

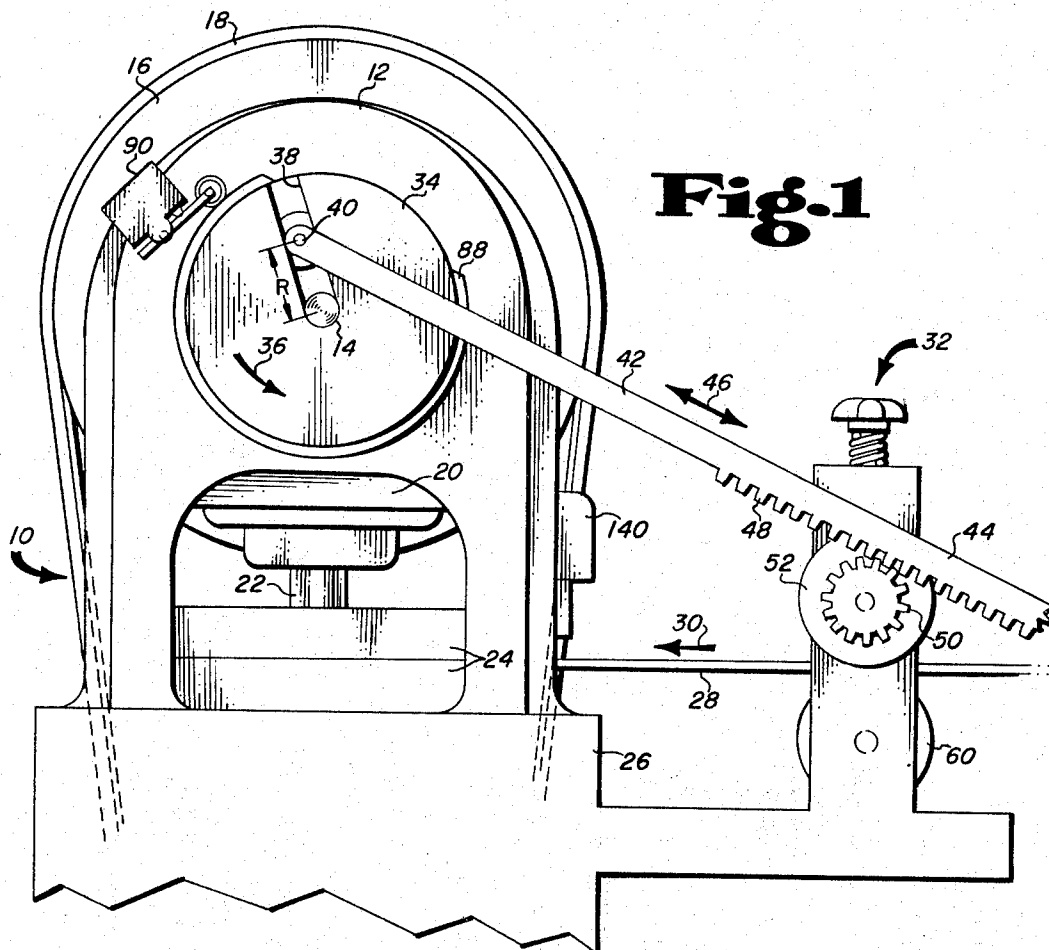
March 5, 1968

S. P. WILLITS ETAL  
WEB FEED SYSTEM PROVIDING AN AUXILIARY  
CORRECTING FEED MOVEMENT

3,371,834

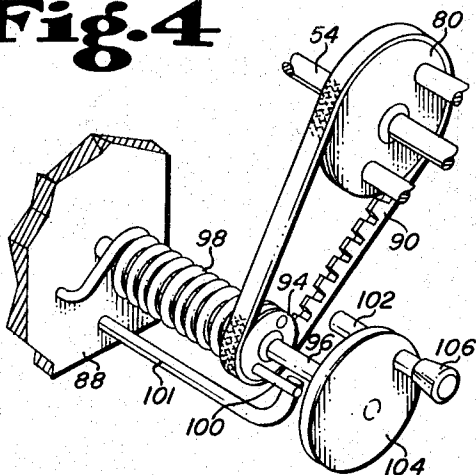
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**Fig. 1**

