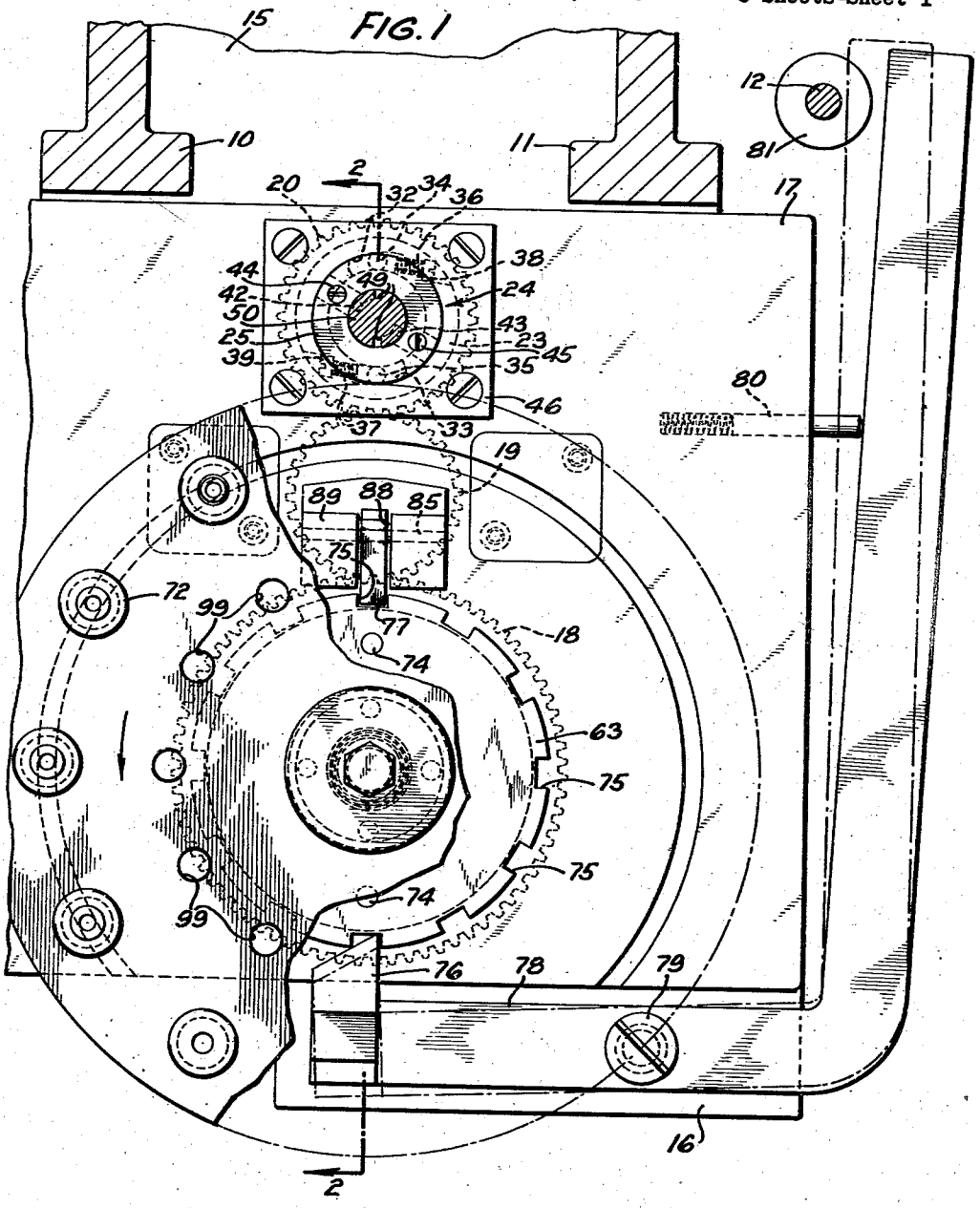
Dec. 11, 1945. A. M. MacPHEAT ET AL 2,390,600

