United States Patent [19]

Peterson

[11] **3,907,188**

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[54] **INTERMITTENT STRIP ROLL FEED**

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[73] Assignee: **Cooper-Weymouth, Peterson, Inc.**, Westfield, Mass.

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[21] Appl. No.: **459,129**

[52] **U.S. Cl.** **226/154**

[51] **Int. Cl.²** **B65H 17/22**

[58] **Field of Search** 226/90, 154, 155

[56] **References Cited**

UNITED STATES PATENTS

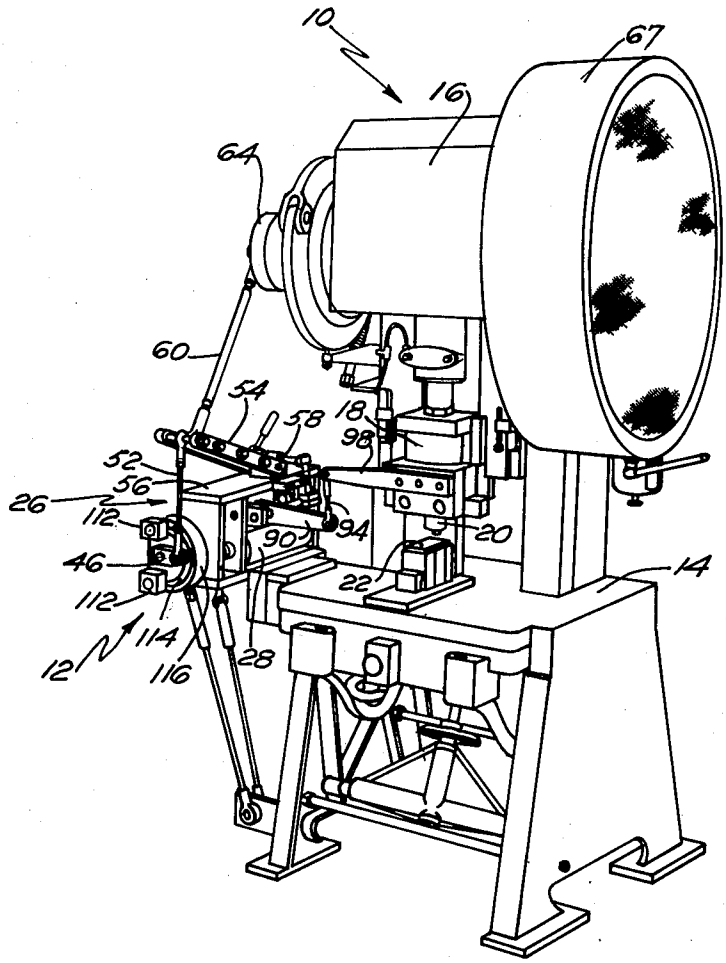
2,693,955	11/1954	Maust	226/90
2,831,570	4/1958	Conrad	226/155 X
3,137,428	6/1964	Peterson	226/154
3,493,159	3/1970	Balunas	226/154 X
3,613,565	10/1971	Muller	226/155 X
3,758,011	9/1973	Portmann	226/154 X

Primary Examiner—Richard A. Schacher
Attorney, Agent, or Firm—Salter & Michaelson

[57] **ABSTRACT**

A roll feed for power presses and the like for imparting intermittent linear feed to strip stock, said feed comprising a pair of feed rollers through which the stock extends, said rollers being drivingly geared to each other, there being means for imparting oscillation to said rollers, one of said rollers being mounted for movement away from the other roller to disengage the stock located therebetween, and cam means controlled by reciprocation of the ram of the power press for causing said rollers to disengage the stock when the rollers are rotating in a reverse direction, said cam means permitting said rollers to drivingly engage said stock when the rollers are rotating in a forward or feed direction.