**Fig. 4**



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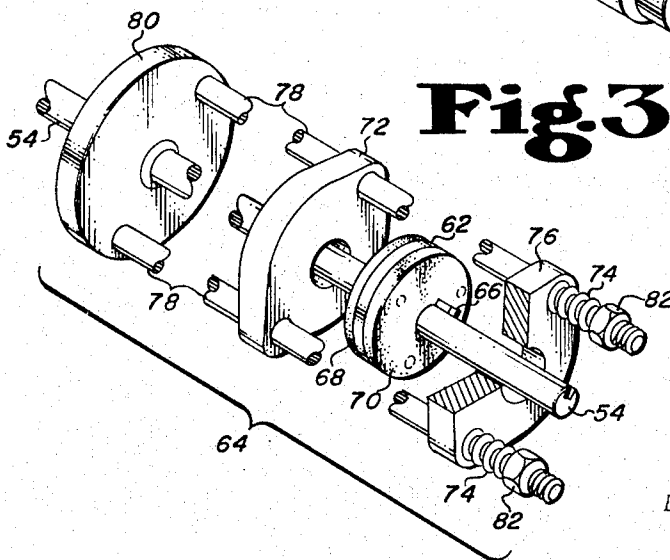
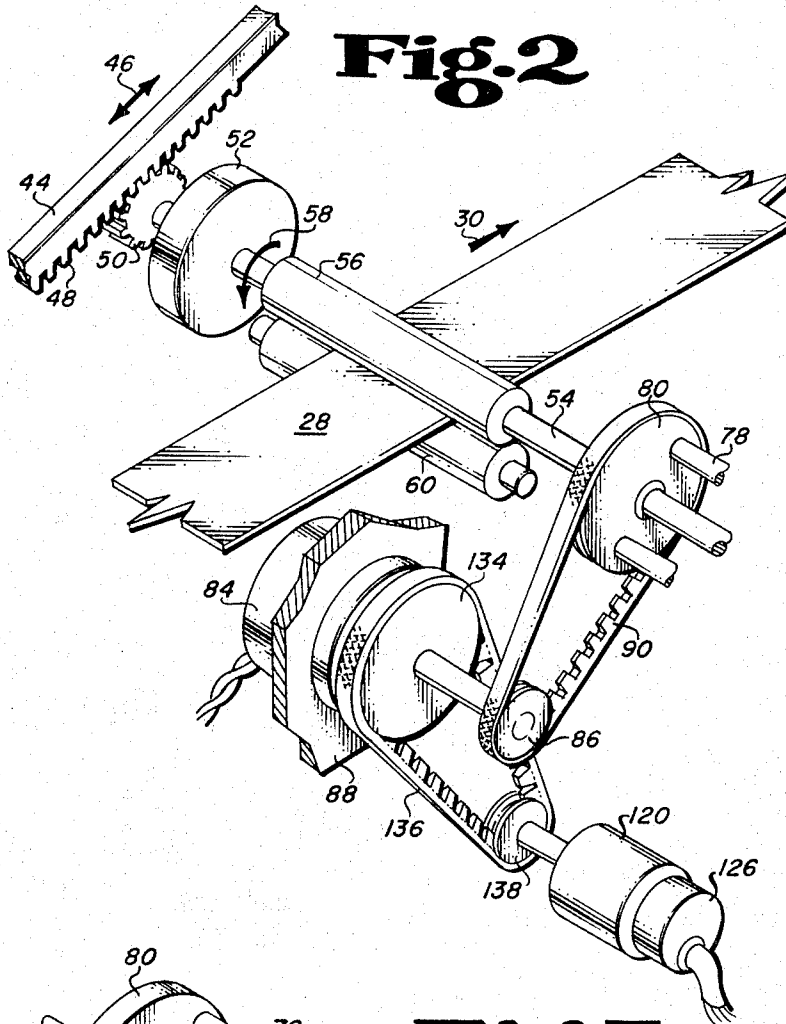
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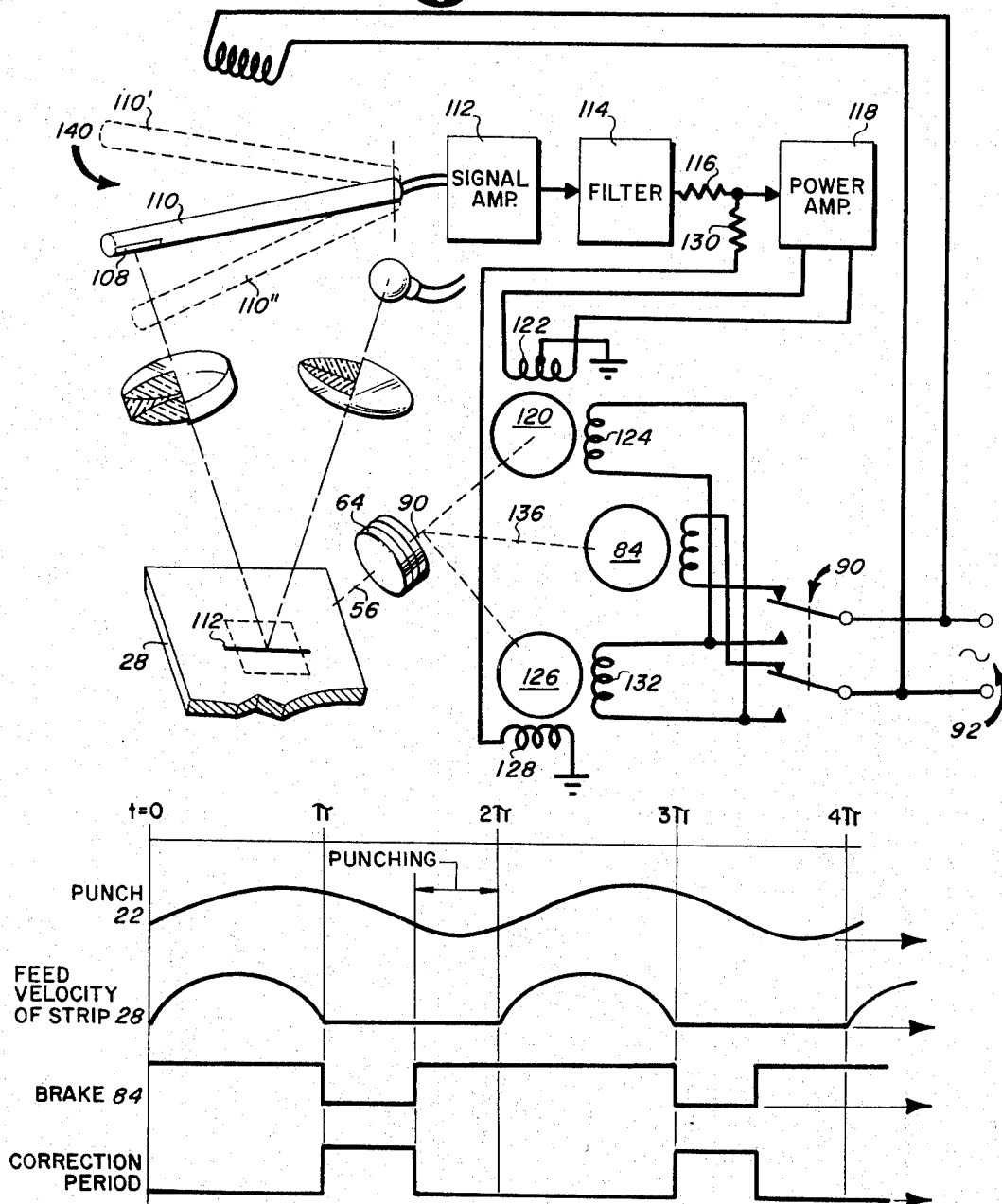
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**Fig. 5**