PUNCH PRESS MECHANISM

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FIG. 1



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PUNCH PRESS MECHANISM

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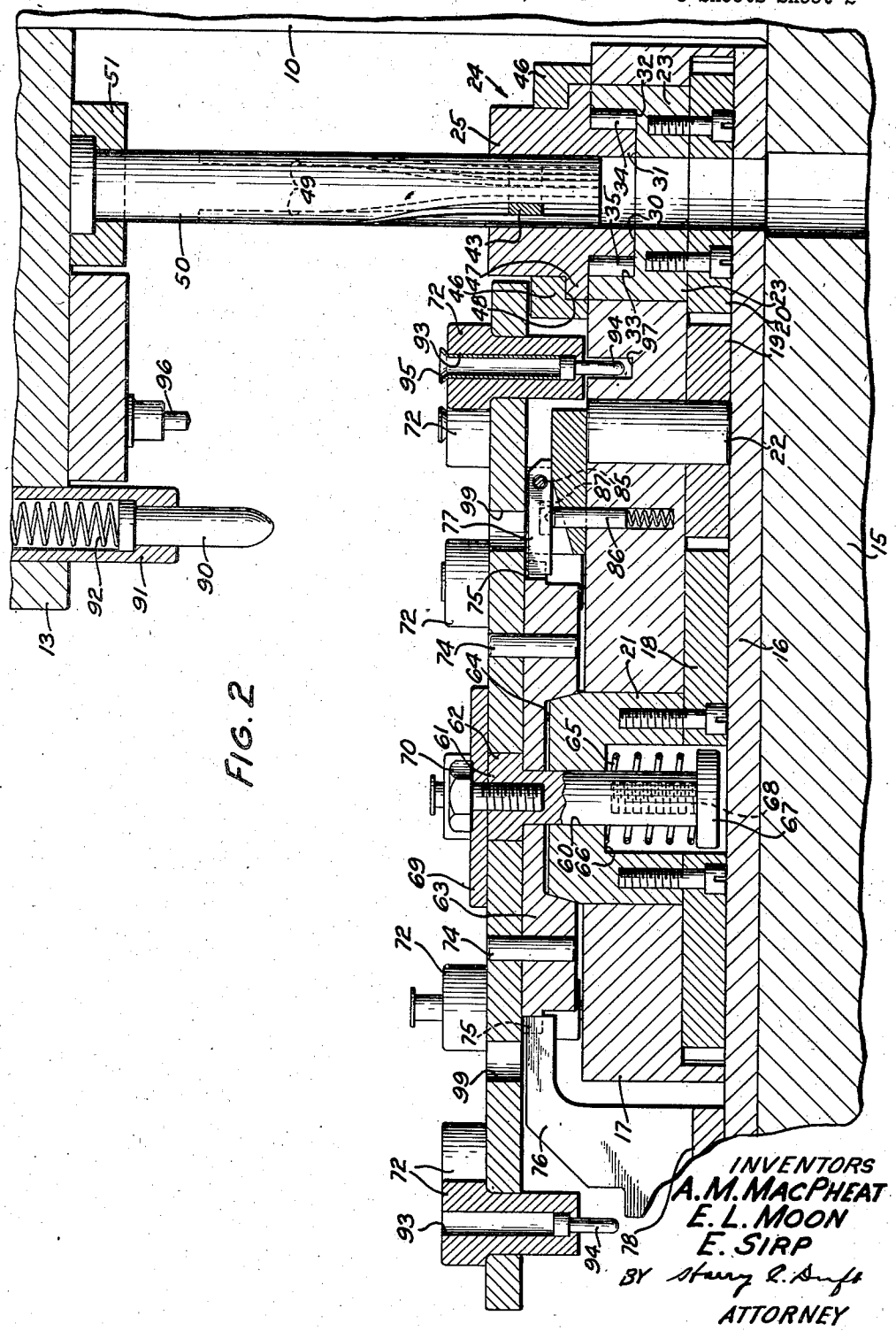