11 Claims, 9 Drawing Figures



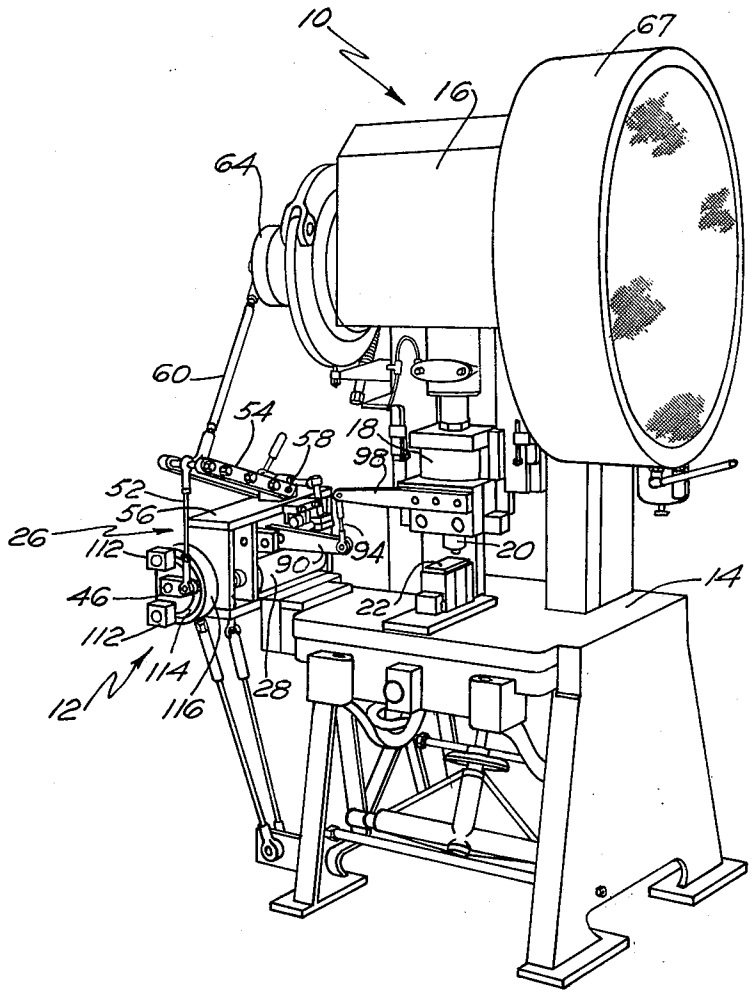

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FIG. 1

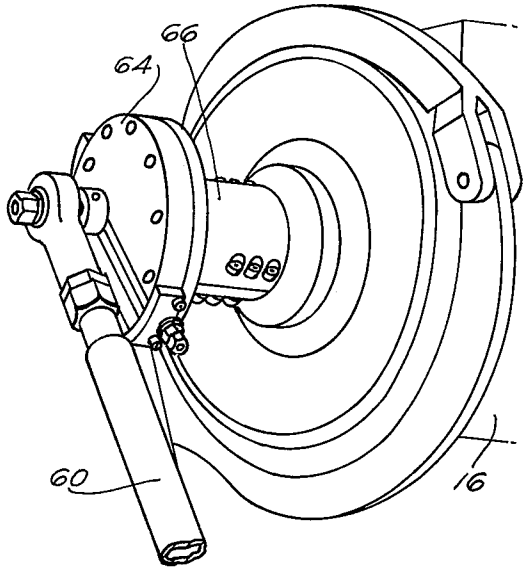
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FIG. 3

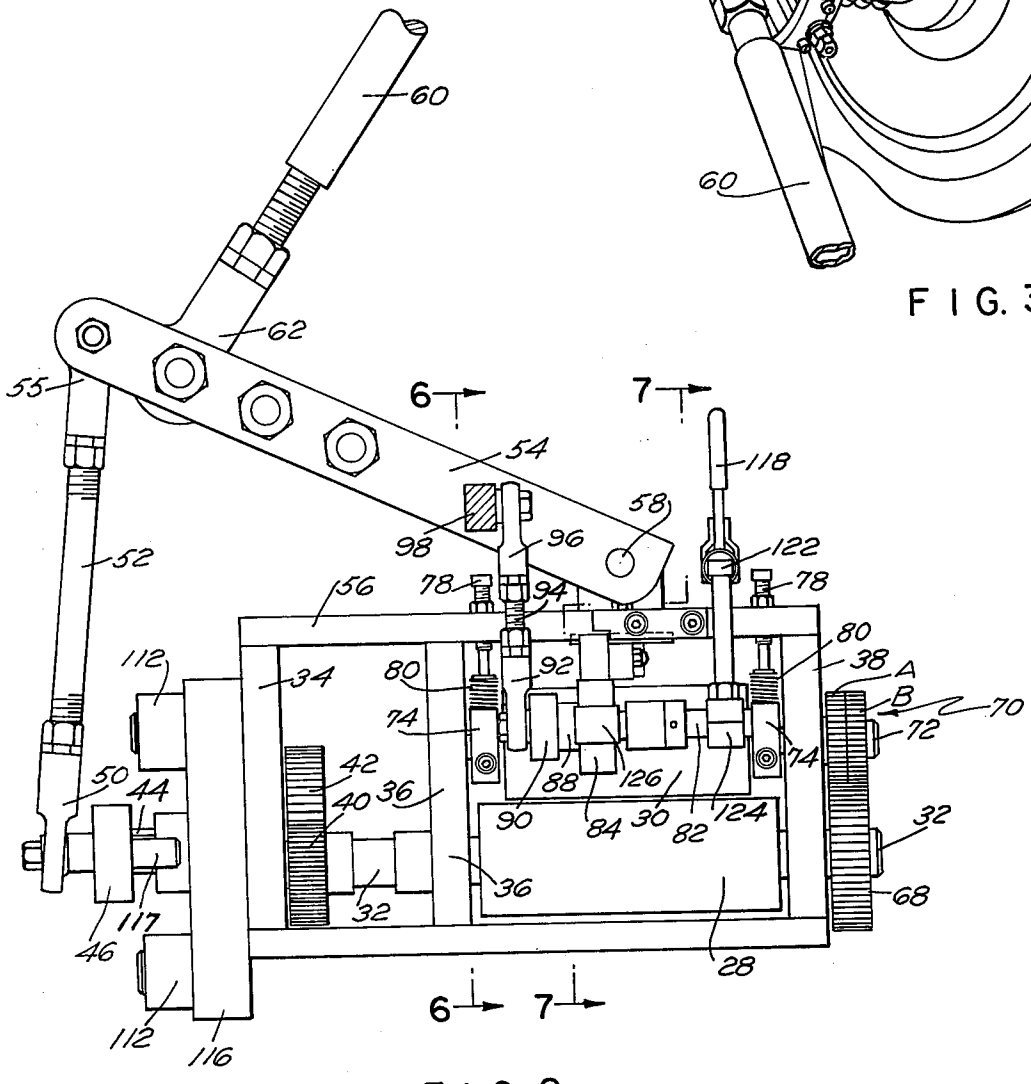
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FIG. 2

