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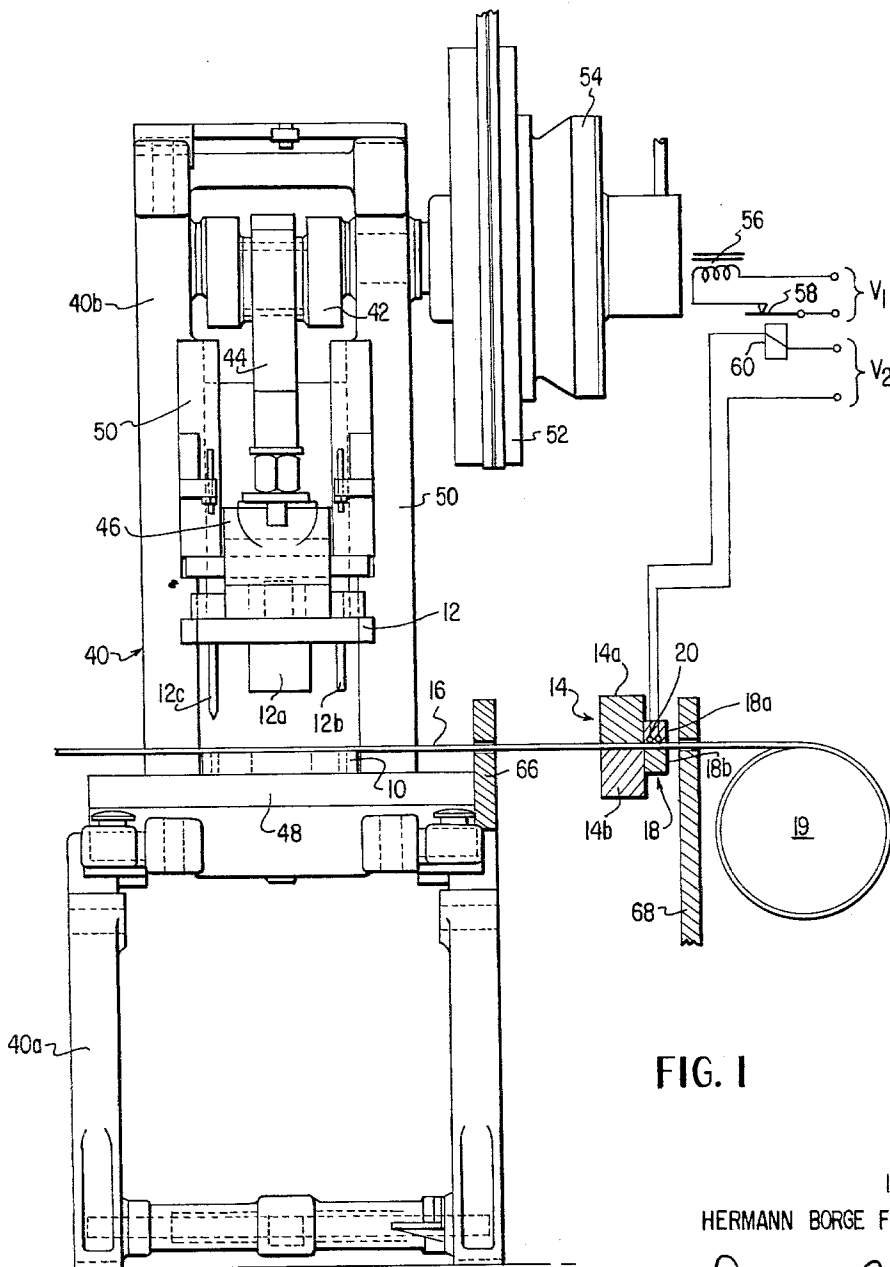
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3,229,556