FIG. 2

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PUNCH PRESS MECHANISM

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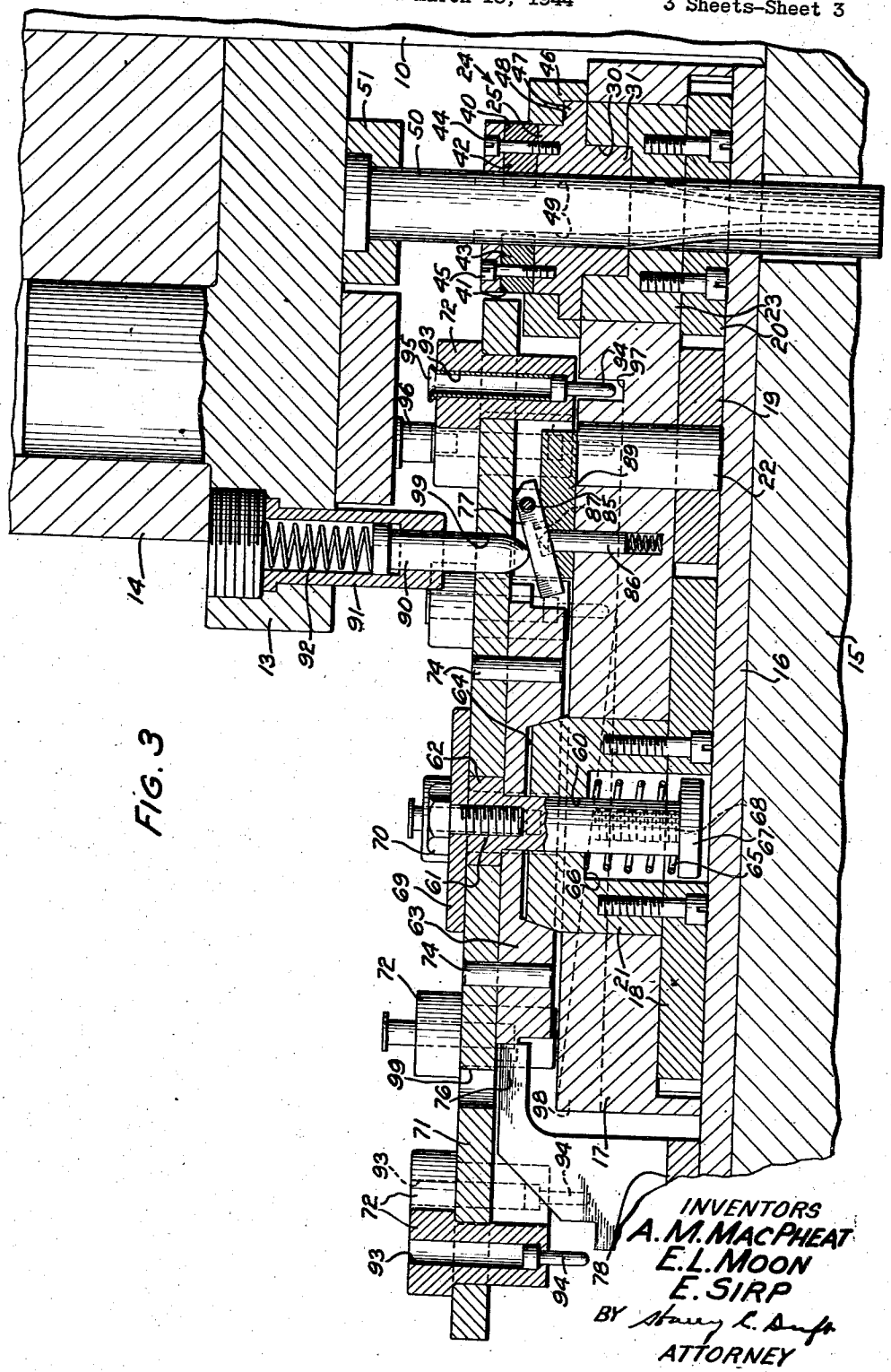


FIG. 3

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PUNCH PRESS MECHANISM

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10 Claims. (Cl. 153—10)

This invention relates to punch press mechanisms and more particularly to a dial feed for use in a punch press.

It is an object of the present invention to provide a simple and efficient dial feed for an article processing apparatus.

In accordance with one embodiment of the invention as applied to a dial feed for a punch press, the ram of the press has a reciprocable cam member fixed to it for imparting rotation to a driving element in opposite directions when the press head is advanced and retracted. The cam member is in the form of a splined shaft having a helical groove or spline formed in it to engage a key on the driving element of a unidirectional driving device, which has its driven element in mesh with an intermedate gear for imparting step by step rotative movement to a dial rotatably mounted on the bed of a punch press. Means are provided for locking the dial in indexed positions to which it is rotated on the upstroke of the press head and an interlock cooperates with a portion of the dial to prevent operation of the punch press unless the dial is in one of its proper indexed positions.