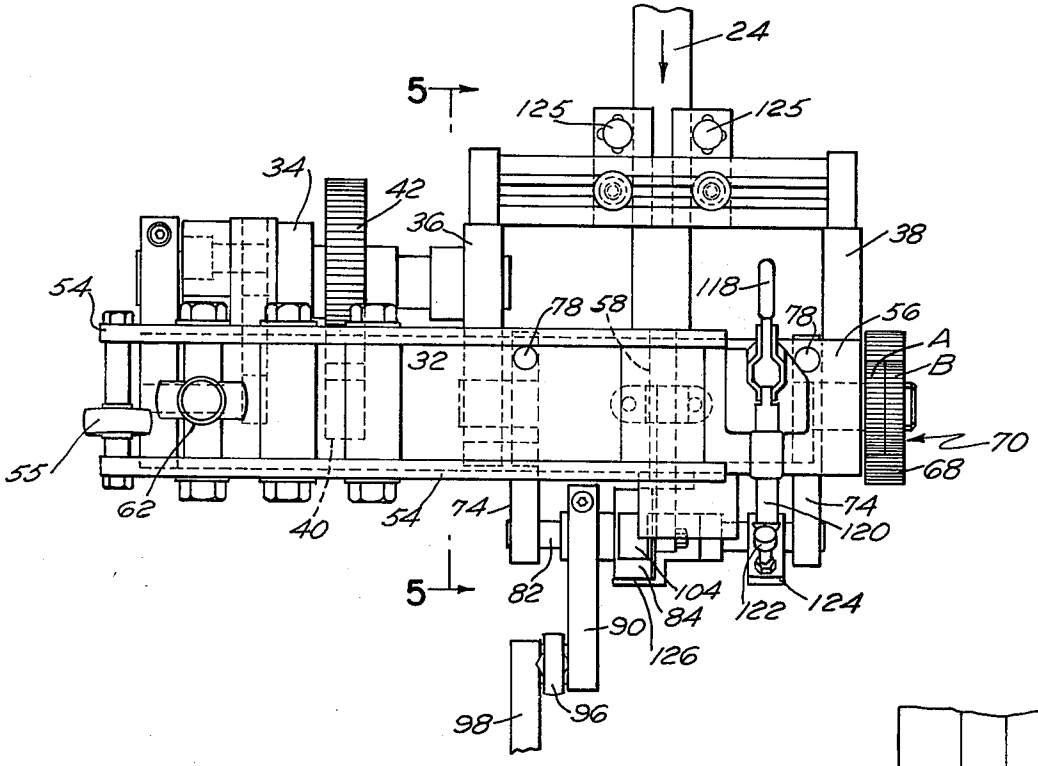
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FIG. 4

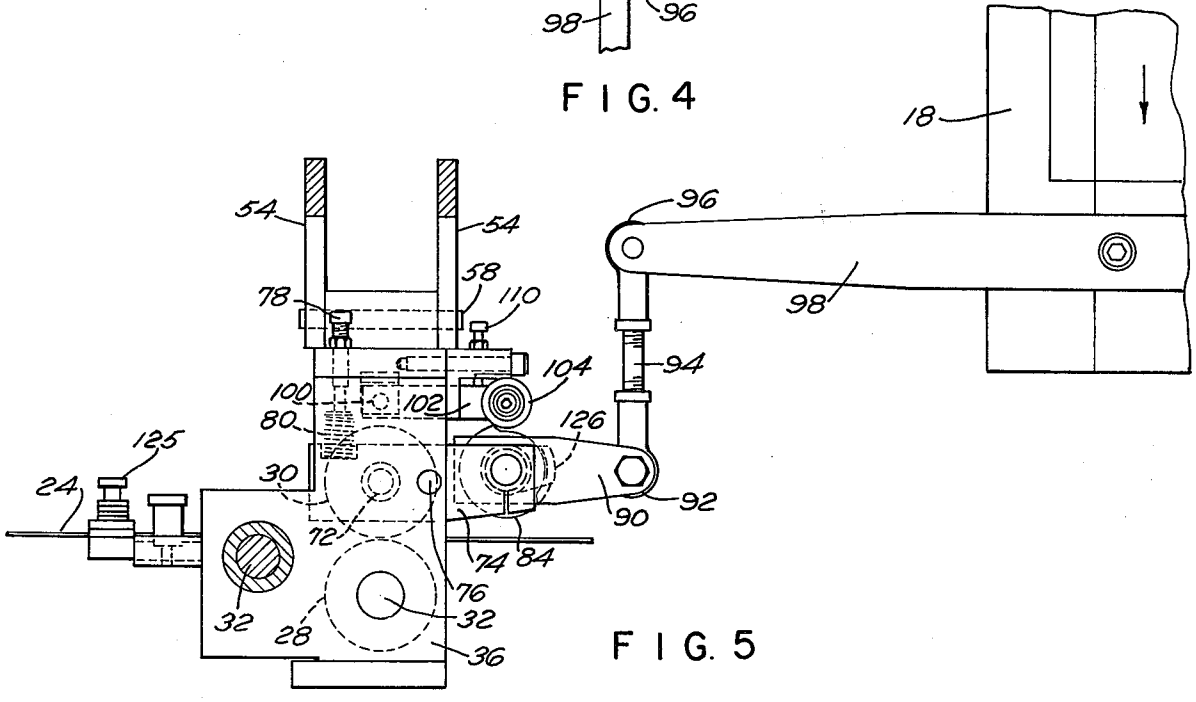
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FIG. 5

