

[54] **STOCK FEEDING DEVICE**

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[51] Int. Cl. **B65h 17/22**

[58] Field of Search. 226/154, 156, 35,
226/152, 155, 176, 177

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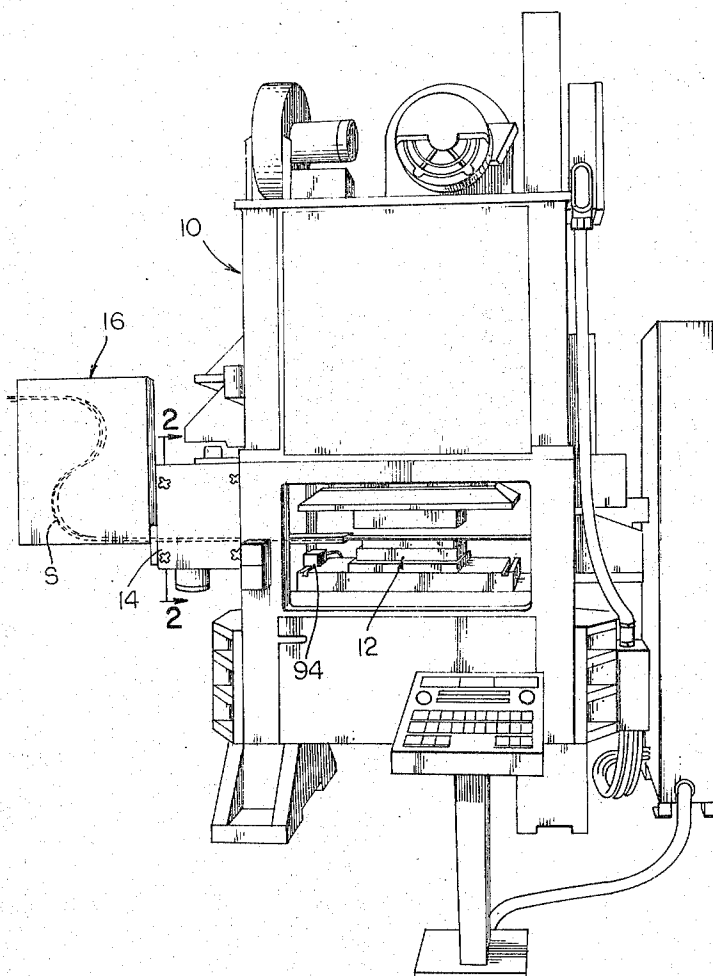
