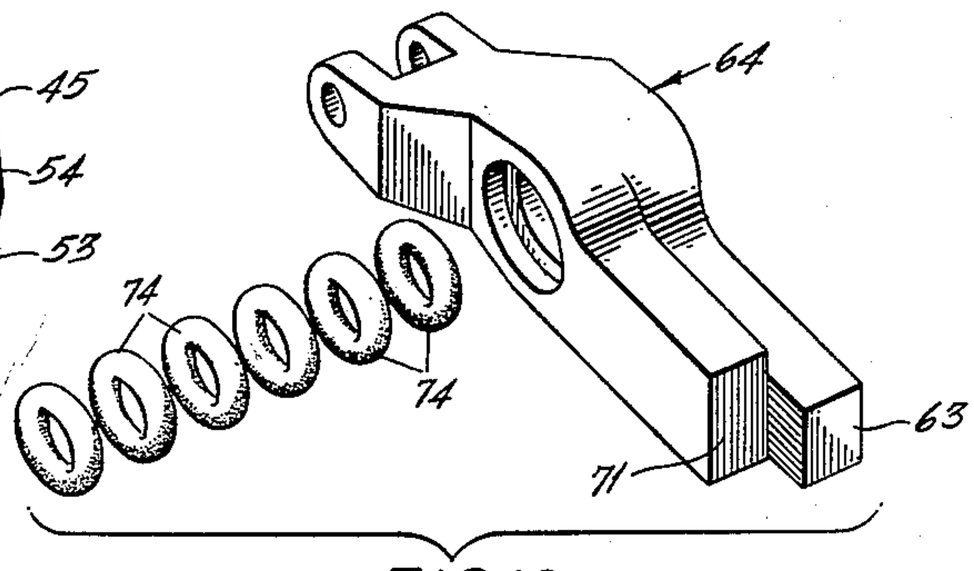


FIG. 10

INVENTOR:
WALTER ELEY

BY

Howson & Howson

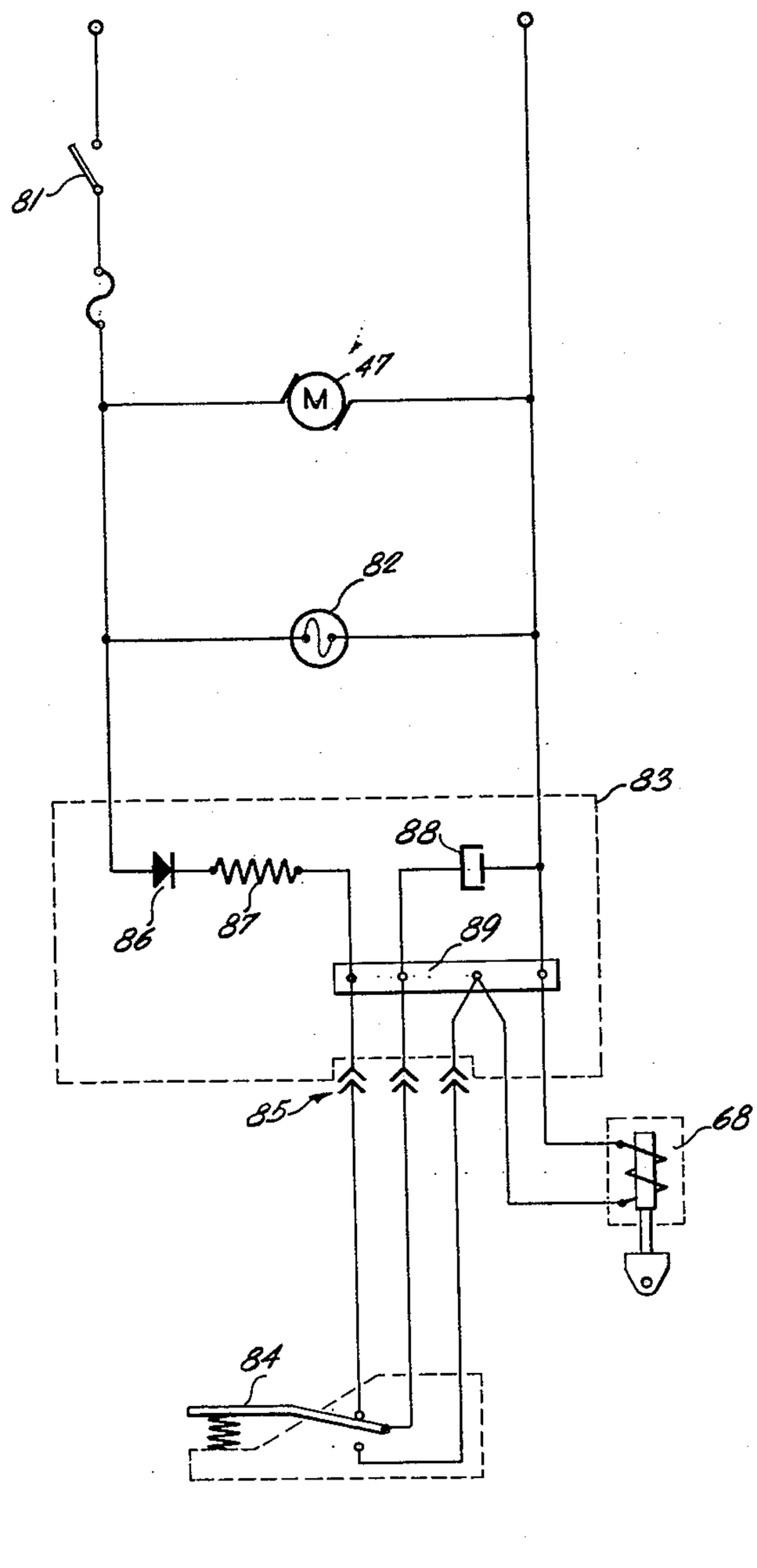
ATTYS.