**Fig. 6**

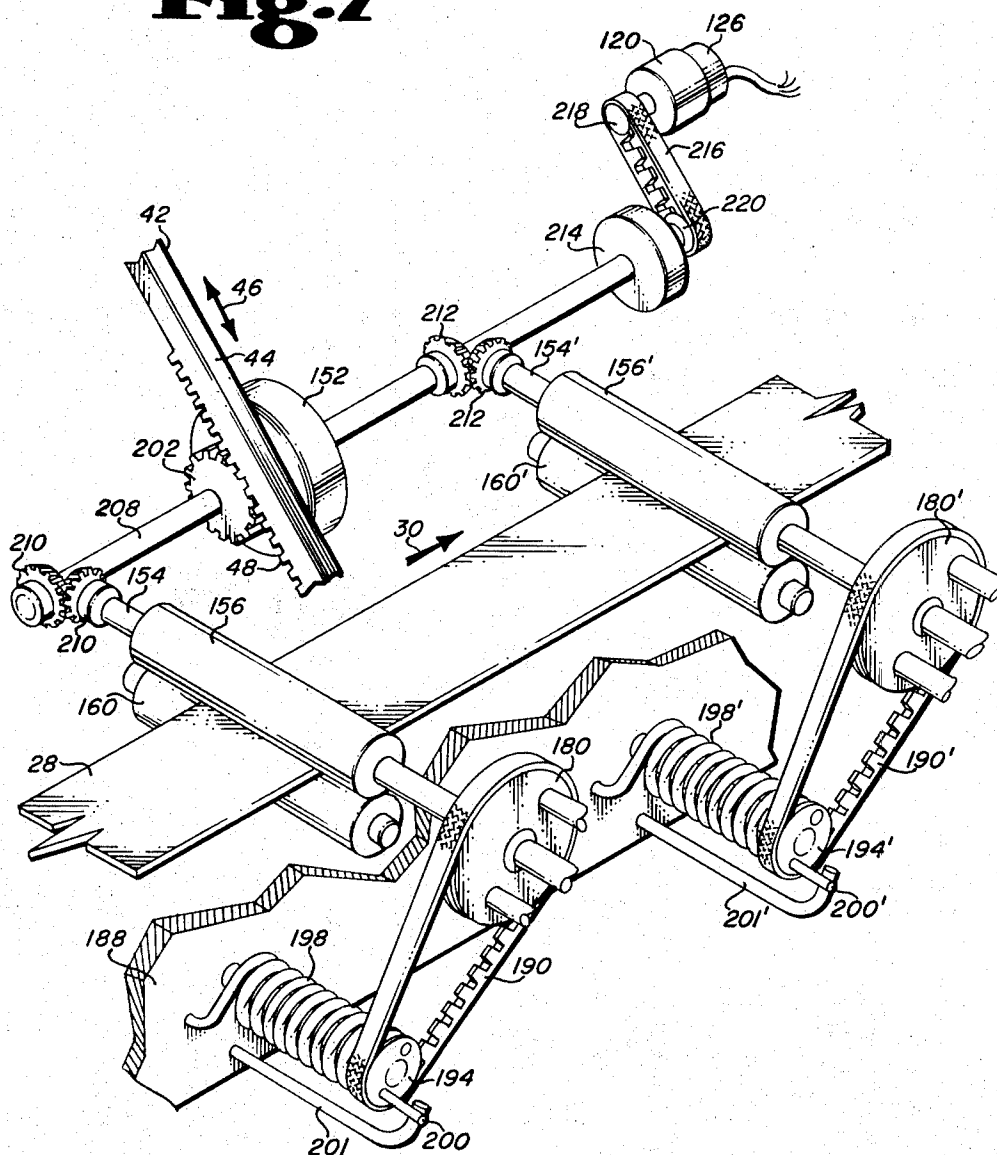
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# Fig.7



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## WEB FEED SYSTEM PROVIDING AN AUXILIARY CORRECTING FEED MOVEMENT

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8 Claims. (Cl. 226—27)

### ABSTRACT OF THE DISCLOSURE

A feed length correcting apparatus for cyclically operating press machinery intermittent strip feed devices operable during a portion of the machine cycle. With a main drive system coupled through an over-running clutch to the feeding elements, an auxiliary feed drive mechanism is also coupled to the feeding elements to impart supplemental motion to effect repositioning of the strip material during intervals when main feed and press are not acting on the strip, if and when and in an amount desired or, automatically under the control of a sensor scanning a characteristic of the strip material.

This invention relates to press machinery generally and, more particularly, to intermittently operable strip stock feeding means therefore, incorporating means for selectively varying the stock feed increment during any of the periodic pauses occurring during the intermittent feed.