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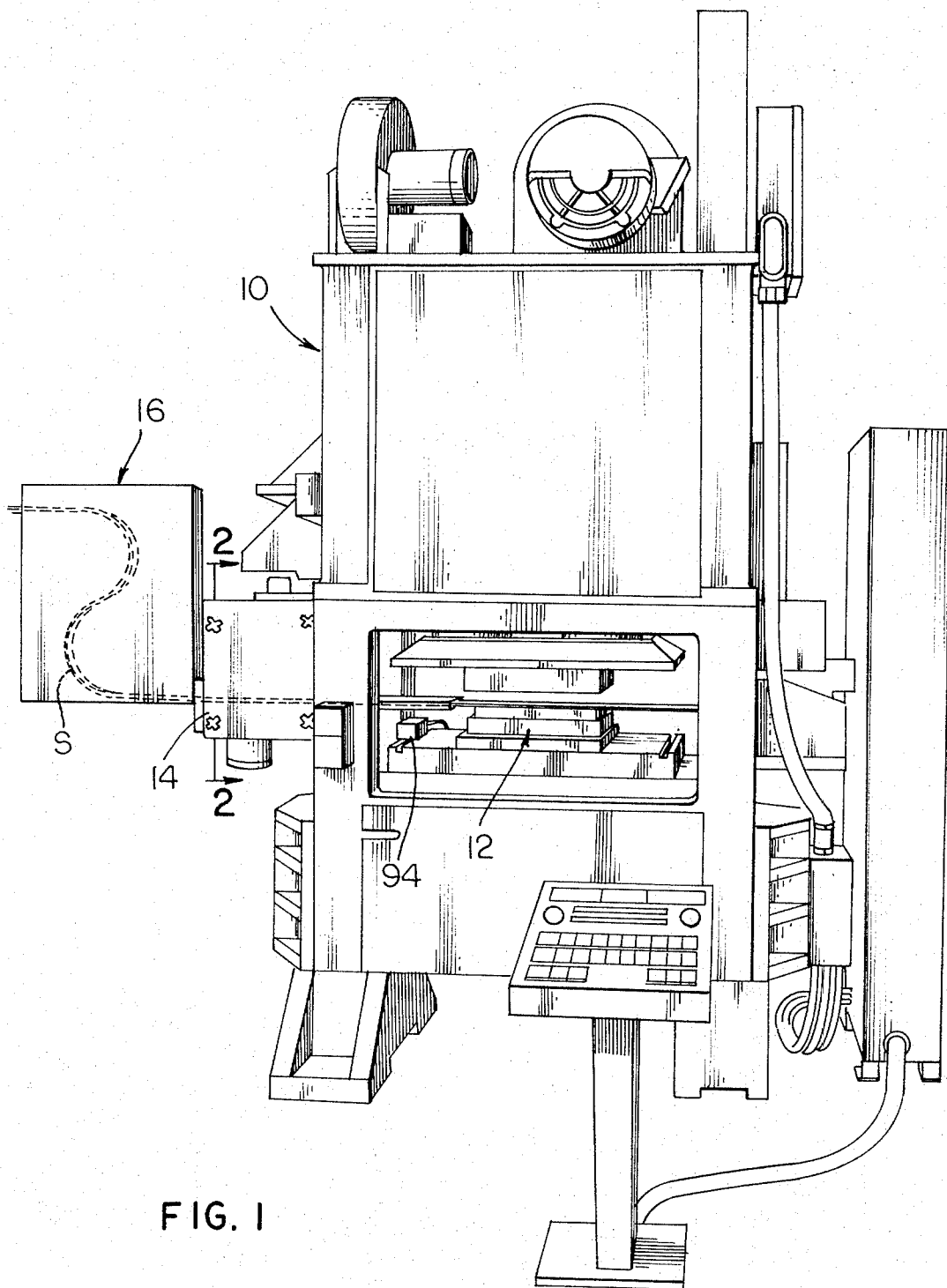
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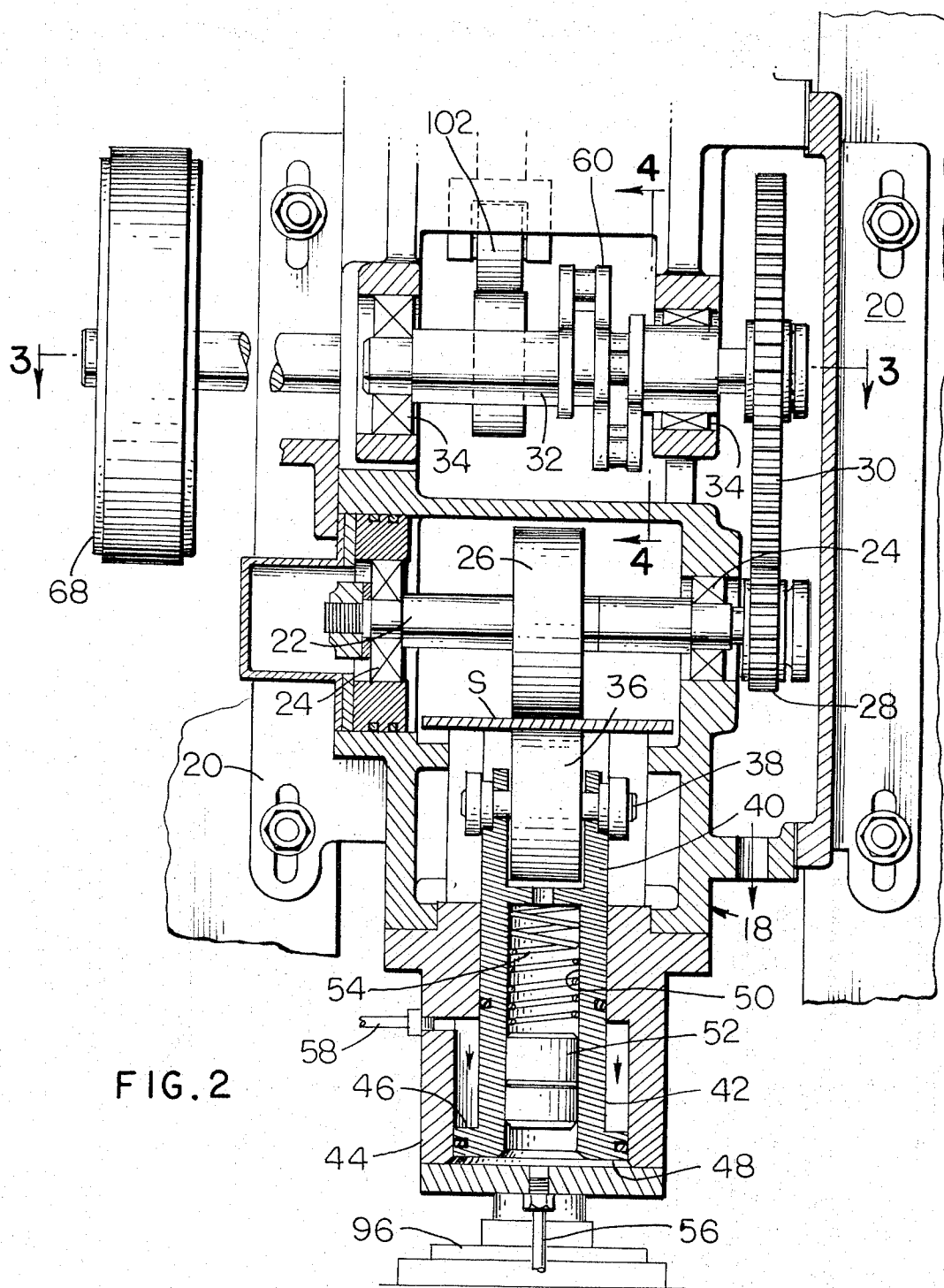
[57] **ABSTRACT**