FEED CONTROL FOR MECHANICAL PRESSES

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

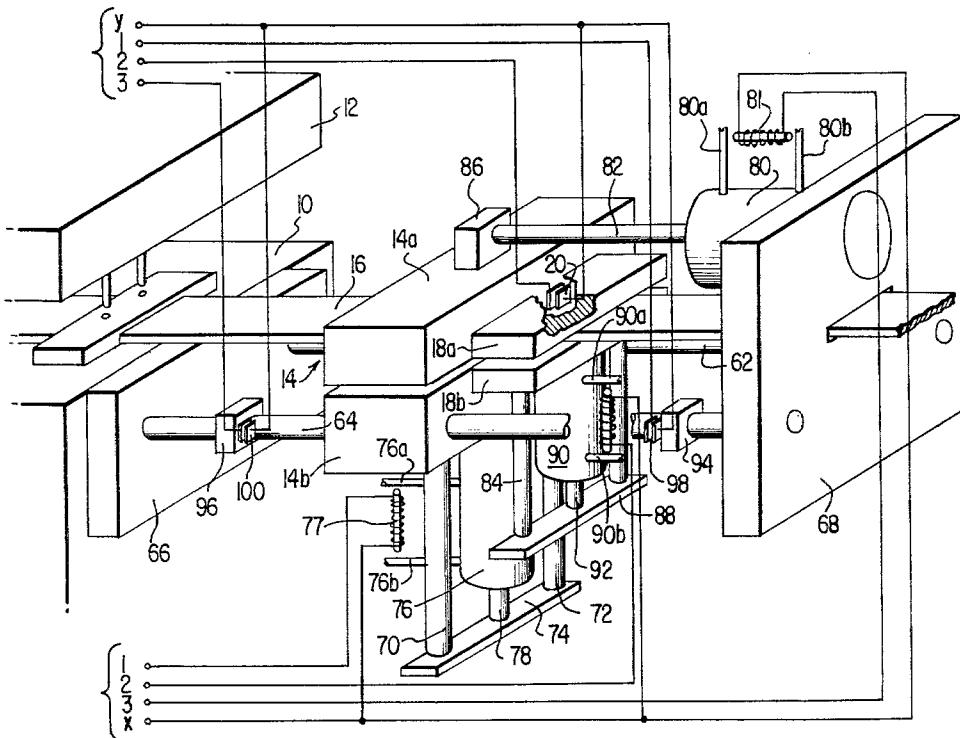
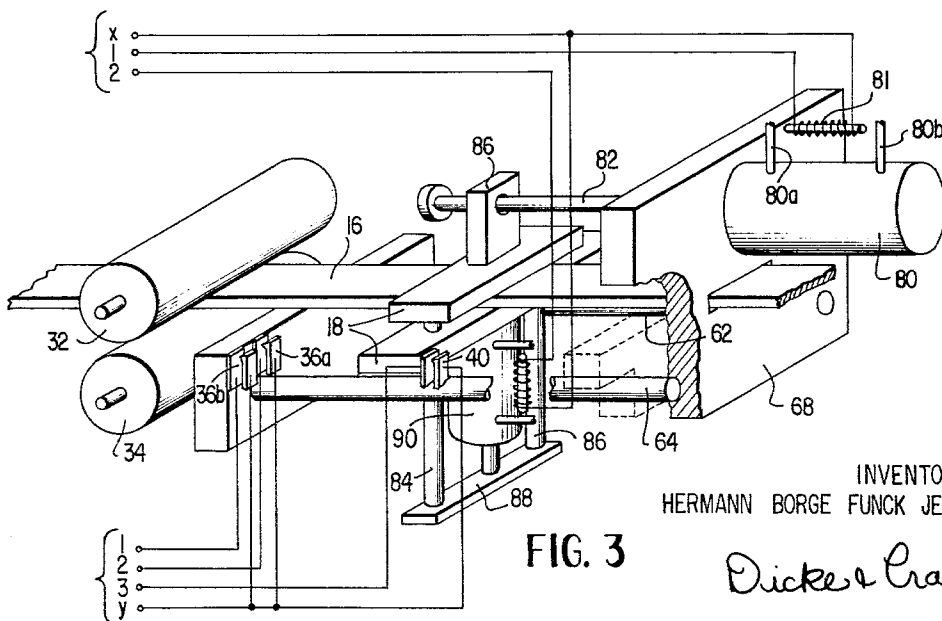


FIG. 2



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FIG. 3

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FEED CONTROL FOR MECHANICAL PRESSES

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20,205/59

20 Claims. (Cl. 83—66)

This invention relates to mechanical presses and similar machines. In mechanical presses such as punch presses a die set or other devices mounted on the bed plate and ram of the press may be operated in punching, drawing and other forming operations.

The invention more specifically relates to feeding means for forwarding a strip material in position relative to a die set or tool mounted in a press of the type referred to.

It is the main purpose of the invention to provide feeder means for moving strip material through a stroke in position relative to the tools of a press which enables sensing of a difference between a predetermined length of said stroke and the stroke as actually carried out.

It is a further purpose of the invention to provide indexing means for the forward stroke of strip material to be used as a work piece in a press of the type referred to here above for producing articles therefrom in which said indexing means is rendered operable if the length of the forwarding stroke is not as predetermined.

It is a further purpose of the invention to provide a combination of a press as here above mentioned and sensing or indexing means as mentioned in which said sensing means or indexing means can be used to control the power drive of said press and stop the press in response to a difference between the stroke through which the strip material is forwarded and a predetermined length of said stroke.

Further objects and advantages of the invention will appear from the following description.

The invention will in the following be described with reference to the accompanying drawing, in which:

FIGURE 1 is a front elevation of the press showing schematically an arrangement according to the invention,

FIGURE 2 is a perspective schematic view of a feeding arrangement according to the invention having a gripper feed mechanism, and

FIGURE 3 is a corresponding perspective schematic view of an arrangement having a roller feed mechanism.

The press shown in the front elevation of FIGURE 1 is of the type generally referred to as a flywheel type punch press.