Intermittently operating work feeding devices and particularly those of the strip stock feeding variety associated with punch presses are well known devices. Most of these devices are machine powered and permit adjustment of their effective feed length to allow for variations in job requirements, there being several frequently used and accepted methods for effecting this feed adjustment. For strip stock, roll feeds are a common feeding device, although various types of stock grippers and pushers, hitch feeds and shuttle feeds are also used. Most of these types of feed device share one common attribute, feed or stock advance is effected through a clutch and the length of feed is a function only of clutch effective engagement time.

For mechanical simplicity, machine powered roll feed devices are most frequently actuated by a crank and lever system working in conjunction with an over-running clutch connected to one or more sets of feed rolls. The periodically oscillating free end of the lever is used to impart oscillatory rotating motion to the input of the clutch and, by virtue of the over-running characteristics of the clutch, the effective engagement angle of the driven rolls is proportional to the angle of the oscillatory stroke of the lever. The other frequently used feed systems are also frequently powered by crank-lever systems acting through over-running clutches to achieve an intermittent unidirectional drive. In all such instances, adjustment of the stock advance is made by changing the stroke angle which, in turn, is accomplished by an adjustment of the crank-lever system.

While feed devices of the foregoing type are rugged and simple in their execution, for certain applications they present disadvantages in that the stroke or feed is not amenable to adjustment during operation of the machine. That is, the machine must be shut down to make a stroke adjustment, then brought back up to speed to check the effect of the adjustment since, because of inertial and other forces present, feed lengths tend to vary nonuniformly with machine speed variations. Difficulty in setting feed length is a particularly trying problem, when the strip stock being fed has a high unit value per feed increment as it often does in the nameplate industry. There, secondary blanking, embossing and coining operations are often

made on designs preprinted on the strip stock. Since the preprinting operation often is subject to small spacing errors, it is highly desirable that the strip feed be made adjustable during machine operation to compensate for these spacing errors.

Accordingly, and with the foregoing comments in mind, a principal object of this invention is to provide new and improved strip feeding apparatus which permits adjustment of the feed increment during press operation.

Another object of this invention is to provide new and improved strip feeding apparatus having auxiliary driving means for the feeding apparatus.

Still another object of this invention is to provide new and improved strip feeding apparatus having associated sensory apparatus to enable detection of a contrast feature on the strip being fed and its displacement from a reference position after completion of a normal feed stroke.

Yet another object of this invention is to provide new and improved strip feeding apparatus having servo controlled auxiliary driving means for the feeding apparatus responsive to the output of associated sensory apparatus to effect strip material repositioning after completion of the normal feed stroke.

The foregoing and other objects are achieved in the strip feed correction system of the invention by a novel auxiliary feeding mechanism. This auxiliary mechanism is operable during intervals where the main feed leaves the fed strip quiescent and when the strip is not being otherwise acted upon by the associated machine. In particularly critical feed situations, the feed correction system further embodies a scanning apparatus responsive to a contrast feature condition of the strip to be fed. This scanner delivers output signals which are applied to the correction system through servo apparatus to effect feed corrections.

The nature of the invention and its many features and objects will appear more fully, however, from the following description made in connection with the accompanying drawings in which:

FIGURE 1 is a side elevational view of a punch press embodying the feed correction system of the invention;

FIGURE 2 is a partial schematic view in perspective form showing the principal mechanism elements of the aforesaid correction system;

FIGURE 3 is an exploded perspective view of a brake mechanism employed in the invention;

FIGURE 4 is a partial perspective view of a portion of the elements of an alternate embodiment of the invention's feed correction system;

FIGURE 5 is a combination mechanical schematic-electrical block diagram of the principal elements of the feed correction system of FIGURE 2;

FIGURE 6 is a chart showing the relative time-displacement characteristics of selected elements of the feed system and its associated punch press, and

FIGURE 7 is a partial schematic view in perspective form showing the principal mechanism elements of a double roller embodiment of the invention's correction system.

Referring now to the drawings wherein like reference characters denote corresponding parts throughout the several views, in FIGURE 1 a punch press 10 is illustrated embodying a roller type of strip feeding apparatus embodying the inventive principles. Punch press 10 is of standard construction and includes a frame 12, rotatable crankshaft 14, a flywheel 16 secured on one end of the crankshaft 14, a belt 18 drivingly connecting the flywheel 16 to a motor (not shown). The crankshaft 14 is adapted to vertically reciprocate a ram 20 and punch 22 with respect to a die 24 secured to press bed 26 for caus-

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ing the die and punch to operate upon successive increments from a strip of stock 28 fed therebetween.

The strip of stock 28 is fed through the press in the direction of arrow 30 by means of an intermittently operating roller feed mechanism 32, the stock being positioned between two rollers. In the illustrative mechanism of FIGURE 1, roll feed is powered and controlled by a press actuated crank and rack-pinion mechanism, the rack-pinion combination being the equivalent of a lever. The crank plate 34 is secured to the opposite end of crankshaft 14 from flywheel 16 and rotates with crankshaft 14 in the direction of arrow 36. A radial slot 38 of T cross-section in the crank plate serves to anchor radially positionable rack pivot pin 40. Rack 42 is secured near its one end to pivot pin 40 which passes therethrough. Then, as crank plate 34 is rotated, the end 44 of rack 42 is reciprocally oscillated in the direction of double-ended arrow 46, a distance equal to twice the radial distance R pivot pin 40 is offset from the axis of crankshaft 14.