April 27, 1965 W. ELEY 3,180,121

CLUTCH

Filed Aug. 2, 1961 4 Sheets-Sheet 4

FIG. 11.



INVENTOR:
WALTER ELEY
BY
Howson & Howson
ATTYS.

United States Patent Office

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Patented Apr. 27, 1965

1

3,180,121
CLUTCH

Walter Eley, Hatboro, Pa., assignor to Crockett Machine Products Company, Hatboro, Pa., a corporation of Pennsylvania

Filed Aug. 2, 1961, Ser. No. 128,721
4 Claims. (Cl. 72—2)

The present invention relates to a clutch for apparatus having a driven rotary member, and has particular application to a press which is adapted for punching electrical terminals from sheet metal strips and for crimping such terminals to electrical conductors, and similar operations which require precision work in a rapidly repetitive cycle.

In such presses, the mating punching, and/or crimping dies are mounted with the lower die on the work table or other stationary part of the press and the cooperating upper die on the upper jaw of the press which is displaceable vertically relative to the table. The upper jaw is normally reciprocated by a single revolution clutch which causes it to be displaced downwardly to effect mating of the upper and lower dies and then return to the upper limit position for removal of the punched or crimped element and insertion of a fresh work piece. The removal of the completed work piece and the insertion of the fresh work piece is normally effected manually by the operator of the press and accordingly, it is desirable to insure completion of the single cycle of operation at the point where the upper jaw is at its greatest separation from the lower jaw. Furthermore, it is desirable to provide means for ready adjustment of the stroke to insure proper mating of the die when the jaw is in its lower limit position effecting punching and/or crimping engagement of the respective dies. Because of the manual removal and insertion of the work piece, it is imperative that the press cycle only once upon each actuation thereof so as to insure against injury to the operator.

With the foregoing in mind, the present invention provides an improved clutch for apparatus such as a press which insures single-cycle operation of the press with the interruption precisely at the top of the stroke of the press, when the jaw is at its maximum spacing from the table.

A further object of the present invention is to provide an electrically-controlled clutch for a press having an improved control circuit of simple form which enables rapid cycling of the press under the control of the operator without danger of recycling.

The present invention provides a press which is of simple manufacture but which is fully effective in operation and use.