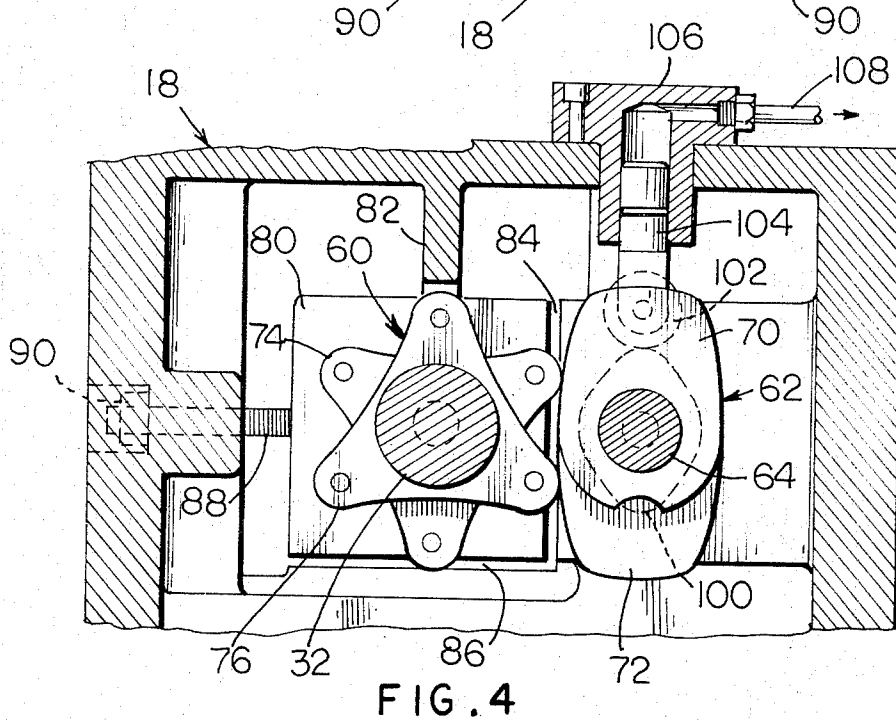
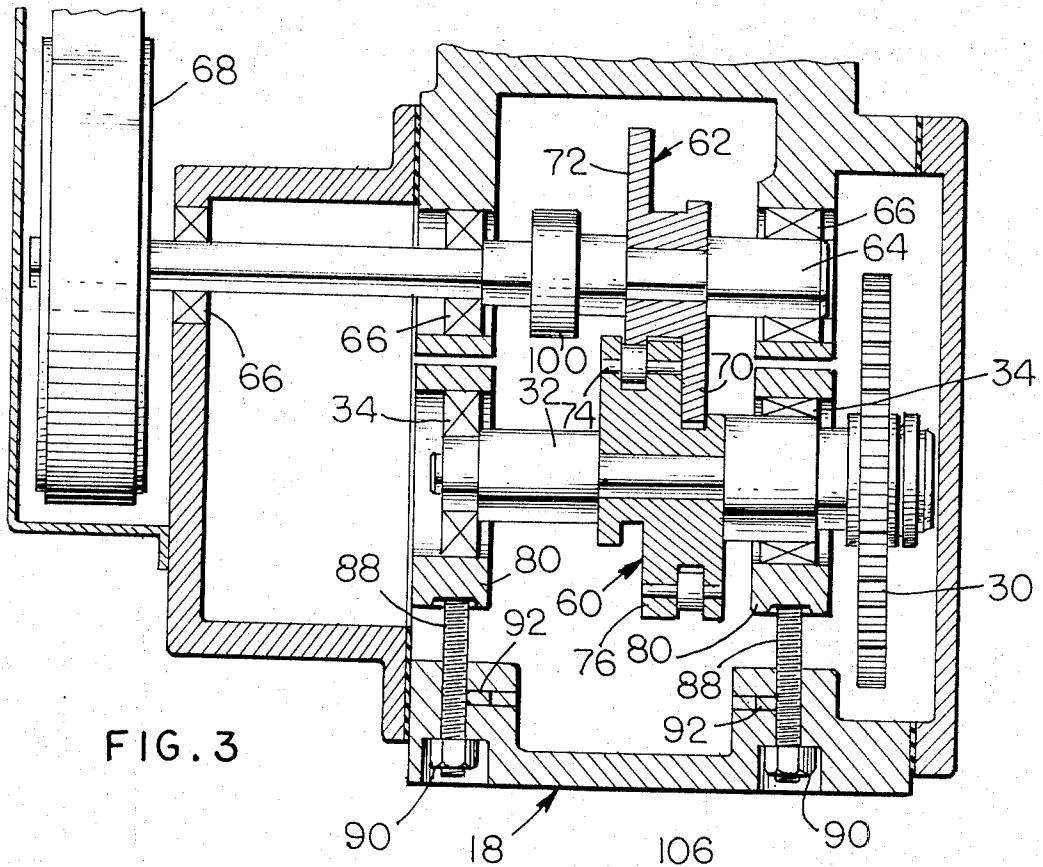
A stock feeding device in which a pair of rollers frictionally engage the stock therebetween, with one of the rollers being intermittently driven and the other roller being pressed toward the driven roller. The rollers are contained within a housing which includes adjusting screws for eliminating lost motion between the elements of the intermittent drive which are also mounted in the housing. An arrangement is provided for momentarily retracting the idler roller away from the driven roller between feed intervals of the rollers.