A complete understanding of the invention may be had by reference to the following detailed description when considered in conjunction with the accompanying drawings, wherein

Fig. 1 is a plan section through a punch press looking down at the bed of the press on which an intermittently rotatable dial is mounted, parts being broken away to illustrate more clearly the parts lying beneath them;

Fig. 2 is a vertical sectional view taken substantially along the line 2—2 of Fig. 1 in the direction of the arrows showing the head of the press in its elevated position; and

Fig. 3 is a view similar to Fig. 2 except that it shows the punch press head in its operated position.

Referring to the drawings, wherein like reference characters designate the same parts throughout the several views, particular reference being first had to Fig. 1, wherein the press head standards 10 and 11 of a punch press mechanism are shown in section and wherein the trip rod 12 of the press is also shown in section. It will be understood that the punch press is of the usual type, wherein, by the tripping of the rod 12, the press will go through one complete cycle to advance a press head 13 from the position shown in Fig. 2 to the position shown in Fig. 3 and then to retract it to the position shown in Fig. 2. Any suitable mechanism not shown may be provided for performing this operation. The press head 13, as shown in Fig. 3, is mounted upon and reciprocates with an actuator member 14. The punch press is provided with a base or bed 15, as is usual in such mechanisms, on which there is mounted a bolster plate 16. The bolster plate has suitably secured thereto an irregularly shaped relatively thick plate 17. The plate 17 is cut out on its underside to receive gears 18, 19 and 20, which rest on the upper surface of the bolster plate 16 and are fixed to a driving collar 21, a stud shaft 22, and a sleeve 23, respectively. The sleeve 23 forms the driven element of a unidirectional drive mechanism, designated generally by the numeral 24, which comprises, in addition to the sleeve 23, a driving element or collar 25.

The driven element 23 has a socket 30 formed in it for receiving a tubular extension 31 of the driving collar 25. In addition to receiving the tubular extension 31 of the collar 25, the socket 30 is provided with recesses 32 and 33 of gradually decreasing width for receiving roller bearing members 34 and 35, which are spring pressed toward the reduced portion of the recesses 32 and 33, respectively, by compression springs 36 and 37, as is usual in such devices. The compression springs are held against the roller bearing members by means of set screws 38 and 39 and normally tend to force the roller bearings 34 and 35 into wedging engagement with the narrow end of the recesses 32 and 33 and with the tubular extension 31, whereby, when the driving collar 25 is rotated counterclockwise, as viewed in Fig. 1, the collar 25 and sleeve 23 will be positively locked together and the collar 25 will drive the sleeve 23. When the collar 25 is rotated in a clockwise direction, the roller bearings will roll between the collar 25 and surfaces of the recesses 32 and 33 and, consequently, will not drive the sleeve 23. The collar 25 is provided adjacent its upper surface with a pair of slots 40 and 41, in which keys 42 and 43 may be locked by machine screws 44 and 45, and the collar 25 is held against the upper surface of the plate 17 by a retainer plate 46, the collar 25 being provided with a radially extending shoulder 47, which engages under a cooperating shoulder 48 formed on the retainer plate 46. In this manner, the collar 25 is held in place with respect to the sleeve 23 and will carry the keys 42 and 43 in keyways or splines 49—49 formed helically in a camming rod or shaft 50. The shaft 50 may be fixed in any suitable manner to the press head 13, for example, by means of a retaining plate 51. The rod or shaft 50 is fixed to the press head 13 and is not rotatable with

respect thereto, whereby, when the press head is reciprocated, the rod 50 will be moved up and down and, since the keys 42 and 43 extend into the splines 49 in the rod, the collar 25 will be rotated in opposite directions by the camming action of the rod 50 on the keys 42 and 43. However, the sleeve 23 will, upon reciprocation of the press head 13, be rotated in one direction only due to the unidirectional drive mechanism 24, in its operation, positively connecting the sleeve 23 to the collar 25 only during the rotation of the collar 25 in one direction.