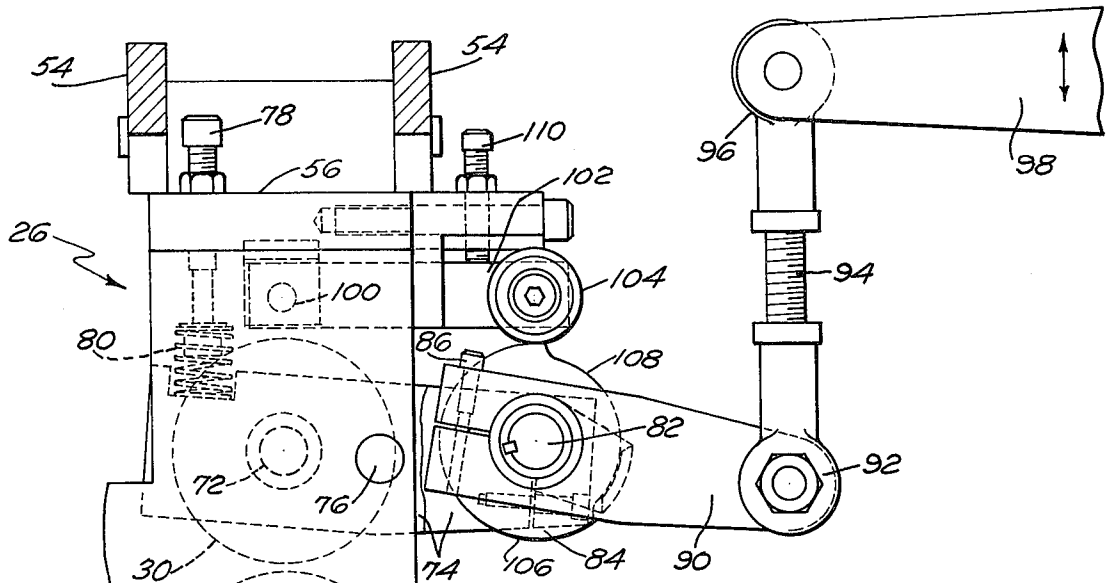
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FIG. 6

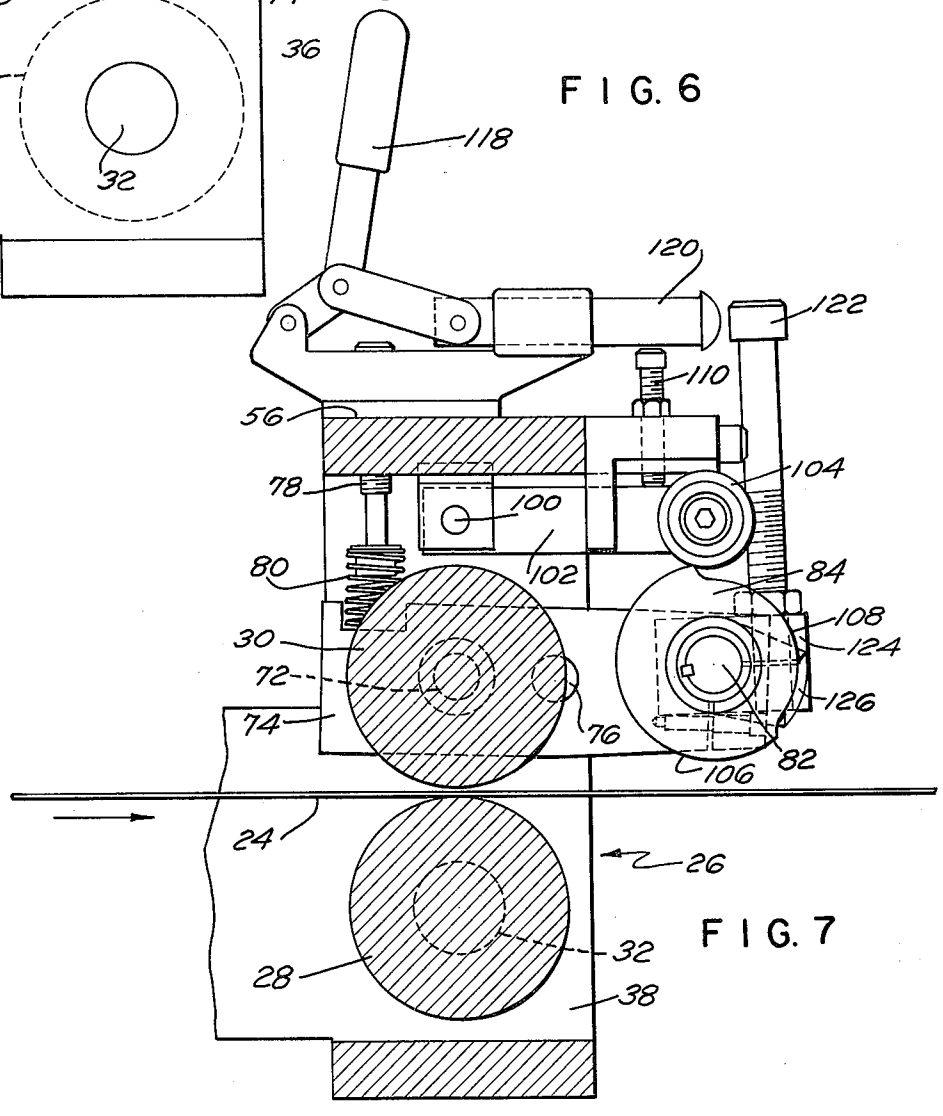
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FIG. 7

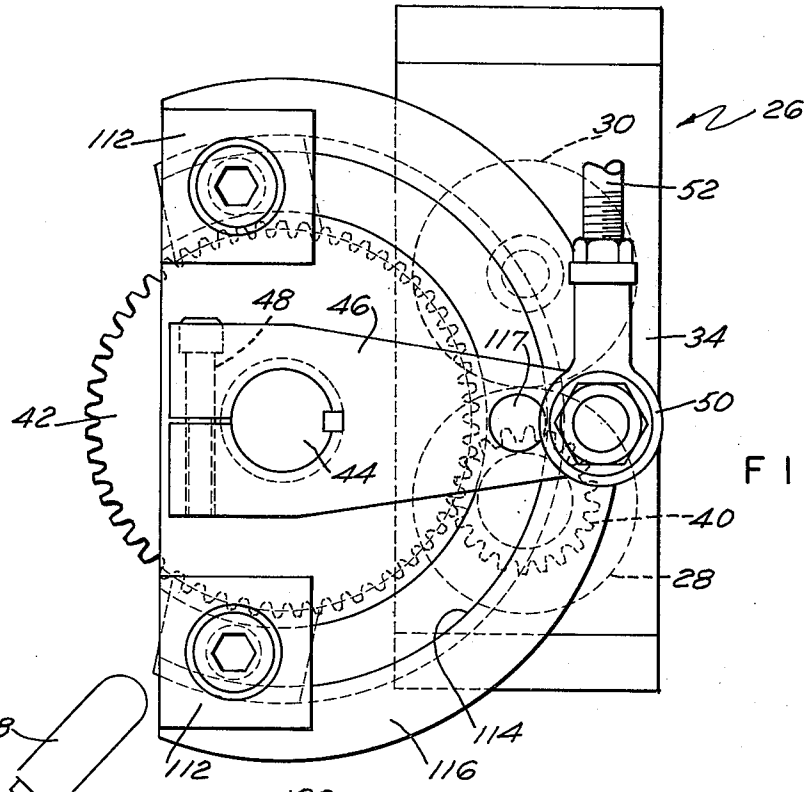
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FIG. 8