End 44 of rack 42 bears rack teeth 48 which mesh with the pinion input gear 50 of over-running clutch 52. Clutch 52, in turn, has its output member connected to the shaft 54 of feed roller 56. See FIGURE 2. Thus, the reciprocating oscillations of rack 42 effect a corresponding reciprocating oscillation of gear 50. Because of the well known characteristics of over-running clutches, this oscillation of input gear 50 results in intermittent rotation of shaft 54 and feed roller 56 in the direction of arrow 58. Since strip 28 is frictionally engaged with feed roller 56 by means of pressure roller 60, strip 28 is intermittently advanced in the direction of arrow 30 a distance proportional to R.

While the distance R may be adjusted to effect various lengths of advance of strip 28, these adjustments can only be made with the press stopped and, consequently, can not take into account variations in strip 28 or the roll feed mechanism 32, either of which may effect the strip length it is desired to feed. It is an advantageous feature of the inventive feed correction system that this inability to make strip feed length adjustments during press operation is overcome.

In the described embodiment of inventive feed correction system, feed length adjustments are made by supplementing the effective rotation of the over-running clutch 52. How this can be accomplished can be seen in part from a consideration of the driving characteristics of over-running clutches. In such clutches, if the input member is locked in position, the output member may be turned freely in one direction but, is prevented from reversing by the "one-way" locking action of the clutch. Of course, these characteristics continue to hold true when the clutch input member 50 is oscillated during alternate half cycles of the associated press 10. However, considering the oscillatory rate as being equivalent to the locking of the input member, it is apparent that an auxiliary drive system could drive the output member faster (and hence further) in the forward direction than the input member is being driven due to the over-running action of the clutch. Of course, during this forward cycle the one-way characteristics of the clutch prevent a slower auxiliary drive of the output member than that of the input member. Similarly, when the clutch input member is rotating in the reverse direction during the following half cycle, the output member can be driven in reverse by an auxiliary drive system as fast as the clutch is rotating in reverse, but no faster, and can be driven in the forward direction as fast as desired.

In many, if not most feed mechanisms employing an over-running clutch, a fixed friction brake is connected directly or indirectly to the clutch output member. This brake absorbs the residual inertial energy of both the strip and the feed mechanism during the decelerating portion of the feeding half cycle of clutch operation to prevent substantial and/or non-uniform overtravel of the strip. During the reverse half cycle of clutch operation,

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the brake prevents the occurrence of feed mechanism reversal. In a typical roll feed application, the brake body or stator is fixed to the frame of the feed mechanism 32 and the rotor is connected to the driven feed rollers shaft.

However, it is a feature of the invention that this brake can be utilized for the introduction of an auxiliary driving source to the feed roller. This inventive feature is realized by an arrangement disconnecting the brake stator from the frame to permit its rotation and then constraining it from rotating by a controlled movable element. Such arrangements are shown in FIGURES 2, 3 and 4.

The rotor 62 of brake 64 is secured to feed roller shaft 54 by means of a key 66 and hence is constrained to rotate therewith. The friction surfaces 68 and 70 of rotor 62 are maintained in frictional contact with the stationary surfaces of stators 72 and 76 by means of compression springs 74 acting upon a stator plate 76. Tie rods 78 slideably passing through guides in stators 72 and 76 and fixedly connected to brake drive member 80 maintain the several parts of the brake aligned and, by means of nuts 82 on their one ends, provide reaction members for springs 74.

Advantageously, brake drive member 80 is mechanically coupled to the rotor 86 of electro-magnetically actuated brake 84 whose body is secured to the frame 88 of the feed mechanism. As shown, the coupling is by means of timing belt 90 but other conventional coupling devices may be used as well. Brake 84 is chosen to be of sufficient capacity when electrically actuated to prevent rotation of brake drive member 80. Thus, with electrical power being supplied to brake 84, the stator of brake 64 is effectively coupled in a fixed relationship to the frame of the feed mechanism as in the typical roll feed application described above. Also, with power applied to brake 84 while the feed roller 56 is being driven by the over-running clutch 52, the brake 64 slips and/or provides the torque necessary to decelerate the roller 56.

Because of the characteristics of clutch 52 during the feed roll drive part of the cycle, any small or slow rotation of brake 64 as might be occasioned by slippage of the electrically actuated brake 84, has no effect on the amount of the feed because brake 64's rotation is slower than that of the output member of clutch 52. However, at the completion of the feed cycle when the feed roller 56 would normally be stationary, any rotation of brake 64 is transmitted to and effects the rotation of the feed roller. This attribute is utilized in the described inventive system to accomplish roll feed correction.

When the roll feed cycle is completed, a switch actuating cam 88 secured to the crankshaft 14 of press 10, acts upon switch 90 to open the circuit connecting brake 84 to the AC line at terminals 92. With brake 84 thus released, any rotational inputs applied to its rotor 86 or to the brake 64 are transmitted to feed roller 56 and may be used to accomplish roll feed correction by adding to or subtracting from the feed effected by the particular setting R of the lever 42 upon the crank plate 34. These supplemental corrections may of course be effected manually by means of a knob or other input device affixed to either brake rotor 86 or to some portion of brake 64 and such correction means are within the scope of the invention.

The basic feed correction system has also been modified in certain invention embodiments to permit an alternate form of auxiliary feed through brake 64. This modification is shown in FIGURE 4 where brake drive member 80 is mechanically coupled to the frame 88 of the feed mechanism through an interposed system providing adjustable backlash. Timing belt 90 interconnects drive member 80 and pulley 94 which is freely rotatable about shaft 96. Also arranged over shaft 96 is a torsion spring 98 secured at its one end to frame 88 and at its other end to pulley 94. Torsion spring 98 loads the pulley 94 and hence feed roller 56 in opposition to its direction of rotation for strip feed. Pulley 94 carries thereon a stop 100

which, when pulley 94 is rotated during the feed stroke, makes contact with fixed stop 101. An adjustable stop 102 is secured to plate 104 which in turn is secured to shaft 96. Shaft 96 is frictionally secured to frame 88 by means capable of exerting greater torque than that required to slip brake 64. Graspable knob 106 provides a means for rotating plate 104 to preset the position of adjustable stop 102.