Such presses as well as control systems therefor are generally known to those skilled in the art and the structure of the press itself in the control system will therefore only be described in such brief terms as necessary to explain the present invention and its mode of operation.

The press has a stationary frame generally referred to by 40 comprising a lower part 40a and a top part 40b. A crank shaft 42 is journaled in the top part 40b of the frame and a pitman rod 44 is attached in the usual manner to the crank pin of the crank shaft 42. The lower end of the pitman rod 44 is attached in the usual manner to a head or ram 46 slidably guided for reciprocation towards and away from a press bed 48 by means of a pair of guides 50.

A flywheel 52 is journaled on the crank shaft 42 and adjacent the flywheel a suitable clutch and brake arrangement 54 is arranged.

The clutch and brake arrangement will not be described in any detail and is commonly known to those skilled in the art in a plurality of variations. Such

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clutch and brake arrangement includes a shiftable clutch element mounted for movement axially on the crank shaft 42 to alternatively engage the flywheel to establish driving connection between the flywheel and the crank shaft 42 and to engage a stationary brake for positively halting the crank shaft. The shifting of the clutch element may within the scope of the invention be effected pneumatically or hydraulically or directly by electroresponsive means such as for example a solenoid.

The embodiment of the present invention to be disclosed in more detail in the following illustrates by way of example the principle of the invention using electrical control and it is therefore in the following supposed that the clutch and brake mechanism included in the member 54 is controlled by means of a solenoid 56. In the case of hydraulic or pneumatic control of the clutch and brake mechanism the solenoid 56 may be a solenoid operating a solenoid valve regulating the flow of pressure medium to the clutch.

The flywheel 52 is driven from a suitable power source such as an electrical motor, not shown, and the flywheel with appertaining clutch and brake mechanism defines a power transmission system in which the clutch mechanism is alternatively operable to operatively connect the crank shaft 42 with the flywheel for reciprocating the ram 46 or braking the rotation of the crank shaft 42 for positively halting the reciprocation of the ram 46.

Most power presses of the type briefly described in the foregoing and available in the market are provided with such friction clutches and similar devices. The majority of such known presses are also provided with a control mechanism for obtaining selectively single stop operation or continuously running operation.

The present invention is particularly concerned with such presses capable of operating continuously to produce articles by punching and/or drawing or other forming operations from a strip or band 16 by means of a die or tool set mounted on the bed 48 and the ram 46.

A suitable tool set is schematically illustrated in FIGURE 1 and comprises a matrix 12 mounted on the ram 46 and a matrix 10 mounted on the bed 48.

A typical tool has as indicated a primary cutting member 12a operable to stamp out the article in question, one or more auxiliary punches 12b operable to punch holes in the strip adjacent the orbit of the article to be punched out from the strip and one or more guiding pins 12c extending below the underside of the punches 12a and 12b and operable to project down through the holes punched by the punching pins 12b to correctly position the strip 16 relatively to the punches during the operation of the tool.

If, for some reason, an automatic forwarding mechanism moving the strip 16 intermittently forward to its position under the tool fails to operate correctly resulting in a stroke of the strip of a length different from the predetermined stroke as governed by the mutual position of the punch pins and the feeler pins of the tool, the feeler pins of the tool will not engage correctly in the holes punched by the punch pins and the result may be breakage of the feeler pins. This is probably one of the most common sources of disturbances in the operation of presses of this type. In the best case the feeler pins fall down which, however, requires demounting of the upper part of the tool from the press for the purpose of mounting new feeler pins and remounting of the tool. In many cases however, the feeler pins are passing through the tool and causing damage of the edge of the tool with the result that grinding of the tool is necessary.

In both cases the machine is out of operation until the tool has been repaired and if it is necessary to grind

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the tool this also means that the lifetime of the tool has been cut down.

The invention provides a safeguarding against a stroke of the material strip different from that as foreseen by the automatic feeder mechanism.

In the front view shown in FIGURE 1 the feeder mechanism comprises a device 14 including a pair of members 14a and 14b operable to be clamped on the strip 16 from each side thereof and means, not shown, in FIGURE 1 are supposed to move the clamping device through a stroke to forward the strip a predetermined stroke the length of which is governed by the design of the tool.

According to the invention I provide follower means generally referred to by 18 operable to be connected with the strip 16 and to participate in the forwarding stroke of the strip. A further important feature of the invention is indexing or sensing means which also may be referred to as differential means operable to ascertain any difference in the stroke made by the follower means 18 and the predetermined stroke of the strip as governed by the design of the tool.

The invention further provides means operable in response to actuation of said differential or sensing means for operating the clutch-and-brake mechanism 54 to disengage the clutch and render it ineffective to drive the ram and render the brake effective to stop or positively halt the reciprocation of the ram.