When the sleeve 23 is rotated step by step, it will, through the gears 20, 19 and 18, impart intermittent rotation to the driving collar 21. The driving collar 21 has a central aperture 60 formed in it, which is adapted to receive a post 61 having a head 62. The head 62 of the post 61 rests on the upper surface of a dial plate 63, which has a tapered socket 64 in its lower surface for receiving the upper end of the driving collar 21, which is tapered to fit snugly in the socket 64 and to form a friction connection between the collar 21 and the dial plate 63. The central aperture 60 is enlarged adjacent the lower end of the collar 21 to receive a coil spring 65, which engages a shoulder 66, at the upper end of the enlarged portion of the central aperture 60, and a head member 67. The head member 67 has a threaded shank 68 threaded into the post 61 and the head member 67 is acted upon by the compression spring 65 to tend to draw the post 61 downwardly, thus to frictionally engage the tapered surface of the collar 21 with the tapered surface of the socket 64, whereby these two parts will tend to rotate together, but in case that there is an obstruction to the rotation of the dial plate 63, the collar 21 may turn without breaking any of the parts cooperating with the dial plate. Suitably attached to the upper surface of the dial plate 63, for example, by means of a washer 69 held in place on the post 61 by a machine screw 70, is an article supporting plate 71 carrying a plurality of article holding fixtures 72, which will be described more in detail hereinafter.

The dial plate 63 and article supporting plate 71, in addition to being held together by the washer 69 and machine screw 70, are interconnected by dowel pins 74 so that the two plates will rotate together. Around the periphery of the dial plate 63, there are provided a plurality of notches 75 adapted to register with either a pawl 76 or a latch 77. The pawl 76 is formed on the end of a bell crank lever 78, which, as shown most clearly in Fig. 1, is pivoted on the bolster plate 16 by means of a pivot pin 79 and is normally urged to rock in a clockwise direction by a spring pressed plunger 80 seated in the edge of the plate 17. The pawl 76 is so formed that when the dial plate 63 is rotated counter-clockwise, the pawl will be cammed out of a notch 75 and onto the outer peripheral surface of the plate 63, thus to rock the lever 78 about the pivot pin 79 and carry the rear end of the lever 78 into the path of a collar 81 attached to the trip rod 12, thereby to prevent operation of the trip rod at any time that the dial plate 63 is out of a proper indexed position.

The latch 77 serves to lock the dial plate 63 in one of its proper indexed positions, to which it has been driven by the unidirectional drive mechanism 24, and the latch 77 is operative to effect this latching due to the fact that it is loosely pivoted on a pin 85 and is urged upwardly by a spring-pressed plunger 86 seated in the plate 17 and having its upper pointed end engaging a camming surface 87 on the underside of the latch 77. The latch 77 is free to rock slightly on the pin 85 within the confines of a slot 88 formed in the bracket 89 which supports the pin 85 and which is mounted upon the upper surface of the plate 17 beneath the article supporting plate 71. The camming surface 87 on the latch 77 slopes upwardly from the forward edge of the latch 77, as viewed in Figs. 2 and 3, toward the rear of the latch 77 so that the latch 77 will be cammed forwardly when it is engaged by a spring pressed plunger 90, which is suitably supported in a tube 91 carried by the head 13 and which is urged downwardly by a compression spring 92.

In the operation of the apparatus, the head 13, in moving downwardly, will carry the plunger 90 with it through one of a series of apertures 99 formed in the article supporting plate 71 and into engagement with the latch 77. The latch will thus be pressed downwardly out of the notch 75 in the dial plate 63 and, due to the pressure of the plunger 90 and plunger 86 on the top and bottom thereof, will be cammed forwardly, as viewed in Fig. 3, or to the right, as viewed in Fig. 1, to rock slightly about the pin 85. When the head 13 is retracted, the plunger 90 will be retracted with it and the latch 77 will move upwardly under the influence of the plunger 86. However, since the latch has been cammed slightly out of normal position, its upper surface will engage the lower surface of the peripheral edge of the dial plate 63 and the latch 77 will then be under spring pressure to engage in the next notch 75 when the dial plate 63 is rotated through the unidirectional drive mechanism 24 and connected gearing.