In operation, the mechanism of FIGURE 4 responds to feed roll drive by compressing spring 98 until stop 100 contacts fixed stop 101. Then brake 64 slips for the remainder of the driving cycle. At the end of the driving cycle, spring 98 drives the feed rolls backward until the reverse limit of travel is reached when stop 100 contacts the adjustable stop 102. In this manner the net feed length is shortened by adjusting the amount of travel of stop 100 once the driving cycle is completed. For more shortening of the feed length, stop 100 is permitted to travel further. For less shortening (a longer net feed length), stop travel is reduced.

When the inventive feed correction system is utilized in conjunction with high speed punch presses, e.g., operating at cyclic rates of several hundred strokes per minute, it has been found advantageous to employ automatic sensor and servo apparatus to detect required strip feed length variations and accordingly effect the necessary corrections. Sensor and servo apparatus suitable with minor adaptations for effecting such detection and correction functions, is described in the co-pending application of William L. Mohan, Ser. No. 499,742, filed Oct. 21, 1965, titled Edge Gradient Scanner, and assigned to the same assignee. The sensor apparatus there described is illustrated in FIGURE 6 at 140 and is responsive to contrast features in the scanned area. These features may either be of narrow width relative to the sensor scanning amplitude such as a line or, may be relatively wide in which case they are designated an edge. When scanning a line-like contrast feature 112, the output signal of the photo cell 108 contained in oscillating arm 110 comprises varying amounts of fundamental and harmonic components of the oscillatory frequency. When line 112 is centered in the scanned area, the fundamental component entirely disappears and only even harmonics remain. As the line is displaced from center, the fundamental component increases in amplitude with its phase relative to the oscillatory frequency determined by the direction of displacement from center. Since these scanner characteristics are advantageously identical to those of the scanner of the aforesaid Mohan application and the two scanners are identical in construction, operation and the signal output characteristics of their oscillating photo-cells, the scanner is not further described here.

The output signal from cell 108 is amplified in signal amplifier 112. The amplified output of amplifier 112 is processed by low-Q tuned filter 114 which passes the fundamental frequency contained therein and reduces the amplitude of any higher harmonics present. The filtered signal is passed by summing resistor 116 and is further amplified in power amplifier 118 before being applied to the control winding 122 of two-phase servo motor 120. The fixed phase winding 124 of motor 120 is provided with an AC reference voltage applied at terminals 92. To achieve velocity damping in the system, tachometer 126 is mechanically coupled to motor 120 and provides an output signal from its winding 128 which is applied through summing resistor 130 to the input of power amplifier 118. The excitation winding 132 of the tachometer is provided with an AC reference from the same terminals 92 that supply the entire correction system. For drawing convenience and simplicity and because such provisions are well known in the servo art, means for phase correcting the AC reference applied to motor 120 and tachometer 126 have not been illustrated.

As best shown in FIGURE 2, the pulley 138 on the output shaft of servo motor 120 is mechanically coupled,

by means of a timing belt 136, to a pulley 134 affixed on the rotor shaft of brake 84. Thus, assuming brake 84 is not energized, an error signal generated by scanner cell 108 will actuate servo motor 120. Motor 120 will, through the foregoing described system of belts and pulleys rotate brake 64 and, hence cause feed roller 56 to move strip 28 and minimize the error signal. To insure that brake 84 is de-energized during intervals when servo corrections are being accomplished, the same press operated switch 90 that insures brake actuation during the strip feed and punching portions of a press cycle and that de-energizes the brake during the feed correction portion of the cycle, also energizes the servo system when it de-energizes the brake and vice versa.

For description purposes, the foregoing scanner-controlled servo system has been described in terms of an electro-optical type of sensor. It has been found, however, that under certain conditions other sensor types may advantageously be employed. Particularly useful in dirty atmospheres are the various capacitor effect or magnetic or acoustic detectors well known to the art and these may equally well be employed in the inventive systems if the contrast feature of the strip 28 are chosen to be of a type that will enable response of the detector used.

#### Operation—Single roll system

When the motor of punch press 10 is started, the crankshaft 14 will be rotated and the punch 22 reciprocated once for each revolution of the crankshaft to act upon a strip of stock 28 passed between it and die 24. As the crankshaft rotates, crank plate 34 turns with it effecting the reciprocal oscillation of rack 42. The rack teeth 48 of rack 42 are engaged with the input pinion 50 of over-running clutch 52 and, in turn, effect its oscillation. This oscillation of input pinion 50 imparts an intermittent and unidirectional rotation of controlled duration to feed roller 56 and, hence, an intermittent advance of strip 28 toward the die.

Scanner 140 scans the surface of strip 28 and provides an error signal having characteristics related to any mispositioning of the contrast features in its scanned area. This error signal is amplified and, during the correction part of the cycle, is utilized by servo motor 120 which drives the feed roller 56 to minimize the mispositioning.

The operation of the invention may be further understood by reference to the chart of FIGURE 6 which shows the time-displacement relationships between selected elements of the press and inventive system in the illustrative embodiment of FIGURE 1. In the upper graph, the reciprocating movement of punch 22 is shown compared with the angular displacements  $\pi$ ,  $2\pi$ , etc. of the crankshaft 14. The next graph represents the intermittent advance of strip 28. The third graph represents the "on" time of brake 84 and the last graph, the time remaining during which roll feed correction can be effected.