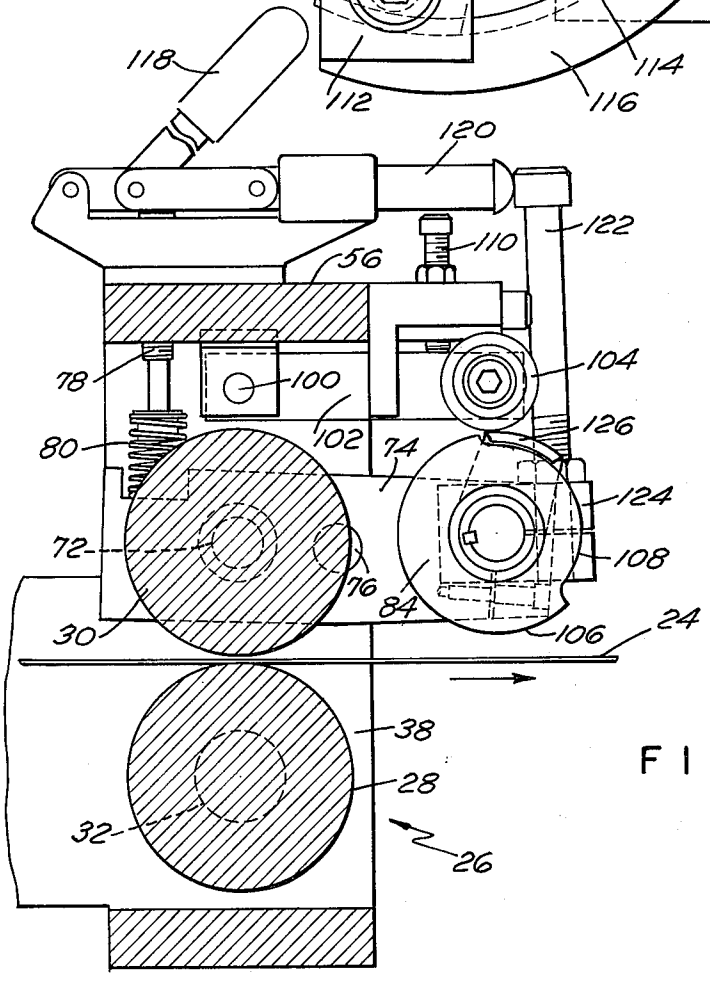
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FIG. 9

INTERMITTENT STRIP ROLL FEED

BACKGROUND AND SUMMARY OF THE INVENTION

This invention relates to feed mechanisms for power presses, such as stamping presses and the like, as well as other apparatus using a roll feed. In such apparatus, the roll feed imparts a predetermined linear movement to strip stock in timed sequence to the operation of the press. The type of operation being performed on the strip stock determines the required length of feed and the required length of time that the stock must remain stationary.

One type of roll feed that has often been used in connection with power presses, such as stamping presses and the like, is illustrated by U.S. Pat. No. 2,591,993 dated Apr. 8, 1952, and U.S. Pat. No. 3,505,890 dated Apr. 14, 1970. In roll feeds of this type, a pair of vertically aligned rollers are geared to each other for imparting linear feed to a strip that passes therebetween. Intermittent feed is imparted to the strip by an indexing mechanism mounted at the end of the shaft of one of the rollers, said indexing mechanism being driven by a pawl and ratchet arrangement, which in turn is driven by an arm eccentrically mounted on the flywheel of the stamping press. By adjusting the length of the oscillatory stroke of said arm, the length of feed may be adjusted.

Although roll feeds of this general type have proven to be effective for many years, recent developments in power presses, stamping presses and the like have resulted in presses which operate at greatly increased speeds of more than 1000 revolutions per minute, thus placing great strain on the indexing mechanism, and particularly the pawl and ratchet means that form a part thereof.

The present invention completely eliminates the use of indexing mechanism of the general type shown in the above mentioned patents and instead comprises a feed wherein the feed rollers are continuously oscillated but wherein cam means are provided for separating the rollers during the reverse stroke thereof to disengage the stock located therebetween, said cam means permitting the rollers to assume a driving or feeding relationship with respect to the strip during rotation of the rollers in a forward or feed direction. This general type of arrangement is shown in U.S. Pat No. 3,137,428 dated June 16, 1964, wherein wedge means are provided for automatically separating the rollers during reverse oscillation thereof, said wedge means automatically moving to inoperative position during rotation of the rollers in a forward or feed direction to permit the rollers to intermittently feed the strip stock. The problem with such an arrangement, particularly in high-speed operations, is excessive wear on the wedges, thus creating lubrication problems which have proven difficult to overcome.