As mentioned hereinbefore an electrical control of the clutch is supposed in the embodiment illustrated in the drawing. As more specifically illustrated in FIGURE 1 the control solenoid 56 which in response to energization is supposed to shift the clutch to render it operable to drive the crank shaft 42 is included in a circuit with a voltage source V_1 in series with a relay contact 58 which is closed to energize the solenoid 56 and respond to energization of a relay winding 60. The relay winding 60 is included in a second circuit with a voltage source V_2 in series with a switch 20 which forms the sensing or differential means and is caused to be opened in response to a difference in stroke as aforementioned.

In the embodiment illustrated in FIGURE 1 the strip 16 is supposed to be forwarded from a strip supply in the form of a strip coil 19 forming a magazine for the work-piece strip and the primary feeding device 14 is supposed to be in the form of a pair of clamps 14a and 14b forming a primary gripper to be clamped on the strip by suitable means. When clamped the clamping members 14a and 14b are by other suitable means reciprocated to feed the strip forward through its desired stroke. It will be understood that the clamping and forward stroke is timed with the reciprocation of the press ram 46 by other suitable electrical or mechanical control means. Such feeding mechanism with automatic actuated gripper means timed with the movement of the press ram are also commonly known as accessories to power presses, for example as manufactured by Weingarten or Schuler in Germany, and a suitable feeding mechanism can easily be selected by those skilled in the art planning production of articles to be manufactured on a press as described.

In the specific embodiment shown my invention provides in addition to the primary feeders a pair of auxiliary clamps 18a and 18b which in the embodiment shown in FIGURE 1 are arranged in such close proximity to the primary clamps that a switch which may be a microswitch, for example of the Honeywell type which is embedded in a cavity, for example of one of the auxiliary clamps is retained closed as long as the auxiliary clamping members participate in the stroke of the strip 16 in close proximity with the primary clamping members 14.

If, for some reason, e.g. due to wear of the primary feeder, a greasy surface of the strip 16 or any other reason the primary feeders are making their forward reciprocation with a slip relative to the band or strip 16 which would result in a decreased length of the predetermined stroke of the strip this causes the primary clamping mem-

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bers 14a and 14b also to slip relative to the secondary clamping members 18a and 18b which results in a space between the primary clamping members and the secondary clamping members whereby the switch 20 is opened.

This results in de-energization of the relay winding 60 and thereby opening of the relay contact 58 which again de-energizes the solenoid 56 which in its turn controls the operative driving position of the clutch 54. Accordingly the clutch 54 is shifted and the crank shaft 42 positively halted with the result that the downward reciprocation of the ram head 46 is prevented so that a safeguard against damage to the tool is obtained.

A somewhat more specific, though still schematic, arrangement of the parts of the feeder mechanism including actuating means for the clamping members is shown in FIGURE 2, in which the parts already described in the foregoing with reference to FIGURE 1 are designated by the same reference numerals as in FIGURE 1 with the exception of the primary clamping members of which the outer one is referred to by 14a and the lower one by 14b.

In FIGURE 2 the lower clamping member 14b is mounted for reciprocation on a pair of guides 62 and 64 which extend between a member 66 secured to the press frame, and a member 68 spaced therefrom. The outer clamping member 14a is movable in vertical direction and has a pair of guide pins 70 and 72 extending downwardly through guiding holes in the lower clamping member 14b.

The guide pins 70 and 72 are at their lower ends connected by means of a cross bar 74. A pneumatic or hydraulic cylinder 76 having a piston movable therein is secured to the underside of the lower clamping member 14b and has an extending piston rod 78 the lower end of which operatively engages the cross bar 74.

Another hydraulic or pneumatic cylinder 80 having a piston movable therein is secured on the plate or member 68 and has an extending piston rod 82 the end of which is in connection with a member 86 extending above the surface of the upper clamping member 14a.

The auxiliary clamping members 18a and 18b are loosely mounted on the strip 16. A pair of guide pins 84 and 86 are secured to the upper auxiliary clamping member 18a and extend downward through holes in the lower clamping member 18b. The lower ends of the guide pins 84 and 86 are connected by means of a cross bar 88. A small hydraulic or pneumatic cylinder 90 is secured to the underside of the lower auxiliary clamping member 18b and has a downwardly extending piston rod 92 to operatively engage the cross bar 88.

The actuation of the cylinder 76 is caused by supply of pressure medium such as air or pressure fluid through supply pipes 76a and 76b and in similar manner pressure medium is supplied to the cylinder 80 through pipes 80a and 80b as well as to the cylinder 90 through pipes 90a and 90b. In each of the pipes valves, not shown, to be opened and closed by energization of solenoids 77, 81 and 91 respectively are provided as disclosed in my copending U.S. application Ser. Nos. 689,620, filed Oct. 11, 1957, now abandoned, and 24,063, filed Apr. 22, 1960.

On the guide 64 an adjustable stop 94 including a sensing switch 98 is arranged to limit the reciprocation of the feeding mechanism in one direction and for limiting the reciprocation in the other direction a stop 96 including a sensing switch 100 is supported on the guide 64.