From the foregoing it will be clear that the strip 28 will be advanced through the press during the major portion of its cycle when the punch 22 is not engaging the strip, and that the strip will "dwell" at zero velocity when the punching action is taking place. For positiveness of operation and to prevent jitter in the strip, brake 84 is energized throughout the strip feed and punching action, cam 88 being proportioned for this purpose.

Further, while FIGURE 6 illustrates an overall cycle sequence of—feed—correct—punch—etc., it is believed manifest that the only requirement imposed by the inventive feed system is that the correction portion of the cycle occur when the strip being fed would otherwise be at rest, i.e., during a "dwell" portion of the feed cycle.

While the foregoing description has been of an application of the invention to a single roll feed mechanism, the invention's correction system not only may be applied to a double roll feed mechanism but provides additional advantages when it is so applied. One of the problems

inherent in double roll feed mechanisms is maintaining both of the sets of rolls in sufficiently exact synchronism. Backlash in the inter-connection between the two roll sets, material stretch, etc., all tend to destroy exact synchronism with attendant material buckling problems. It is a feature of the invention that these problems of ordinary double roll strip feed mechanisms are overcome when the feed correction system of the invention is used therewith.

One embodiment of the inventive feed correction system to a double roll feed mechanism is illustrated in FIGURE 7. As there shown, the system is quite similar to that of FIGURES 2 and 4. Accordingly, where elements of the FIGURE 7 system perform identical or nearly identical functions to those of their equivalents in FIGURES 2 and 4, they have been assigned reference numerals 100 higher for FIGURE 7, e.g., 52=152, 101=201, etc. Additionally, since there are two sets of identical feed rolls in the FIGURE 7 embodiment, only one set of reference numerals has been assigned to roll elements, the second and identical set being distinguished by prime (') designations of the same numerals.

The basic press-actuated drive mechanism of FIGURE 1 is also employed in the double roll feed correction system; that is, the roll feed is powered by a press actuated crank and rack-pinion mechanism, the crank and rack being selectively coupled to effect variations in the length of stroke of the rack 42 to accommodate the basic feed length requirements of the strip 28. The rack teeth 48 on end 44 of rack 42 mesh with pinion gear 202 secured to the input member of over-running clutch 152 and freely rotatable about cross-shaft 208. This results in an intermittent unidirectional rotation of the output member of clutch 152 which output member is secured to cross-shaft 208. Two further pairs of bevel gears 210 and 212 secured to cross-shaft 208 and feed roller shafts 154 and 154' result in the intermittent rotation of drive rollers 156 and 156' and the corresponding incremental advance of strip 28 in the direction of arrow 30.

As in the embodiment of FIGURE 4, each of the drive rollers 156 and 156' have affixed thereto friction brake mechanisms 164 and 164' (not shown in FIGURE 7) having, respectively, drive members 180 and 180' belt coupled to individual backlash mechanisms. However, unlike the mechanism of FIGURE 4, an adjustable stop is not provided as part of the backlash mechanisms themselves. Instead, the unidirectional characteristics of a single over-running clutch 214, having its output member affixed to cross-shaft 208 and its input member servo controlled, are advantageously employed to provide a single adjustable stop for both backlash mechanisms. Timing belt 216 connects servo motor 120 to over-running clutch 214 by means of pulleys 218 and 220, respectively.

#### Operation—Double roll system

As in the single roll system, operation of the associated press effects the reciprocal oscillation of rack 42 in the direction of double ended arrow 46. The rack teeth 48 of rack 42 engaging the input pinion 202 of over-running clutch 150 results in the intermittent advance of strip 28.

As the strip is being fed, springs 198 and 198' are compressed until pins 200 and 200' contact fixed stops 201 and 201'. At this point, friction brakes 164 and 164' begin slipping that will continue until the advance of strip 28 is completed. Then, springs 198 and 198' drive their respective feed rolls backward until the reverse limit of travel is reached when servo motor 120 prevents further rotation of over-running clutch 214. As in other embodiments, servo motor 120 is responsive to the output signals of scanner 140 which are, in turn, indicative of any mispositioning of a selected contrast feature of strip 28. Thus, the feed stroke effected by the press powered drive of rack 42, is shortened under scanner surveillance until

the selected contrast feature is located at a scanner established reference position. When this position is reached, operation of servo 120 ceases and over-running clutch 214 prevents further backward travel of the two feed roll systems and strip 28.

From the foregoing description it can be seen that the FIGURE 7 embodiment, by virtue of its selective backlash controlled by a single adjustment stop, prevents backlash from being a problem and enables the two sets of rolls to be maintained in closer synchronism than heretofore possible.

While, for facility in discussion, the foregoing illustrative embodiments of the inventive correction system have been press powered roll feeds, it should be apparent to those skilled in the strip feed art that the feed mechanisms described need not be directly powered by their associated machine. All that is required is a machine signal to initiate a feed cycle and some prime mover to actuate the feed mechanism through a feed cycle upon receipt of such a signal. Further, the inventive feed system is operable with feed systems other than roll feeds; hitch, gripper and shuttle feeds being especially amenable to operation with the inventive apparatus.

While two methods of introducing feed corrections through brake 64 have been described in terms of manual supplemental repositioning of brake 64, the use of an automatic scanner controlled servo system to effect such repositioning has only been described in terms of the correction system of FIGURES 2 and 7. Manifestly, the same scanner-servo system can be employed to reposition the adjustable stop 102 utilized in the FIGURE 4 embodiment.