18 Claims, 5 Drawing Figures









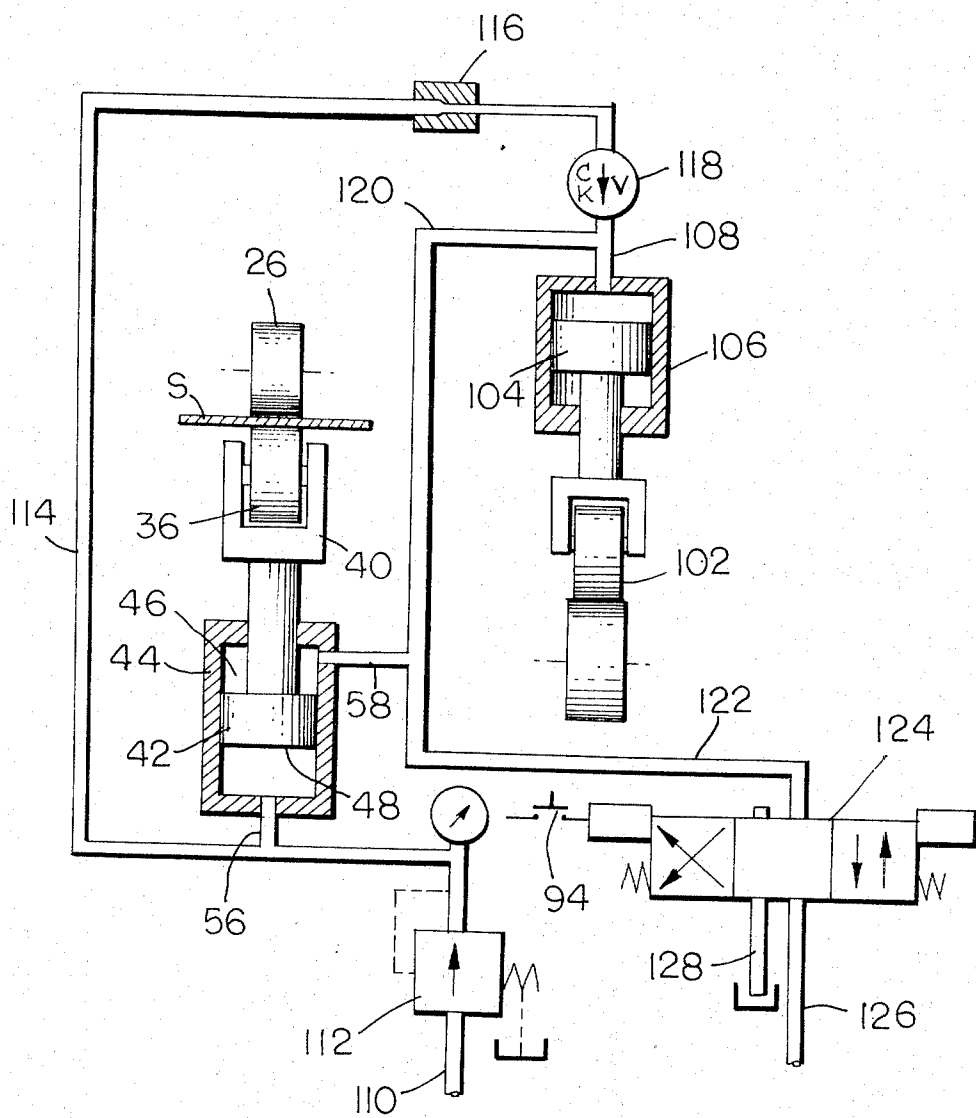


FIG. 5

STOCK FEEDING DEVICE

The present invention relates to a feed device and is particularly concerned with a feed device for feeding stock into a machine, such as a press.

Stock devices for feeding stock, such as strip stock, into a machine are known, and quite often take the form of a pair of feed rollers between which the stock passes and which rollers frictionally engage the stock and feed the stock therebetween as the feed rollers are driven in rotation.

The present invention is concerned with a feed device of the nature referred to and particularly characterized in being capable of efficient operation at extremely high speeds. By high speeds, it is meant the feeding of stock at speeds up to about 1,600 feeds per minute or more, with a feed advance of 2 inches or more.

It has been found that most conventional feed devices are incapable of operating at the high speeds referred to and those that can operate at the aforementioned high speeds are extremely noisy and do not have ample service life for economical operation, and are usually capable of feed lengths of less than 1 inch.

With the foregoing in mind, a primary objective of the present invention is the provision of a superior feed device, especially for feeding stock into a machine, such as a press, which is capable of operating for long periods at extremely high rates of speed, and with significant feed lengths.

Another object of the invention is the provision of a feed device of the nature referred to which is relatively quiet in operation and which has a long service life.

Still another object is the provision of a feed device of the nature referred to which is easy to service and which incorporates adjustment means that permit the achievement of precise fitting and preloading of critical components while allowing normal machining tolerances to be employed in its manufacture.

These and other objects and advantages of the present invention will become more apparent upon reference to the following detailed specification taken in connection with the accompanying drawings in which:

FIG. 1 is a somewhat schematic view of a press having a feed device according to the present invention mounted thereon for feeding stock into the press.

FIG. 2 is a vertical transverse section through the feed device looking in at the feed device from the side thereof facing toward the press, and is indicated by line II—II on FIG. 1.

FIG. 3 is a plan sectional view indicated substantially by line III—III on FIG. 2.

FIG. 4 is a fragmentary sectional view indicated by line IV—IV on FIG. 2.