The solenoids for the cylinder control valves are as shown includes in a group O of electrical circuits having a common lead x and the sensing switches 20, 98 and 100 are included in a second group of circuits S having a common lead y in the manner more fully disclosed in my copending application Ser. No. 689,620 which is hereby made part of the disclosure of the present application.

It is further within the scope of the invention supposed that the desired sequential operation of the parts is effected by plug-in control as also described in my application here mentioned. Also the other copending application Ser.

No. 24,063, filed Apr. 22, 1960, is hereby made part of the disclosure of the present application.

A detailed explanation of the control unit, the stepping switch arrangement used therein and the manner in which the automatic control of the machinery can be planned is not given here insofar as the two copending applications before referred to are effective to teach those skilled in the art all details in this respect.

The mode of operation of the arrangement described here above is substantially as follows:

In the position of rest the primary transport clamps or main grippers 14a and 14b are in the right hand position in engagement with the stop 94 whereby the switch 98 is actuated. The movement to this position is a result of the return stroke of the piston rod 82. Both cylinders 76 and 90 are not actuated, i.e. the primary clamping members 14a and 14b as well as the secondary clamping members 18a and 18b are not clamped on the strip. Due to the return stroke the secondary clamping members 18a and 18b have followed the stroke in right hand direction and the secondary clamping device is in close proximity to the primary clamping device with the switch 20 closed.

The press ram 46 is on the way up after having punched out an article and punched die holes by means of the punch pins 12b.

In response to some suitable sensing device, for example a sensing switch actuated at a certain point of the upward stroke of the ram 46 the control actuates the solenoid 77 and 91 to cause the cylinders 76 and 90 to clamp the primary as well as the secondary clamping members in engagement with the strip. Suitable sensing switches, not shown, may be actuated in response to said clamping and thereby give a signal back to the control causing the solenoid 81 to be actuated to reciprocate the piston pin 82 in left hand direction and thereby forward the strip 16 through the predetermined stroke governed by the tool, i.e. the mutual location of the punch pins 12b and the feeler pins 12c of the tool. This stroke is also governed by the location of the abutment 96. The forward feed of the stroke is so timed with the movement of the ram that the strip is forwarded to the desired position not substantially later than when the ram starts its downward stroke. By way of example it is possible within the scope of the cathode arrangement disclosed in my copending applications referred to here above to adjust the control for normal single stroke operation of the press with stop in the top position and to let actuation of the switch 100 overrule the stop in said top position and give a signal to the control which causes the press to continue its downward stroke. The switch 100 also senses the end of the stroke of the primary clamping device 14a, 14b and gives a signal to the control causing de-energization of the solenoids controlling the valves 76 and 90 so as to loosen the clamping of the primary as well as the secondary clamping device as well as to reverse the movement of the piston in the cylinder 80 to reciprocate the clamping device to the right hand position.

As long as the secondary clamping device 18a, 18b participates in the stroke, i.e. in the embodiment shown operates as a follower in close proximity with the primary clamping device 14a, 14b the sensing switch 20 remains closed and the relay winding 60 remains energized resulting in energization of the solenoid 56. This again results as already explained hereabove in retaining of the clutch in operative position to drive the crank shaft 42 from the flywheel 52.

If for some reason the clamping device 14a, 14b slips relatively to the strip during its left hand forwarding stroke a gap is formed between the primary clamping device and the auxiliary clamping device or follower resulting in opening of the switch 20 and thereby de-energization of the relay 60 resulting in opening of the relay contact 58. This de-energizes the solenoid 56 and results in actuation of the clutch 54 to render it ineffective to drive the crank shaft 42. This renders the brake in-

cluded in the clutch device effective to halt the crank shaft 42 and prevent the downward reciprocation of the press ram 46.

FIGURE 3 schematically illustrates a modified embodiment of the structure shown in FIGURE 2. According to FIGURE 3 a roller feed comprising a pair of rollers 32 and 34 is provided instead of a gripper mechanism as shown in FIGURE 2 and the auxiliary gripper in FIGURE 3 is clamped on the strip to make a stroke together with the strip. Furthermore gauge means are provided to ascertain that the stroke has the desired length.

Also a roller feed for mechanical presses is a commonly known accessory and no detailed reference will be made to such roller feed.

In FIGURE 3 the forward stroke of the strip is controlled by the rotation of the two rollers 32 and 34. The roller feed may be mechanically actuated from the main shaft of the press. A sensing switch, not shown, is actuated concurrently with the operation of the roller feed and controls actuation of the cylinder 90 pressing the auxiliary grippers 18 and 18a on the strip 16. The auxiliary gripper hereby as hereinbefore described operates as a follower which participates in the stroke of the strip 16. When the follower has completed its forward stroke it actuates a sensing device generally referred to by 36. In the embodiment shown in FIGURE 3 the sensing device comprises a pair of sensing switches 36a and 36b which may be so designed that one switch is closed when the other is opened. The one switch may for example de-energize the cylinder which clamps the auxiliary gripper on the strip while the other switch may give a signal to the press that the downward movement of the ram may continue. One of the switches may also give a signal to the control to cause a cylinder 80 to be energized and retract the auxiliary gripper to its initial position in which a switch 40 is actuated and senses the right hand position of the auxiliary gripper. The switch 40 may give a signal to the control to cause de-energization of the cylinders 80 and if desired also actuation of the cylinder 90 clamping the auxiliary gripper on the strip.