It is therefore a primary objective of the present invention to provide improved means for separating the feed rollers when it is desired to disengage the stock located therebetween, i.e., during the reverse stroke or oscillation of said rollers, which means, at the same time, insure that the rollers will drivingly engage the stock to feed same during the forward stroke or oscillation of the rollers. This objective is achieved by utilizing cam means which are controlled by reciprocation of the ram of the power press, stamping press or the like. This is an extremely important feature of the present invention, since by controlling the feed of the stock by movement of the ram, greater feed accuracy is obtained. Expressed differently, since the critical feed requirement is that the stock be fed in proper timed relation to operation of the ram, it obviously follows that this requirement can best be met by having the feed directly controlled by movement of the ram.

It is a further object of the present invention to provide means for manually moving the feed rollers to their inoperative or non-feed position so that strip stock may be manually inserted when the machine is stopped. In addition, means are provided for rendering the cam means ineffective during the first stroke of the ram after the press is first started so that the strip will not be moved until the first operation has been performed thereon. Said means automatically become inoperative after one operation or stroke of the ram.

Other features, advantages and objects of the invention will become apparent as the description thereof proceeds when considered in connection with the illustrative drawings.

DESCRIPTION OF THE DRAWINGS

In the drawings which illustrate the best mode presently contemplated for carrying out the present invention:

FIG. **1** is a perspective view of a power press having the feed of the present invention;

FIG. **2** is a rear elevational view of the roll feed per se;

FIG. **3** is a fragmentary perspective showing the flywheel and eccentric assembly of the power press;

FIG. **4** is a top plan view of the roll feed;

FIG. **5** is a section taken on line **5—5** of FIG. **4**;

FIG. **6** is a section taken on line **6—6** of FIG. **2** showing the cam means in the position wherein the feed rollers are disengaged;

FIG. **7** is a section taken on line **7—7** of FIG. **2**;

FIG. **8** is a fragmentary side elevational view, on an enlarged scale, looking from the left with respect to FIG. **2**; and

FIG. **9** is a view similar to FIG. **7** showing the toggle means and the cam latch means in their operative positions.

Referring to the drawings, and more particularly FIG. **1**, there is shown generally at **10** a power press comprising a roll feed mechanism shown generally at **12.** The power press **10** comprises conventional apparatus and per se forms no part of the present invention, and hence detailed description thereof is deemed unnecessary. Generally speaking, however, it will be noted that the press **10** comprises a table or bed **14** on which is mounted a head portion **16** from which a reciprocating ram **18** depends. It will be understood that ram **18** carries any suitable tool or die **20** which cooperates with die bed **22** for successively performing a desired operation on metallic strip stock **24** which is intermittently fed by the roll feed **12.** More specifically, the roll feed **12** functions to intermittently feed the strip stock, the feed being discontinued while the die **20** performs its operation on the stock, after which the stock is automatically fed inwardly a sufficient distance so that the same operation may again be performed. As will be obvious, in high speed presses which sometimes operate at a speed of more than 1000 revolutions per minute,

it will be apparent that the feed must be reliable and accurate, as well as durable in use.

The roll feed **12** comprises a housing **26** secured to the end of table **14** by any suitable means, which has mounted therein lower feed roller **28** and upper feed roller **30**. More specifically, lower feed roller **28** is mounted on shaft **32** which is journalled in vertical walls **34, 36** and **38** of the housing **26.** Secured to shaft **32** is a gear **40** which meshes with a larger gear **42** carried by shaft **44** journalled in vertical wall **34.** Oscillatory movement is imparted to shaft **44** by means of lug **46** which is clamped thereon, as by clamping screw **48** (see FIG. **8**) and which at its other extremity is connected by a universal ball joint **50** to arm **52** which in turn is connected to frame **54,** as by universal ball joint **55.** As will be seen most clearly in FIGS. **1** and **2,** frame **54** is pivotally connected to top wall **56** of the housing **26** as at **58** whereby said frame member may pivot up and down. The aforesaid oscillating movement of frame **54** is imparted to it by means of arm **60** which is connected to the frame by universal ball joint **62.** At its upper end, the arm **60** is connected to an eccentric **64** carried by flywheel shaft **66** of the press **10.** It will therefore be seen that as flywheel **67** and eccentric **64** rotate, the crank arm **60** will be caused to reciprocate, thereby imparting up and down pivotal movement to the frame **54,** which movement in turn causes oscillation of lug **46** by means of arm **52;** and since the lug **46** is keyed to shaft **44,** it follows that the latter will likewise oscillate. The same oscillatory movement is transmitted to lower roller **28** through the aforesaid gears **42** and **40.** At its outer extremity, adjacent vertical wall **38,** shaft **32** carries gear **68** which meshes with gear **70** carried by shaft **72** on which upper roller **30** is mounted. Thus, oscillation of lower roller **28** is imparted to upper roller **30** by means of gears **68** and **70.**

It is important to note that shaft **72** is not journalled directly to the housing **26,** but rather is journalled in a pair of spaced levers **74** which are pivotally mounted to vertical walls **36** and **38** as at pivot points **76.** As will be seen most clearly in FIGS. **6, 7** and **9,** pivotal movement of the levers **74** about pivot point **76** in a clockwise direction will cause upper roller **30** to be carried away from lower roller **28** so as to discontinue driving engagement with strip stock **24** located therebetween. It will be understood that even though the rollers **28** and **30** separate sufficiently to discontinue feeding engagement with the strip stock **24,** the driving engagement between the rollers by means of gears **68** and **70** continues to exist, since the depth of the gear teeth is sufficient to permit some degree of separation between the rollers without effecting disengagement of the gears. Adjustment screws **78** mounted in top wall **56** of housing **26** cooperate with springs **80** to normally urge levers **74** in a counterclockwise direction about pivot point **76;** whereupon upper rollers **30** will normally be resiliently biased into contact with lower roller **28.** By adjusting the screw **78,** the resilient pressure contact between the rollers **28** and **30** may be readily adjusted.