FIG. 5 schematically illustrates a fluid circuit associated with the feed device.

BRIEF SUMMARY OF THE INVENTION

The feed device according to the present invention comprises a pair of opposed feed rolls with one mounted on a shaft which is rotatably supported in the frame of the device on a fixed axis and to which shaft is connected an intermittent drive. The other feed roller is movably mounted in the casing of the device for movement toward and away from the driven roller and includes a fluid actuator which urges it toward the driven roller and which fluid actuator can be supplied

with fluid in a direction to urge the said roller away from the driven roller.

The intermittent drive for the driven roller is in the form of an indexing drive having a cam driver continuously driven in rotation and a follower which is intermittently driven thereby and which is geared to the shaft of the driven roller.

A feature of the present invention is the provision of a mounting arrangement for the follower shaft such that all lost motion can be eliminated between the drive cam and follower, thereby providing for high speed quiet operation of the feed device.

DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings somewhat more in detail, the press shown in FIG. 1 is generally indicated at 10 and has mounted therein a die set 12 to which stock to be operated is fed. The stock is fed by a feed device 14 mounted at the left side of the press as it is viewed in FIG. 1 and which receives the stock to be fed from a device 16 which controllably maintains a slack loop in the stock ahead of the feed device.

The feed device, with which the present invention is concerned, is shown more in detail in FIGS. 2 to 5. In these figures, it will be noted that the device comprises a frame generally indicated at 18 and which includes mounting flange means 20 by means of which it is adjustably secured to the press into which it is to feed stock.

Frame 18 has a first shaft 22 therein journaled on anti-friction bearings 24 with a first feed roller 26 keyed to the shaft to rotate therewith. Shaft 22 carries a pinion 28 at one end meshing with a gear 30 mounted on another shaft 32 journaled in the frame on bearings 34. Shaft 32 is intermittently driven by a device to be explained more fully hereinafter.

Beneath driven roller 26 in opposed relation thereto is a second feed roller 36 which may be considered an idler roller in that it is not driven in rotation. The stock being fed, indicated at S, is engaged between the rollers and is frictionally advanced thereby when the driven roller rotates.