It will be appreciated that also at the right hand end of the stroke of the auxiliary gripper in FIGURE 3 a double switch can be provided.

It will further be understood that though the invention has been described in great detail with reference to the examples to illustrate the principle of the invention and its mode of operation various modifications will be possible within the scope of the invention.

I claim:

1. In a press having a bed and a reciprocable ram for receiving relatively movable parts of a tool operable to produce articles from strip material: a frame supporting said bed, a shaft mounted for rotation, means operable to reciprocate said ram in response to rotation of said shaft, a power driven flywheel, a brake, means for normally holding said brake stationary in said frame, clutch means for operatively connecting said shaft to said flywheel, means operable to feed said strip material to said tool by forwarding said strip material through a stroke of a predetermined length, follower means, means independent of said feed means for connecting said follower means with said strip to participate in the forwarding stroke thereof, differential means operable in response to a difference between the stroke of said follower means and said predetermined stroke of said strip material, and means controlled by said differential means for rendering said clutch means ineffective to drive said shaft in response to such difference and render said brake means effective to hold said rotatable shaft stationary and thereby stop reciprocation of said ram.

2. In a press having a bed and a reciprocable ram for receiving relatively movable parts of a tool operable to produce articles from strip material: a frame supporting said bed, a shaft mounted for rotation, means operable to reciprocate said ram in response to rotation of said shaft,

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a power driven flywheel, a brake, means for normally holding said brake stationary in said frame, clutch means for operatively connecting said shaft to said flywheel, a pair of clamping members operable to feed said strip material to said tool by forwarding said strip material through a stroke of a predetermined length, a pair of auxiliary clamping members, means for connecting said auxiliary clamping members with said strip to participate in the forwarding stroke thereof, differential means operable in response to a difference between the stroke of said auxiliary clamping members and said predetermined stroke of said strip-material, and means controlled by said differential means for rendering said clutch means ineffective to drive said shaft in response to such difference and render said brake means effective to hold said rotatable shaft stationary and thereby stop reciprocation of said ram.

3. In a press having a bed and a reciprocable ram for receiving relatively movable parts of a tool operable to produce articles from strip material: a frame supporting said bed, a shaft mounted for rotation, means operable to reciprocate said ram in response to rotation of said shaft, a power driven flywheel, a brake, means for normally holding said brake stationary in said frame, clutch means for operatively connecting said shaft to said flywheel, a pair of main grippers, means operable to engage said grippers with said strip material, means operable to reciprocate said main grippers to forward said strip material through a stroke of a predetermined length, a pair of auxiliary grippers, means for connecting said auxiliary grippers with said strip in a predetermined mutual position relatively to said main grippers so as to cause said auxiliary grippers to participate in the forwarding stroke of said strip, differential means operable in response to change of mutual position between said main grippers and said auxiliary grippers, and means controlled by said differential means for rendering said clutch means ineffective to drive said shaft and render said brake means effective to hold said rotatable shaft stationary and thereby stop reciprocation of said ram.

4. In a press having a bed and a reciprocable ram for receiving relatively movable parts of a tool operable to produce articles from strip material: a frame supporting said bed, a shaft mounted for rotation, means operable to reciprocate said ram in response to rotation of said shaft, a power driven flywheel, a brake, means for normally holding said brake stationary in said frame, clutch means for operatively connecting said shaft to said flywheel electrical control means operable to selectively engage said clutch to drive said ram and to disengage said clutch and render said brake operable to halt said shaft, primary feeder means operable to forward said strip material to said tool through a stroke of a predetermined length, follower means independent of said primary feeder means operable to travel with said strip during the forwarding stroke thereof, electrical sensing means operable to be actuated in response to a difference between the stroke of said follower means and said predetermined stroke of said strip material, said electrical sensing means being included in a circuit arrangement with said electrical control means and operable to render said clutch means ineffective to drive said shaft and render said brake means effective to hold said rotatable shaft stationary and thereby stop reciprocation of said ram in response to actuation of said electrical sensing means.

5. In a power press having a relatively stationary tool bed and a ram member for a tool counter part mounted for reciprocation: a control system for reciprocating said ram including an engageable and disengageable clutch, feeding means for intermittently forwarding strip workpiece material to a predetermined position relatively to said tool, follower means independent of said feeding means operable to be connected with said strip material for intermittent forward movement together therewith to a predetermined position, means for gauging a difference

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between said predetermined forwarded position of said strip work-piece and said forwarded position of said follower means and means operable in response to such difference to disengage said clutch.