It will be noted that gear **70** is preferably a split gear comprising halves A and B, which halves are rotatably adjustable with respect to each other, said adjustment being provided to reduce backlash when the spacing between gears **68** and **70** is changed, in the manner hereinafter to be described, to adjust for different thicknesses of strip stock **24.**

The levers **74** are fixedly secured to a shaft **82** that extends therebetween, said shaft having a cam **84** rotatably mounted thereon. More specifically, cam **84** is clamped, as by screw **86,** onto hub portion **88** which clampingly receives link **90** which is connected, as by universal joint **92,** to arm **94,** which in turn is connected by universal joint **96** to arm **98** fixedly carried by ram **18** of press **10.** It will thus be seen that as ram **18** reciprocates upwardly and downwardly, arm **98** will impart oscillatory movement to cam **84** through arm **94** and link **90.** Mounted to the housing **26,** as at **100,** is a plate **102** which rotatably carries a roller follower **104** which engages cam **84.** More specifically, as will be seen, cam **84** is generally circular and comprises a relatively large radial portion **106** and a reduced radial or dwell portion **108.** As previously described, springs **80** normally bias the levers **74** in a counterclockwise direction around pivot point **76** whereby the cam **84** will be resiliently urged upwardly into engagement with roller follower **104.** More specifically, when the high point **106** of cam **84** is in engagement with follower **104,** lever **74** will be forced downwardly or rotated in a clockwise direction about pivot point **76,** against the action of spring **80,** whereupon roller **30** will be raised away from roller **28** sufficiently to disengage the strip stock **24** located therebetween. When, on the other hand, during oscillation of the cam **84** the low point **108** thereof moves into engagement with follower **104,** that end of the lever **74** will, in effect, be raised so as to impart a counterclockwise movement to the lever whereby roller **30** will again make driving contact with roller **28** to feed the strip stock **24.** It will be understood that the springs **80** will always serve to maintain the cam **84** in engagement with follower **104;** and hence when the follower moves off the high point of cam **84,** the springs **80** will automatically move the lever until the low point of the cam moves upwardly into engagement with the follower.

Thus it will be seen that it is reciprocation of the ram **18** that directly controls oscillation of cam **84,** which means that it becomes a simple matter to properly position the cam so that the rollers **28** and **30** drivingly engage the strip **24** to feed same during forward oscillation of the rollers, and, by the same token, to cause the rollers to separate to discontinue driving engagement with the strip **24** during reverse oscillation of the rollers. It will be understood that the length of the feed stroke may be adjusted by radially adjusting the point of connection of the arm **60** to eccentric **64,** as is well known.

It has also been found desirable to provide positive limit means for the oscillatory movement of lug **46;** and, to this end, limit blocks **112** are secured in arcuate trackway **114** of plate **116,** which blocks function as positive limit means for the oscillatory stroke of lug **46,** as will be seen most clearly in FIGS. **1** and **8.** More specifically, lug **46** carries inwardly extending pin **117** which engages the blocks **112** to define the limits of the oscillatory travel of lug **46,** note FIG. **2.** Thus, the blocks **112** insure that the proper feed stroke is maintained, and it will be understood that the position of said blocks may be adjusted to conform to different length strokes.

As will be obvious, the amount of undercut of dwell portion **108** with respect to radial portion **106** will determine the extent of movement of lever **74,** it being understood that only a small degree of movement takes

place, i.e., just enough to permit the rollers **28** and **30** to separate sufficiently so that the strip **24** extending therebetween will no longer be driven. If, however, thicker or thinner strip stock is employed, thus necessitating an increase or decrease in spacing between the rollers **28** and **30,** adjustment means are provided for slightly raising or lowering follower **104.** More specifically, an adjustment screw **110** is carried by top wall **56** of housing **26** and bears against the upper edge of plate **102** to act as stop means for limiting the uppermost position of roller **104.** As will be obvious, appropriate adjustment of this screw will function to reposition follower **104** by pivoting plate **102** about pivotal mounting **100,** whereupon if the follower **104** is permitted to slightly elevate, then obviously a greater degree of spacing will exist between the rollers **28** and **30,** and vice versa.

Whenever the press **10** is stopped, the ram will always be in a position of top dead center, or close thereto, in which position the low point of cam **84** will be in engagement with follower **104,** whereupon the rollers **28** and **30** will be in driving relation with respect to each other. When it is desired to once again start the press **10,** it is desirable that means be provided for forcing lever **74** downwardly or in a clockwise direction so that the rollers **28** and **30** will be separated sufficiently to permit the stock **24** to be manually threaded therethrough to a desired position with respect to ram **18.** In order to accomplish this objective, a toggle mechanism **118** is mounted to the top of housing **26,** which toggle is operative to extend pin **120** into engagement with upright post **122** carried by block **124** which is clamped or keyed to shaft **82.** Thus, it will be seen that when toggle **118** is moved from the position of FIG. **6** to the operative position of FIG. **9,** pin **120** engages post **122** to impart a sufficient degree of clockwise moment to shaft **82** and hence levers **74,** so as to cause the latter to move to the position illustrated in FIG. **9** wherein the rollers are in separated or nondriving relation, whereupon stock **24** may be manually pushed in through friction brake and lead-in guides **125** until the strip passes between rollers **28** and **30** and assumes the desired position with respect to ram **18.** If at this point the toggle **118** were released and the press **10** started up, it will be obvious that the initial reciprocation of ram **10** would cause movement or feed of the strip stock. Since, however, it is desired that the strip be maintained in the precise position to which it is manually fed until the first press operation has been performed, means are provided for preventing movement or feed of the strip during the first operation of the press after start-up of the latter. More specifically, cam **84** is provided with a latch member **126** that is rotatably mounted with respect thereto and extends radially to a position wherein it overlies a part of dwell portion **108.** Any suitable resilient means are provided for normally urging or rotating latch member **126** in a clockwise direction to the inoperative position illustrated in FIGS. **6** and **7.** When, however, the press **10** has been stopped, and toggle member **118** has been actuated to force lever **74** and cams **84** in a downward or clockwise direction, the latch member **126** is manually swung or rotated to the opposite end of dwell portion **108,** as illustrated in FIG. **9.** At this point, toggle mechanism **118** is released whereupon latch member **126** is clampingly engaged in said operative position due to the pressure thereagainst of follower **104.** As will be noted, latch member **126** is specifically designed so as to fill a part of dwell portion **108;** and hence, in effect, when latch **126** is in its operative position, it actually forms a continuation of enlarged radial portion **106** of the cam member so as to increase the working surface thereof. Thus, the presence of latch member **126** in its operative position prevents the cam **84** and plate **74** from moving upwardly to move the feed rollers into driving relation with strip **24.** However, as soon as ram **18** has moved sufficiently to oscillate cam **84** to the point where radius **106** makes engagement with follower **104,** latch member **126** will be released and will automatically move to inoperative position once again, either by suitable spring means, or by gravity. This arrangement permits the first operation of the press **10** to be performed on the stock **24** at the precisely desired position on the latter, since no feeding of the stock takes place until the first reciprocation of the ram has been completed and latch **126** has moved to inoperative position to then allow the feed means to take over in the manner previously described.