The invention has been described in detail with respect to preferred embodiments thereof. However, it will be understood that variations and modifications can be effected within the spirit and scope of the invention as herein described and as defined in the appended claims.

What is claimed as the invention is:

1. In a feed system for cyclically operating machinery requiring the advance of a length of strip material each machine cycle, the combination comprising

cycle timing means actuated by said machine for initiating a feed cycle having feed and dwell components, feed means connected to said cycle timing means for effecting the unidirectional advance of a selected fixed length of said strip material during each feed cycle.

auxiliary driving means connected to said feed means to enable bidirectional repositioning of said strip material after completion of said selected fixed length advance, and

adjusting means connected to said auxiliary driving means to control the bidirectional displacement of the latter and thereby effect any desired repositioning of said strip material, said adjusting means comprising

scanner means for generating output signals indicative of the displacement from a reference position of a contrast feature of said strip material, and

servo means connected at its input to said scanner means and at its output to said auxiliary driving means, said servo means being responsive to the output of said scanner means for effecting the controlled bidirectional displacement of said auxiliary driving means thereby minimizing said indicated displacement.

2. In a feed system for cyclically operating machinery requiring the advance of a length of strip material each machine cycle, the combination comprising

cycle timing means actuated by said machine for initiating a feed cycle having feed and dwell components, feed means connected to said cycle timing means for effecting the unidirectional advance of a selected

fixed length of said strip material during each feed cycle,  
 auxiliary driving means connected to said feed means for frictionally absorbing residual inertial energy of said strip material and said feed means at the end of the feed cycle, and  
 adjusting means connected to said auxiliary driving means for effecting the controlled displacement of the latter after completion of said selected fixed length advance to thereby effect any desired correction in feed length, said adjusting means comprising  
 scanner means for generating output signals indicative of the displacement from a reference position of a contrast feature of said strip material, and  
 servo means connected at its input to said scanner means and at its output to said auxiliary driving means, said servo means being responsive to the output of said scanner means for effecting the controlled displacement of said auxiliary driving means thereby minimizing said indicated displacements.

3. In a feed system for cyclically operating machinery requiring the advance of lengths of strip material each machine cycle, the combination comprising  
 cycle timing means actuated by said machine for initiating a feed cycle having feed and dwell components, feed means connected to said cycle timing means for effecting the unidirectional advance of a selected fixed length of said strip material during each feed cycle, said feed means comprising lever means connected at its one end to said cycle timing means to thereby effect the reciprocal oscillation of its other end,  
 over-running clutch means having input and output members, said input member being connected to and actuated by said reciprocally oscillating end of said lever means, and  
 roller means contacting said strip material and connected to said output member, thereby to achieve the intermittent advance of said strip material, said advance being proportional to the length of said reciprocal oscillation,  
 auxiliary driving means connected to said roller means for frictionally absorbing residual inertial energy of said strip material and said roller means at the end of the feed cycle, and  
 adjusting means connected to said auxiliary driving means for effecting the controlled displacement of the latter after completion of said selected fixed length advance to thereby effect any desired correction in feed length.

4. A strip material feed system in accord with claim 3 wherein said adjusting means comprises  
 brake means,  
 actuator means connected to said cycle timing means and responsive thereto for releasing said brake means during at least some portion of said dwell component of said feed cycle, and  
 means for introducing supplemental controlled displacements of said auxiliary driving means during that portion of said dwell component of said feed cycle that said brake is released.

5. A strip material feed system in accord with claim 4 wherein said means for introducing supplemental controlled displacements of said auxiliary driving means comprises  
 scanner means for generating output signals indicative

of the displacement from a reference position of a contrast feature of said strip material, and  
 servo means connected at its input to said scanner means and at its output to said auxiliary driving means, said servo means being responsive to the output of said scanner means for effecting the controlled displacement of said auxiliary driving means thereby minimizing said indicated displacement.

6. In a feed system for cyclically operating machinery requiring the advance of lengths of strip material each machine cycle, the combination comprising  
 cycle timing means actuated by said machine for initiating a feed cycle having feed and dwell components, feed means connected to said cycle timing means for effecting the unidirectional advance of a selected fixed length of said strip material during each feed cycle,  
 auxiliary driving means connected to said feed means for frictionally absorbing residual inertial energy of said strip material and said feed means at the end of the feed cycle, and  
 adjusting means connected to said auxiliary driving means for effecting the controlled displacement of the latter after completion of said selected fixed length advance to thereby effect any desired correction in feed length, said adjusting means comprising  
 adjustable backlash introducing means for selectively shortening the advance of said strip material.

7. A strip material feed system in accord with claim 6 wherein said adjustable backlash introducing means comprises  
 fixed limit stop means,  
 adjustable limit stop means,  
 spring loaded means having limits of travel established by said fixed limit stop means and said adjustable limit stop means,  
 scanner means for generating output signals indicative of the displacement from a reference position of a contrast feature of said strip material, and  
 servo means connected at its input to said scanner means and at its output to said adjustable limit stop means, said servo means being responsive to the output of said scanner means for effecting the adjustment of said adjustable limit stop as a function of said displacement of said contrast feature.

8. A strip material feed system in accord with claim 7 wherein said feed means comprises  
 a first and a second roll feed mechanism,  
 means interconnecting said first and said second roll feed mechanisms to effect their simultaneous coaction, and  
 means connected to said cycle timing means and said interconnecting means to thereby effect said unidirectional advance of said selected fixed length of said strip material.

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