6. In a power press having a relatively stationary tool bed and a ram member for a tool counter part mounted for reciprocation: a control system for reciprocating said ram including an engageable and disengageable clutch, a pair of primary feeding grippers operable to forward strip workpiece material to a predetermined position relatively to said tool, follower means operable to be connected and travel with said strip material in predetermined trailing disposition relatively to said primary grippers, means for sensing a change of mutual position between said primary grippers and said follower means during the forward movement of said strip and means operable in response to such change of position to disengage said clutch.

7. In a power press having a relatively stationary tool bed and a ram member for a tool counter part mounted for reciprocation: drive means for reciprocating said ram, means including an engageable and disengageable clutch for selectively rendering said clutch effective to drive said ram and ineffective to halt said ram, electrical control means operable to disengage said clutch, feeding means for intermittently forwarding strip workpiece material to a predetermined position relatively to said tool, follower means independent of said feeding means operable to be connected with said strip material for intermittently forward movement together therewith to a predetermined position, means for gauging a difference between said predetermined forwarded position of said strip workpiece and said forwarded position of said follower means and switch means included in said electrical control means operable to disengage said clutch in response to such difference.

8. In a power press having a relatively stationary tool bed and a ram member for a tool counter part mounted for reciprocation: a control system for reciprocating said ram including an engageable and disengageable clutch, feeding means for intermittently forwarding strip workpiece material to said tool through a stroke of a predetermined length, follower means operable to be connected with said strip material to travel therewith through its forward stroke, sensing means engageable by said follower means in response to its arrival at the end of said predetermined stroke and means operable in response to lack of such engagement to disengage said clutch.

9. In a power press having a relatively stationary tool bed and a ram member for a tool counter part mounted for reciprocation: a drive means for reciprocating said ram, electrical control means operable to engage and disengage said drive means, feeding means operable to forward strip workpiece material to said tool through a stroke of a predetermined length, follower means operable to be clamped on said strip material independent of said feeding means for travelling therewith through its forward stroke, electrical sensing means and actuating means therefor selectively operable by said follower means to render said drive means effective to reciprocate said ram in response to arrival of said follower means at the end of said stroke and to render said drive means ineffective in response to a reduced length of the stroke of said follower.

10. In a mechanical press having means for reciprocating a relatively movable part of a tool operable to produce articles from strip material and including a power transmission for reciprocating said part of said press, control means selectively operable to reciprocate said press parts and positively halt said reciprocable press part: primary means operable to engage said strip material, means operable to move said primary means to feed said strip material forward through a stroke of a predetermined length, secondary means operable to engage said strip material and mounted for reciprocating

movement to follow said strip material during its forward feeding stroke, means independent of said means operable to move said primary means operable to engage said secondary means with said strip material in timed relationship with the engagement between said primary means and said strip material for causing said secondary means to follow said strip material engaged therewith during its forward stroke, means operable in response to the difference between the stroke of said secondary means and the predetermined length of the stroke of said strip material as caused by the operation of said primary means and means operable in response to the operation of said differential means for rendering said drive means included in said power transmission ineffective and said halting means effective to stop reciprocation of said part of said press.

11. In a mechanical press having means for reciprocating a relatively movable part of a tool operable to produce articles from strip material and including a power transmission for reciprocating said part of said press control means selectively operable to reciprocate said press part and positively halt said reciprocable press part: primary feeding means operable to engage and move said strip material forward through a stroke of a predetermined length, clamping means operable to be clamped on said strip material and mounted for reciprocating movement, pressure operated means operable to clamp said clamping means on said strip material in timed relationship with said primary means so as to operate said clamping means as a follower travelling with said strip material during its forward stroke, sensing means in contact with said primary feeding means and operable in response to the difference between the stroke of said clamping means and the predetermined length of the stroke of said strip material and means controlled by said sensing means for rendering said drive means included in said power transmission ineffective and said halting means effective to stop reciprocation of said part of said press.

12. In a mechanical press having means for reciprocating a relatively movable part of a tool operable to produce articles from strip material and including a power transmission for reciprocating said part of said press, clutch means selectively operable to reciprocate said press part and positively halt said reciprocable press part, electrical control means for operating said clutch, primary means operable to engage said strip material and to feed said strip material forward through a stroke of a predetermined length, follower means operable to engage said strip material and mounted for reciprocating movement to follow said strip material during its forward feeding stroke, means operable to engage said follower means with said strip material in timed relationship with the engagement between said primary means and said strip material for causing said follower means to follow said strip material engaged therewith during its forward stroke, electrical switch means operable in response to a difference between said stroke of said follower means and the predetermined length of the stroke of said strip material and means operable in response to the operation of said switch means for operating said clutch means and halting said reciprocable press part.