As will be obvious, ram **18** and eccentric **64** operate in timed relation with respect to each other so that as the feed rollers **28** and **30** are being driven or oscillated in a forward or feed direction, cam **84** will be properly oscillated so as to insure that the feed rollers are making driving or feeding engagement with the strip **24.** Conversly, when the feed roller **28** and **30** are oscillating or rotating in a reverse direction, cam **84** insures that the strip **24** will be disengaged by rollers **28, 30.** By loosening screw **86** and adjusting the position of cam **84** on hub **88,** the timing of cam **84** may be adjusted, i.e., the time at which the cam moves either up or down to control movement of roller **30,** all as aforesaid.

While there is shown and described herein certain specific structure embodying the invention, it will be manifest to those skilled in the art that various modifications and rearrangements of the parts may be made without departing from the spirit and scope of the underlying inventive concept and that the same is not limited to the particular forms herein shown and described except insofar as indicated by the scope of the appended claims.

What is claimed is:

1. A roll feed for intermittently feeding strip stock to a power press having a reciprocating ram, comprising a pair of drivingly engaged rollers between which said stock extends, means carried by said press imparting oscillatory movement to said rollers, one of said rollers being movable between a first position wherein said stock is drivingly engaged by said rollers and a second position wherein said stock is disengaged, resilient means normally urging said one roller to said first position, and cam means controlled by movement of said ram for moving said one roller to said second position, said cam means being operable in timed relation to said oscillating means whereby so long as said rollers are rotating in a forward or feed direction, said one roller is in said first position, and so long as said rollers are rotating in a reverse direction, said one roller is in said second position, said one roller being journalled on a pivotally mounted lever, said cam means being rotatably carried by said lever, link means interconnecting said cam means and said ram whereby reciprocation of the latter imparts oscillatory movement to the former, and a cam follower cooperating with said cam means during oscillation of the latter to cause pivoting of said

lever to move said one roller to its aforesaid first and second positions.

2. In the roll feed of claim **1,** manual means operable to move said one roller to said second position regardless of the position of said ram.

3. In the roll feed of claim **2,** said manual means comprising a toggle linkage.

4. In the roll feed of claim **2,** means carried by said cam means and movable with respect thereto to maintain said one roller in said second position for a predetermined period of time, regardless of the position of said ram.

5. In the roll feed of claim **4,** said predetermined period of time being approximately equal to the time required for one stroke of said ram.

6. In the roll feed of claim **4,** said cam means being generally circular and having a dwell portion, said movable means comprising a latch member which when moved to operative position fills a part of said dwell portion so that the working surface of said cam temporarily assumes a generally constant radius.

7. In the roll feed of claim **6,** said latch member being rotatably mounted with respect to said cam means, and means normally biasing said latch member to inoperative position.

8. A roll feed assembly for intermittently feeding strip stock to a power press or the like comprising a housing, a first roller journalled in said housing, a lever pivotally mounted on said housing, a second roller rotatably carried by said lever, gear means drivingly interconnecting said rollers, resilient means normally urging said lever to a first position wherein said second roller engages said first roller to feed stock passing therebetween, means imparting oscillating movement to said rollers, a generally circular cam rotatably mounted on said lever, said cam having a dwell portion, a follower mounted on said housing, said resilient means urging said cam against said follower, means imparting oscillating movement to said cam, said movement causing said second roller to move away from said first roller when said follower engages the high point of said cam and permitting said second roller to engage said first roller when said follower engages said cam dwell portion, means correlating the oscillation of said rollers with the oscillation of said cam whereby when said rollers are rotating in a forward or feed direction, they drivingly engage stock therebetween to feed same, and when said rollers are rotating in a reverse direction, they are spaced from each other so that the stock is not engaged, and manual means operable to pivot said lever to a position wherein said rollers are separated, regardless of the position of said cam.

9. The assembly of claim **8** further comprising means for readily adjusting the position of said follower to permit adjustment of the spacing between said rollers when the latter are out of engagement with each other.

10. In the assembly of claim **8,** latch means carried by said cam and movable to an operative position to fill a part of said dwell portion whereby the working surface of said cam assumes a substantially constant radius, and means normally biasing said latch means to an inoperative position, whereby when said latch means is moved to its operative position, said second roller is maintained spaced from said first roller.

11. In the assembly of claim **10,** said latch means being maintained in its operative position solely by engagement with said follower, said latch means automatically moving to inoperative position as soon as oscillation of said cam causes said follower to move out of contact with said latch means.

* * * * *