All of the objects of the present invention are more fully set forth hereinafter with reference to the accompanying drawings, wherein:

FIG. 1 is a view in front elevation of a press made in accordance with the present invention;

FIG. 2 is a view in side elevation of the press shown in FIG. 1;

FIG. 3 is an enlarged sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is an enlarged sectional view taken on line 4—4 of FIG. 3;

FIG. 5 is a fragmentary sectional view similar to FIG. 3 at a reduced scale showing the operation of the adjusting means of the present invention;

FIG. 6 is an enlarged sectional view taken on the line 6—6 of FIG. 2 with portions broken away to illustrate the operation of the single revolution clutch embodied in the appartus of the present invention;

FIG. 7 is a fragmentary view of elements of FIG. 6 showing the operation of the clutch;

FIG. 8 is a transverse sectional view taken on the line 8—8 of FIG. 6;

2

FIG. 9 is a vertical sectional view taken on the line 9—9 of FIG. 6;

FIG. 10 is a detached perspective view showing elements of the clutch shown in FIGS. 6 and 8; and

FIG. 11 is a wiring diagram showing the control circuit for the press of the present invention.

Referring now to the drawings, the press illustrated therein comprises a main support 20 having a work table 21 thereon which mounts a stationary die, in the present instance shown as a block 22. The table 21 serves as the stationary jaw of the press and includes bosses 23 for guiding supporting posts 24 of the upper jaw 25 which mounts an upper die, in the present instance shown as a block 26. The supporting posts 24 of the upper jaw 25 are mounted on a lower frame 27 below the table 21 which includes a cross piece 28. The frame 27 is reciprocated vertically by means of an eccentric 30 mounted on a drive shaft 31 and connected to the cross piece 28 by means of a toggle linkage 32 (see FIG. 3).

In the illustrated press, the toggle linkage 32 is readily adjustable to vary the position of the upper jaw 25 relative to the work table 21. To this end, the linkage 32 includes an upper link 33, a lower strap 34 engaged on the eccentric 30 and a toggle-adjusting arm 35 pivoted to the pivotal connection 36 between the upper link 33 and the strap 34. The arm 35 is anchored to the lower frame 27 by means of a bearing block 37 having an internal socket 38 for receiving a ball member 39 threadably engaged on a threaded shank 41 of the arm 35. The ball member 39 has formed integrally therewith a nut 40 for adjusting the ball on the threaded shank 41 of the arm 35 to thereby adjust the angle between the upper link 33 and the strap 34, and consequently, the distance between the eccentric 30 and the connecting arm 28. A lock nut is provided at 42 to secure the ball 39 in adjusted position on the shank 41. Thus, by adjusting the ball 39 on the shank 41, the clearance between the upper jaw 25 and the table 21 is readily adjusted to accommodate different die members 22 and 26, as required, said adjustment also compensating for wear in the die members, if necessary.

The shaft 31 is driven from a drive pulley 45 through a single-revolution clutch 46 as described more fully hereinafter. The drive pulley 45 is constantly driven from a suitable drive motor 47 by means of belts 48. The single-revolution clutch comprises an outer race ring 51 connected to the drive pully 45 and an inner cam mounted on the shaft 31 and having a series of circularly arranged cam faces 53 confronting the inner surface of the race ring 51. Rollers 54 are disposed between the cam faces 53 and the race ring 51 and are maintained in spaced relation by a cage 55. A coil spring 56 is secured at one end 57 to the cam 52 and at the other end 58 to the cage 55 to normally bias the cage clockwise relative to the cam whereby the rollers are urged into frictional engagement between the cam surfaces 53 and the inner surface of the race ring 51. The cage 55 is provided with a lug 62 operable to engage a stop surface 63 formed integrally with a latch lever 64 which is pivoted to the support 20 by a stud 65 and connected at 66 to the clevis 67 of a solenoid 68. Thus, upon energization of the solenoid 68, the latch lever 64 is rocked clockwise to disengage the stop surface 63 from the lug 62 and permit the spring 56 to displace the cam rollers 54 into engagement between the cam surfaces 53 and the race ring 51 to thereby effect a driving connection between the pully 45 and the shaft 31. The solenoid 68 is de-energized causing the lever 64 to rock to the position shown in FIG. 6 under the action of the spring 68 to thereby engage the lug 62 upon the completion of a single cycle and disconnect the drive from the pulley 45 to the shaft 31.