13. In a mechanical press having means for reciprocating a relatively movable part of a tool operable to produce articles from strip material and including in a power transmission for reciprocating said part of said press control means selectively operable to reciprocate said press parts and positively halt said reciprocable press part: a roller feed operable to feed said strip material forward through a stroke of a predetermined length, a pair of clamping members operable to engage said strip material and mounted for reciprocating movement in a direction to follow said strip material during its forward feeding stroke, means operable to engage said clamping members with said strip material in timed relationship with the

operation of said roller feed for causing said clamping members to travel with said strip material during its forward stroke, sensing means supported for actuation at the end of the stroke of said clamping members, and means operable in response to non-actuation of said sensing means for rendering said drive means included in said power transmission ineffective and said halting means effective to stop reciprocation of said part of said press.

14. In a mechanical press having drive means for reciprocating a relatively movable part of a tool operable to produce articles from strip material and including a power transmission for reciprocating said part of said press, control means selectively operable to reciprocate said press part and positively halt said reciprocable press part: gripper feed means operable to engage said strip material, means operable to reciprocate said gripper feed means in engagement with said strip to feed said strip material forward through a stroke of a predetermined length, strip-follower means operable to engage said strip material and to follow said strip material during its forward feeding stroke in predetermined trailing disposition to said gripper feed means, check means operable in response to a change of mutual position between said gripper feed means and said follower means and means operable in response to the operation of said check means for rendering said drive means included in said power transmission ineffective and said halting means effective to stop reciprocation of said part of said press.

15. In a machine having a stamping tool for producing stamped articles from a material strip intermittently supplied to a tool: a pair of main clamping members, means for clamping said members on said strip, means for reciprocating said members clamped on said strip in one direction to forward said strip in the direction of said tool, means for releasing the clamping of said members at the end of their reciprocation stroke and return them in said released position to the other end of said stroke, a pair of auxiliary clamping members, means for clamping said auxiliary clamping members on said strip in trailing disposition relatively to said main clamping members, indexing means for detecting a change of mutual position between said main clamping members and said auxiliary clamping members during the forward transportation stroke of said main clamping members and means responsive to said indexing means for halting operation of said machine.

16. In a mechanical press having means for reciprocating a stamping tool for producing stamped articles from a material strip intermittently supplied to said tool: a pair of main clamping members, means for clamping said members on said strip, means for reciprocating said members clamped on said strip in one direction to forward said strip in the direction of said tool, means for releasing the clamping of said members at the end of their reciprocation stroke and return them in said released position to the other end of said stroke, a pair of auxiliary clamping members, means for clamping said auxiliary clamping members on said strip in trailing disposition relatively to said main clamping members, electrical switch means operable in response to change of mutual position between said main clamping members and said auxiliary clamping members during the forward transportation stroke of said main clamping members, electrical control means operable to stop the reciprocation of said press means, and an electrical circuitry including said control means and said switch means operable to render said electrical control means effective to stop the reciprocation of said press means in response to the operation of said switch means.

17. In a strip forwarding mechanism for intermittently forwarding a strip material to a machine having a stamping tool and having a main member operable to engage said strip and move it through a predetermined stroke, an auxiliary member operable to engage said material strip and to follow said strip through its forwarding stroke,

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means for detecting the indexing difference between said predetermined stroke and the stroke of said auxiliary means and means responsive to said detecting means for controlling the operation of said machine.

18. For use with a power press having a reciprocable tool member for producing articles from strip material intermittently forwarded to a predetermined position relatively to said tool member: a feeding mechanism for said strip material including primary feeding members operable to be clamped on said strip material, means operable to reciprocate said primary members through a predetermined stroke to forward said strip material, auxiliary members operable to be clamped on said strip material in predetermined trailing disposition relatively to said primary members so as to follow said strip through its forwarding stroke, means for detecting a change of trailing disposition between said primary members and said auxiliary members and means responsive to said detecting means for affecting the operation of said press.

19. For use with a power press having a reciprocable tool member for producing articles from strip material intermittently forwarded to a predetermined position relatively to said tool member: a feeding mechanism for said strip material including primary feeding means operable to engage said strip material and move it through a predetermined stroke, auxiliary means operable to be

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clamped on said strip material and travel with it through its forwarding stroke and sensing means operable in response to a length of the stroke of said auxiliary means being less than the length of said predetermined stroke.

20. For use with a power press having reciprocable tool member for producing articles from strip material intermittently forwarded to a predetermined position relatively to said tool member: a feeding mechanism for said strip material including primary feeding means operable to engage said strip material and move its through a predetermined stroke, auxiliary means operable to engage said strip material and follow it through its forwarding stroke and means for detecting a difference in length between said predetermined stroke and the stroke of said auxiliary means.

References Cited by the Examiner

UNITED STATES PATENTS

2,364,716	12/1944	Huebner	83—62
3,079,825	3/1953	Biben	83—209
3,044,675	7/1962	Turner et al.	226—11

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