Idler roller 36 is supported on a shaft 38 mounted in a yoke 40 which extends downwardly from roller 36 and terminates in a piston portion 42 reciprocally mounted in a cylinder 44 formed in the housing of the device. Piston 42 has an upwardly facing area 46 and a downwardly facing area 48.

Piston 42 has an axial bore 50 extending therein from the bottom and mounted in bore 50 is a piston element 52 with compression spring means 54 in bore 50 interposed between the bottom thereof and the upper side of piston element 52.

Pressure supplied to the undersides of the piston elements via conduit 56 urges the idler roller 36 upwardly toward roller 26 whereas a supply of fluid to upwardly facing area 46 of piston 42 via a conduit 58 will urge roller 36 away from roller 26.

The intermittent drive for roller 26 will best be seen in FIGS. 3 and 4 wherein it will be seen that shaft 32 supports a cam follower 60 which is operatively engaged by an indexing cam 62 mounted on a further shaft 64 rotatably supported in frame 18 by bearings 66. Shaft 64 extends outwardly from the housing of the device and has mounted thereon a pulley 68, preferably a cog-type pulley about which is entrained a cog belt that is driven by press 10, preferably by a crankshaft of

the press so that operation of the feed device is synchronized with operation of the press while all lost motion between the crankshaft of the press and shaft 64 can be eliminated by tensioning the drive belt.

As will best be seen in FIG. 4, cam 62 comprises a pair of individual cam portions 70 and 72 which cooperate with the two portions 74 and 76 of the follower on shaft 32 so that in one rotation of shaft 64 two indexes of shaft 32 will take place, each index amounting to 60° of rotation of shaft 32. The same type of arrangement could provide for one index of shaft 32 for each revolution of shaft 64 or for more than two indexes if so desired.

As will be seen in FIGS. 3 and 4, shaft 32 has its bearings 34 contained in portions 80 which are integral with the housing 18 of the device by being connected to the housing by webs 82. This construction can be arrived at by casting the housing and then by cutting around portions 80 as indicated at 84 and 86 so that each portion 80 is supported only by web 82.

The purpose of this is to permit flexible support of portions 80 thereby to permit shaft 32 to be adjusted toward and away from shaft 64 to eliminate all lost motion in the intermittent drive consisting of drive 62 and cam follower 60. Other means of yieldably supporting portions 80 can be provided, but that which has been described and illustrated is both convenient and inexpensive and operates quite satisfactorily.

Each of the portions 80 on the side facing away from shaft 64 is abutted by a respective abutment screw 88 threadedly mounted in the housing and adapted for adjustment thereby to take up all lost motion between indexing cam 62 and cam follower 60. It has been found that the lost motion between these drive elements can be eliminated to the point that, even in an extremely high speed operation, substantially no impact will be developed thereby and any lost motion introduced into the system by manufacturing tolerances of the various parts of the device can be compensated. Advantageously, each screw 88 has a nut 90 thereon and, furthermore, a locking set screw 92 is preferably provided for each screw 88.

The stock feeding out of the device, which is toward the right, as viewed in FIG. 1, is confined from above while beneath the stock is a sensing head 94 sensitive to downward buckling of the stock.

To facilitate vertically adjusting the feed device on the press, a hydraulic jack 96 may be arranged between the press frame and the feed device. When the device is in operation, it is bolted tight against the press frame, but during adjustment thereof, the hydraulic jack 96 becomes useful.

FIGS. 3 and 4 also show that shaft 64 has fixed thereto a two lobed cam 100 which engages a roller 102 mounted on a piston 104 that is reciprocable in a cylinder 106 carried by housing 18. Cam 100, for the drive illustrated, has two rises thereon which cause piston 104 to move upwardly in its cylinder during each dwell period of the cam follower 60 and the parts connected thereto and which includes driven feed roller 26.

The upward movement of piston 104 displaces fluid into a conduit 108 which, as will be seen hereinafter, is connected to conduit 58 so that the displaced fluid will cause piston 42 to move downwardly to separate idler roller 36 from stock S and from driven feed roller 26. The purpose of this arrangement is to release the

stock from the feed rollers immediately after a feed cycle so that the stock can move somewhat as it is influenced by the pilot pins of the die set in which it is being operated, if necessary.

The hydraulic circuit of FIG. 5 shows more in detail the fluid connections employed in the device. In this view, a 400 pound per square inch supply line 110 is connected to a regulating valve 112, the output side of which supplies fluid to a conduit 114 at about 150 to 300 pounds per square inch. Conduit 114 is connected to aforementioned conduit 56 leading into the bottom of cylinder 44 and is also connected through a restrictor 116 to the inlet of a check valve 118, the outlet side of which is connected to conduit 108 leading into the upper end of cylinder 106.