In accordance with the invention, means is provided to insure arrest of the shaft 31 at the point where the

upper jaw 26 is at its maximum spacing from the table 21. To this end, the cam 52 is provided with a stop finger 70. The latch arm 64 is provided with a second stop surface 71 which normally is in the path of movement of the stop finger 70 to position the shaft 31 at the point where the upper jaw 25 is in its upper limit position. It is noted that the stop surface 71 is trailing with respect to the stop surface 63 and is of greater radial extent than the latter surface. Thus, when the latch lever 64 is rocked clockwise by energization of the solenoid 68, the stop surface 63 clears the lug 62 prior to clearance of the stop surface 71 from the arm 70. This delays the rotation of the cam 52 until the cage 55 is advanced, as shown in FIG. 7, so that the lug 62 is leading with respect to the finger 70. After the latch arm 64 is returned to the position shown in FIG. 6, the leading stop surface 63 effects disengagement of the clutch, but the stop surface 71 permits the cam 52 to continue rotation to thereby insure frictional disengagement of the rollers 54 from between the cam surfaces 53 and the inner surface of the race ring 51. The impart of the lug 62 and the stop finger 70 against the latch lever 64 is cushioned by a plurality of cushioning members, in the present instance, O-rings 74 mounted between the stub shaft 65 and the latch lever 64.

To guard against counterclockwise rotation of the cam 52 upon impact of the finger 70 with the surface 71, a supplementary latch 75 is pivoted to the support as indicated at 76 and biased radially inward of the cam 52 by a spring 77. The latch lever 75 provides a third stop surface which operates to engage behind the stop finger 70 upon engagement thereof with the stop surface 71, thereby effectively containing the stop finger 70 and insuring arrest of the shaft 31 at the point where the upper jaw 25 is at its upper limit position. It is noted that the stop finger arrests the movement of the upper jaw at the upper limit of its travel when its momentum is at a minimum. By this construction, the clutch insures that the upper jaw 25 of the press is retained at its upper limit position at all times except during the cyclic operation of the press.

In accordance with another feature of the invention, a simplified control circuit is provided to insure single and instantaneous operation of the solenoid 68. With reference to FIG. 11, the motor 47 of the press is energized continuously when the main switch 81 is closed. A pilot light is provided at 82 to indicate the energization of the motor 47. A control box 83 is mounted on the machine through which the solenoid 68 is energized selectively under the control of a foot treadle 84 which comprises a doublethrow switch adapted to be plugged into the box as indicated at 85. The control box 83 includes a rectifier 86, in the present instance 500 ma., a resistance 87, in the present instance 50 ohms, a capacitor 88, in the present instance 80 mfd., and a terminal board 89. As shown in FIG. 11, when the foot treadle is in its normal position, the switch of the foot treadle effects a connection placing the rectifier 86, the resistance 87, and the capacitor 88 in series across the line. This charges the capacitor 88 to the line voltage. When the foot treadle is operated, the switch associated therewith disconnects the capacitor 88 from the rectifier 86 and resistance 87 and connects the same across the solenoid 68 whereupon the capacitor discharges through the solenoid and momentarily energizes the same. The discharge of the capacitor is such as to provide sufficient power to displace the solenoid a necessary distance to release the latch arm 64 from the lug 62 and the arm 70. As long as the foot treadle is depressed, the capacitor cannot be recharged and the machine cannot be recycled. When the foot treadle is released, the capacitor 88 is again charged through the rectifier 86 and resistance 87; the value of the resistance is such as to permit almost instantaneous charging thereof. The circuit is therefore in condition for subsequent operation of the solenoid by again operating the foot treadle 84.