The article supporting plate 71, as pointed out hereinbefore, carries a plurality of article holding fixtures 72, each of which has a shouldered aperture 93 extending through it for carrying headed ejector member 94. The construction of the holding fixture 72 will depend upon the operations being performed by the punch press on blanks 95 carried by the fixtures 72. In the present embodiment of the invention, two operations are performed upon the blanks for each stroke of the punch press by a tool 96 and another tool (not shown), the construction of which is not pertinent to the present invention. The operations performed on the blanks 95 may vary and the shape of the blank may vary without departing from the scope of the present invention wherein the tool 96 is shown flattening a flange formed on the upper end of the blank 95. The lower ends of the ejector members 94 extend into a groove 97 formed in the plate 17 and as the dial plate 63 is rotated, carrying with it the article supporting plate 71, the ejector members 94 will engage a filler block 98 set into the groove 97 and tapering in such a manner that as the article supporting table is rotated, the blanks 95 will be ejected from the apertures 93 by the ejector members 94 due to the engagement of the lower ends of the ejector members with the block 98 as the fixtures 72 are moved in a circular path.

A better understanding of the invention may be had by reference to the following brief description of the mode of operation thereof. The punch press may be controlled by actuating the trip rod 12 and, as pointed out, each time the trip rod 12 is actuated, the punch press will go through one complete cycle to move the press head 13 from the position shown in Fig. 2 to the position shown in Fig. 3 and back to the position

shown in Fig. 2. As the press head 13 moves downwardly, it will carry the camming rod 50 with it and as the camming rod 50 moves downwardly, the keys 42 and 43 engaging in the splines 49 formed in the camming rod 50 will have rotary movement imparted to them to rotate the collar 25 in a clockwise direction. Rotation of the collar 25 clockwise will not result in any motion being transmitted to the sleeve 23 since the bearing members 34 and 35 will not be wedged between the surfaces of the recesses 32 and 33 but will be rolled freely about their own axes. When the press head comes down to its lowermost position, as shown in Fig. 3, the tool 96 and any other tool which may be mounted on the head 13 will operate on the blank 95 and the plunger 90 will engage the latch 77 to force it out of its associated notch 75 in the dial plate 63. Due to the action of the spring-pressed plunger 86 on the camming surface 87, the latch 77 will also be rocked slightly counterclockwise, as viewed in Fig. 1. After the tools have operated on the blanks 95 associated with them, the head 13 will be retracted to its upper position and, in moving to its upper position, the latch 77 will move up against the peripheral edge of the dial plate 63 and will not enter into the notch 75. The edge of the dial plate 63 will hold the latch 77 depressed until the next notch 75 comes into alignment with the latch. Rotation will be imparted to the dial plate 63 on the upstroke of the press head 13 due to the fact that rotation will be imparted by the rod 50 to the collar 25 to cause it to rotate or oscillate counterclockwise back to its original position. When the collar 25 is rotated counterclockwise, the roller bearing members 34 and 36 will be wedged between the surfaces of the recesses 32 and 33 and the outer surface of the extension 31 and, accordingly, the sleeve 23 will be rotated counterclockwise. As the sleeve 23 rotates counterclockwise, it will, through the intermediate gear 19 and gear 18, drive the driving collar 21 counterclockwise to carry the dial plate 63 in a counterclockwise direction. As the dial plate 63 moves counterclockwise, the pawl 76 will be cammed out of its associated notch 75 and will ride on the periphery of the plate 63 until it drops into the next adjacent notch 75 clockwise from the one which had previously engaged with it. Similarly, the latch 77 will be forced into the next notch from the one in which it had previously registered. The press may now be tripped by actuating trip rod 12 and, since the pawl 76 has fallen into a notch 75 on the dial plate 63, the rear end of the lever 78 will be out of the path of the collar 81 and the press may be tripped.

What is claimed is:

1. In a punch press, a reciprocatory press head, a work forming element on said head, an actuator rod fixed to said head for reciprocation therewith, oscillatory means positioned to be oscillated by said rod in opposite directions upon advancement and retraction of said rod, a dial plate driven from said oscillatory means, work holders on said dial plate for alignment with the forming elements upon movement of the dial, and a unidirectional drive mechanism interconnecting said oscillatory means and the dial plate to drive the dial plate in one direction only and to align a work holder with the forming element.

2. In a punch press having a reciprocatory head, an article forming tool on said head, a cam rod fixed to said head, a cam actuated ring encircling said cam rod for rotation thereby, a unidirectional drive mechanism driven by said ring, an indexable table geared to and driven by said drive mechanism, and article holders on said table for positioning an article to be worked upon by said tool each time the table is driven by its drive mechanism.

3. In a punch press having a bed and a reciprocatory head, a unidirectional drive mechanism supported on the bed of the press, including a reversely actuatable driving element and a unidirectionally rotatable element driven thereby, means carried by the press head for rotating the driving element, an article supporting dial rotatably mounted on the bed and driven by said unidirectionally rotatable element, a tool on the press head for operating upon work carried by the dial, and work holders carried by the dial for presenting successive pieces of work held thereby to position to be operated upon by the tool when the dial is driven.

4. In a punch press having a bed and a reciprocatory press head, a splined rod fixed to said head, a collar keyed to said rod for oscillation thereby, a unidirectional drive mechanism driven by said collar upon oscillation thereof, a dial connected to said drive mechanism to be driven thereby upon oscillation of the collar in one direction, work supports on said dial for carrying work to position to be worked upon, and a tool on the press head for engaging and forming said work in said position during oscillation of the collar in the opposite direction to said one direction.

5. In a punch press having a bed and a reciprocatory press head, a splined rod fixed to said head, a collar keyed to said rod for oscillation thereby, means for supporting the collar for oscillation and for preventing reciprocation thereof, a unidirectional drive mechanism driven by said collar upon oscillation thereof, a dial connected to said drive mechanism to be driven thereby upon oscillation of the collar in one direction, work supports on said dial, and a tool on the press head for operating on work on said supports during oscillation of the collar in a direction opposite to said one direction.

6. In a punch press having a reciprocatory press head, a stationary bed and an indexable article supporting dial plate, article supports on said dial plate, a unidirectional drive mechanism for indexing the dial plate, a cam rod on the press head for driving the drive mechanism in opposite directions upon reciprocation of the press head, said driving mechanism being effective to index the dial upon movement of the cam rod and press head upwardly, and a tool on the press head being effective to operate upon an article upon movement of the press head and cam rod downwardly.

7. A dial feed for use in a punch press having a reciprocatory press head and a stationary bed comprising a driving rod having a helical cam slot cut in it and fixed to the press head, an annular member having a camming key extending into said slot for rotation in opposite directions upon reciprocation of the press head, a second annular member mounted coaxially with respect to the first annular member, means operative to connect the second annular member to said first annular member upon rotation of said first member in one direction, an indexable dial connected to the second annular member to be driven thereby, work supports on said dial and movable thereby successively to position work to be op-

erated upon, and a tool on the press head for operating upon work in a work support.

8. A dial feed for use in a punch press having a reciprocatory press head carrying an article working tool, and a stationary bed, comprising a driving rod having a helical cam slot cut in it and fixed to the press head, an annular member having a camming key extending into said slot for rotation in opposite directions upon reciprocation of the press head, a second annular member mounted coaxially with respect to the first annular member, means operative to connect the second annular member to said first annular member upon rotation of said first member in one direction, an indexable dial connected to the second annular member to be driven thereby, article supports carried by said dial to operative association with said article working tool, means for locking said dial in a plurality of indexed positions, in each of which positions an article in a support is operatively associated with the tool, and means actuated by the press head for releasing said locking means.

9. A dial feed for use in a punch press having a reciprocatory press head, a tool mounted on said head, and a stationary bed comprising a driving rod having a helical cam slot cut in it and fixed to the press head, an annular member having a camming key extending into said slot for rotation in opposite directions upon reciprocation of the press head, a second annular member mounted coaxially with respect to the first annular member for driving connection with the first annular member on movement of the press head away from the bed, means operative to connect the second annular member to said first annular member upon rotation of said first member in one direction by the driving rod when the press head moves away from the bed, an indexable dial connected to the second annular member to be driven thereby, and a plurality of article supports carried by said dial successively to a position in operative association with said tool.

10. In a punch press having a reciprocatory press head, an article working tool on said press head, a stationary bed and an indexable article supporting dial plate, a plurality of work supports carried by said dial plate to position beneath said tool when the dial plate is indexed, a unidirectional drive mechanism for indexing the dial plate, a cam rod on the press head for driving the drive mechanism in opposite directions upon reciprocation of the press head, and means connected to the dial plate for preventing the operation of the press when the dial plate is not in a proper indexed position.

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