The conduit 58 leading to the upwardly facing area 46 of piston 42 is connected by conduit 120 with conduit 108 and is also connected by conduit 122 with a service port of a closed center reversing valve 124 having a high pressure conduit 126 connected to the inlet thereof and an exhaust conduit 128 connected to the exhaust port thereof.

Valve 124 in its centered position blocks off conduit 122 and in one end position connects conduit 122 with high pressure conduit 126 and in the other end position connects conduit 122 with exhaust. High pressure line 126 is about 1,000 pounds per square inch, and when this pressure is supplied to conduit 58, piston 42 will pull idler roller 36 downwardly away from driven roller 26.

During normal operation, valve 124 is in its centered position and, under these circumstances, each time piston 104 moves upwardly in its cylinder 106, fluid will be displaced through conduits 108 and 120 and conduit 58 to the upwardly facing area 46 of piston 42 and momentarily retract idler roller 36 downwardly away from driven roller 26.

The springs 54 between piston element 52 and piston 42 permit piston 42 to move downward without causing excessively high pressures to be developed on the downward facing area 48 of piston 42.

Valve 124 may be controlled in any conventional manner and, among other controls therefor, the sensor 94 provides for the shifting of valve 124 into position to retract idler roller 36 downwardly whenever the stock buckles downwardly between the feed rollers and the die set in the press.

Check valve 118 is provided so that fluid may be supplied as required to make up any leakage in the components connected to conduit 120, keeping the system filled with fluid on the upper sides of pistons 104 and 42. Thus the cam actuated motion of piston 104 will be positively transmitted by displaced fluid to produce a corresponding motion of piston 42 carrying idler roller 36. Solenoid valve 124 may be controlled by manual push buttons to shift its spool to the left to retract idler roll 36 so that stock may be inserted between the feed rolls to start a new coil of stock into the press. Valve 124 may then have its spool shifted to the right by push button control to permit the space above piston 42 to be connected to the drain so that the pressurized fluid below piston 42 will cause it to rise bringing idler roll 36 into contact with the stock S. No adjustment of any components is required to accommodate various conventional stock thicknesses; fluid will enter the space below piston 42 until the piston will no longer move upward. In practice, the electrical controls for valve 124

may be arranged to hold the spool in the right-hand position for a sufficient length of time to fully seat idler roll 36 against the stock, and then de-energize the valve solenoid, permitting the valve to move to its closed spring-centered position shown for operation of the feed.

Due to the high speed of operation of the device, the gears 28 and 30 are preferably continuously bathed in oil and other parts of the device are likewise supplied with lubricant, under pressure where necessary, in order to prevent wear and heating up of the parts.

What is claimed is:

1. In a feed device for feeding stock into a machine; a frame, first and second feed rollers in opposed relation in said frame, intermittent drive means operatively connected to said first roller for driving said first roller intermittently for alternating feed and dwell periods thereof, and means operatively connected to said second roller and urging said second roller toward said first roller so that stock between said rollers is frictionally engaged thereby, said intermittent drive means having a driven input element rotatably mounted in said frame and an output element also rotatably mounted in said frame and operatively engaged by said input element and intermittently driven thereby, means connecting said output element with said first roller, and preload means including a flexible portion carried by said frame and adjustable therein for adjusting the lost motion between said input and output elements.

2. In a device for feeding strip stock into a machine; a pair of feed rollers adapted to receive therebetween the stock to be fed, means urging said rollers toward each other for frictional engagement of stock thereby, means for driving at least one of said rollers intermittently for alternate feed and dwell periods of stock engaged by the rollers, and positive displacement fluid means operable during each swell period of the stock for moving said rollers away from each other thereby at least momentarily to release the stock from the rollers.

3. A feed device according to claim 2 in which said feed device includes a rotatable input shaft, a cam on said input shaft, a first piston actuated by said cam in response to rotation of said input shaft, a second piston connected to one of said rollers, and a closed hydraulic path extending between said pistons for movement of said second piston in roller separating direction in response to actuation of said first piston by said cam.

4. In a feed device for feeding stock into a machine; a frame, first and second feed rollers in opposed relation in said frame, intermittent drive means operatively connected to said first roller for driving said first roller intermittently for alternating feed and dwell periods thereof, and hydraulic means operatively connected to said second roller for forcing said second roller toward and away from said first roller whereby stock between said rollers is frictionally engaged and disengaged thereby, said hydraulic means including positive displacement means for producing the pressure to force said second roller away from said first roller.