When it is desired to interrupt operation of the machine, the foot treadle may be unplugged from the control box 83 and the machine is incapable of being operated. It has been found that upon disconnection of the foot treadle, the charge on the capacitor 88 bleeds off sufficiently rapidly to prevent operation of the solenoid 68 until the capacitor is again recharged to its full potential. In this manner, a simple, but highly effective, control circuit is provided which is fool-proof in operation, but is sufficiently rapid to enable sufficiently rapid recycling of the machine under the control of the foot pedal to keep up with the manual dexterity of the fastest operator of the press.

While a particular embodiment of the present invention has been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims.

I claim:

1. In a press having an upper jaw mounted for vertical reciprocation relative to a work surface, an eccentric for displacing said jaw, and a driving motor for said eccentric, a clutch intermediate said driving motor and eccentric comprising an outer race ring connected to said driving motor, an inner cam having cam faces confronting the inner peripheral surface of said race ring, said cam being connected to said eccentric, rollers disposed between said cam faces and said inner peripheral surface, a cage for displacing said rollers on said cam faces between positions effecting driving connection and disconnection respectively of said race ring and cam, spring means biasing said cage in a direction to effect said driving connections, a lug on said cage, a latch member having a stop surface selectively engageable with said lug to overcome the bias of said spring means to displace said cage in the direction to effect said disconnection, stop means on said cam, a second stop surface on said latch member engageable with the leading surface of said stop means to arrest rotation of said cam at a predetermined point in its cycle, means to displace said latch member between a released portion out of the paths of said lug and said stop means, and a locked position wherein said stop surfaces are in the paths of said lug and said stop means, a second latch mounted for displacement into and out of the path of said stop means and operable in the first-mentioned position to engage the trailing surface of said stop means to limit reverse rotation of said cam from said predetermined point in its cycle, means biasing said second latch into the path of said stop means, said second latch being displaced by said stop means upon passage of the latter past said second latch, and being free to engage behind said stop means upon passage of the latter beyond said second latch, and cushioning means mounting said first latch member for limited displacement relative to said second latch member to resiliently increase the separation between said latch members for reception of said stop means therebetween upon impart of said stop means against said first latch member.

2. In a press according to claim 1, a solenoid for operating said latch member, and a treadle-operated control circuit for selectively energizing said solenoid.

3. In a press according to claim 2, a double-throw switch operated by said treadle, said control circuit including a capacitor connected to be charged through said foot treadle switch in its normal position and discharged through said solenoid and said foot treadle switch in its operating position.

4. In apparatus having a driven rotary member, and drive means for said rotary member, a clutch intermediate said drive means and said rotary member comprising an outer race ring connected to said drive means, an inner cam having cam faces confronting the inner peripheral surface of said race ring, said cam being connected to said rotary member, rollers disposed between said cam faces and said inner peripheral surface, a cage

for displacing said rollers on said cam faces between positions effecting driving connection and disconnection respectively of said race ring and said cam, spring means biasing said cage in a direction to effect said driving connections, a lug on said cage, a stop surface selectively engageable with said lug to overcome the bias of said spring means to displace said cage in the direction to effect said disconnection, stop means on said cam, a second stop surface engageable with the leading surface of said stop means to arrest rotation of said cam at a predetermined point in its cycle, and means to displace said stop surfaces between a released position out of the paths of said lug and stop means, and a locked position wherein said stop surfaces are in the paths of said lug and said stop means, a third stop surface mounted for displacement into and out of the path of said stop means and operable in the first-mentioned position to engage the trailing surface of said stop means to limit reverse rotation of said cam from said predetermined point in its cycle, means biasing said third stop surface into the path

of said stop means, said third stop surface being displaced by said stop means upon passage of the latter past said third stop surface, and being free to engage behind said stop means upon passage of the latter beyond said third stop surface, and cushioning means mounting said second stop surface for limited displacement relative to said third stop surface to resiliently increase the separation between said second and third stop surfaces for reception of said stop means therebetween upon impact of said stop means against said second stop surface.

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CHARLES W. LANHAM, *Primary Examiner.*

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,180,121 April 27, 1965

Walter Eley

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 4, line 41, for "portion" read -- position --;
line 57, for "impart" read -- impact --.

Signed and sealed this 28th day of September 1965.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

EDWARD J. BRENNER
Commissioner of Patents