5. A feed device according to claim 4 in which said drive means comprises a first element which rotates continuously and a second element operatively engaged by said first element and indexed thereby as said first element rotates, a first shaft supporting said first element, a second shaft supporting said second element, said frame comprising first portions supporting

said first shaft and second portions supporting said second shaft, said first portion being integrally fixed in said frame, web means in the frame integral with the frame and said second portions and yieldable to permit movement of said second portions toward and away from said first portions, and means in said frame engaging said second portions and adjustable to adjust the spacing between said second portions and said first portions to eliminate lost motion between said elements.

6. A feed device according to claim 4 in which said drive means comprises a first element which rotates continuously and a second element operatively engaged by said first element and indexed thereby as said first element rotates, a first shaft supporting said first element, said frame comprising first portions supporting said first shaft and second portions supporting said second shaft, said first portion being integrally fixed in said frame, web means in the frame integral with the frame and said second portions and yieldable to permit movement of said second portions toward and away from said first portions, and screws threaded into said frame and engaging said second portions on the sides thereof which face away from said first portion and adjustable in the frame to adjust the spacing between said second portions and said first portions to eliminate lost motion between said elements.

7. A feed device according to claim 4 wherein said hydraulic means includes a source of fluid under pressure, an actuator connected to said second roller, said actuator having an area responsive to fluid pressure to force said second roller away from said first roller, and valve means disposed between said fluid source and said actuator area.

8. A feed device according to claim 7 in which said valve means is a normally centered blocked center reversing valve, said valve in the centered position blocking fluid flow through the valve and in one shifted position connecting said area to said source and in another shifted position connecting said area to exhaust.

9. A feed device according to claim 7 which includes a cylinder and a piston therein, a conduit connecting said cylinder to said actuator area whereby movement of said piston in the cylinder will displace fluid from the cylinder to the area, and means driven by said intermittent drive means for moving said piston in said cylinder during each dwell period of said first roller.

10. A feed device according to claim 7 which includes a cylinder connected in closed circuit with said actuator area, a piston in said cylinder movable in one direction therein to displace fluid from the cylinder to the actuator area, said intermittent drive means including a continuously driven input shaft, and a cam on said input shaft operatively engaging said piston and operable during each dwell period of said first roller to move said piston in said one direction in said cylinder.

11. A feed device according to claim 4 in which said hydraulic means operatively connected to said second roller comprises a piston having a first area responsive to fluid pressure to urge said second roller toward said first roller and a second area opposed to said first area, means for supplying pressure fluid continuously to said first area, and other means for supplying pressure fluid to said second area.

12. A feed device according to claim 11 in which said other means comprises a source of fluid under pressure and a shiftable valve between said source to said second area.

13. A feed device according to claim 11 in which said other means comprises fluid displacing means operated by said drive means so as to displace fluid to said second area during each dwell period of said first roller.

14. A feed device according to claim 12 which includes means sensitive to buckling of the stock being on the outgoing side of said device and adapted for shifting said valve into position to cause a supply of fluid from said source to said second area.

15. A feed device according to claim 11 which includes a piston connected to said second roller, the end of said piston facing away from said second roller forming said first area, a cylinder in which said piston is reciprocable and forming a part of said frame, a bore extending into said piston from the end opposite said second roller, a piston element slidable in said bore, and compression spring means between said piston and the side of said piston element which faces away from said first area.

16. A feed device according to claim 15 in which said piston comprises a shoulder facing away from said first area and forming said second area.

17. In a feed device for feeding stock into a machine;

a frame, first and second feed rollers in opposed relation in said frame, intermittent drive means operatively connected to said first roller for driving said first roller intermittently for alternating feed and dwell period thereof, said drive means provided with a driven input element rotatably mounted in said frame and an output element also rotatably mounted on said frame and operatively engaged by said input element and intermittently driven thereby, means connecting said output element with said first roller, and preload means carried by said frame and including a flexible portion having adjustment means for adjusting the lost motion between said input and output elements.

18. A feed device according to claim 17 in which said drive means includes a first shaft supporting said first element, a second shaft supporting said second element, said frame comprising first portions supporting said first shaft and second portions supporting said second shaft with relative flexibility provided between said first and second portions of said frame, said preload means adapted to move said first and second portions relatively to each other.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,782,618

Dated January 1, 1974

Inventor(s) John E. Voorhees

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Col. 1, line 15, the comma (,) after "speeds" first occurrence, should be a period (.).

Col. 5, line 37 (Claim 2) "swell" should be --- dwell ---.

Col. 6, line 44 (Claim 9) "actuator" omitted between "the" and "area".

Col. 8, line 7 (Claim 17) "on" should be --- in ---.

Signed and sealed this 9th day of April 1974.

(SEAL)
Attest:

EDWARD M. FLETCHER, JR.
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents