Dec. 27, 1955 A. F. GROLL 2,728,571

STRIP STOCK FEEDERS

Filed Aug. 31, 1949 4 Sheets-Sheet 1

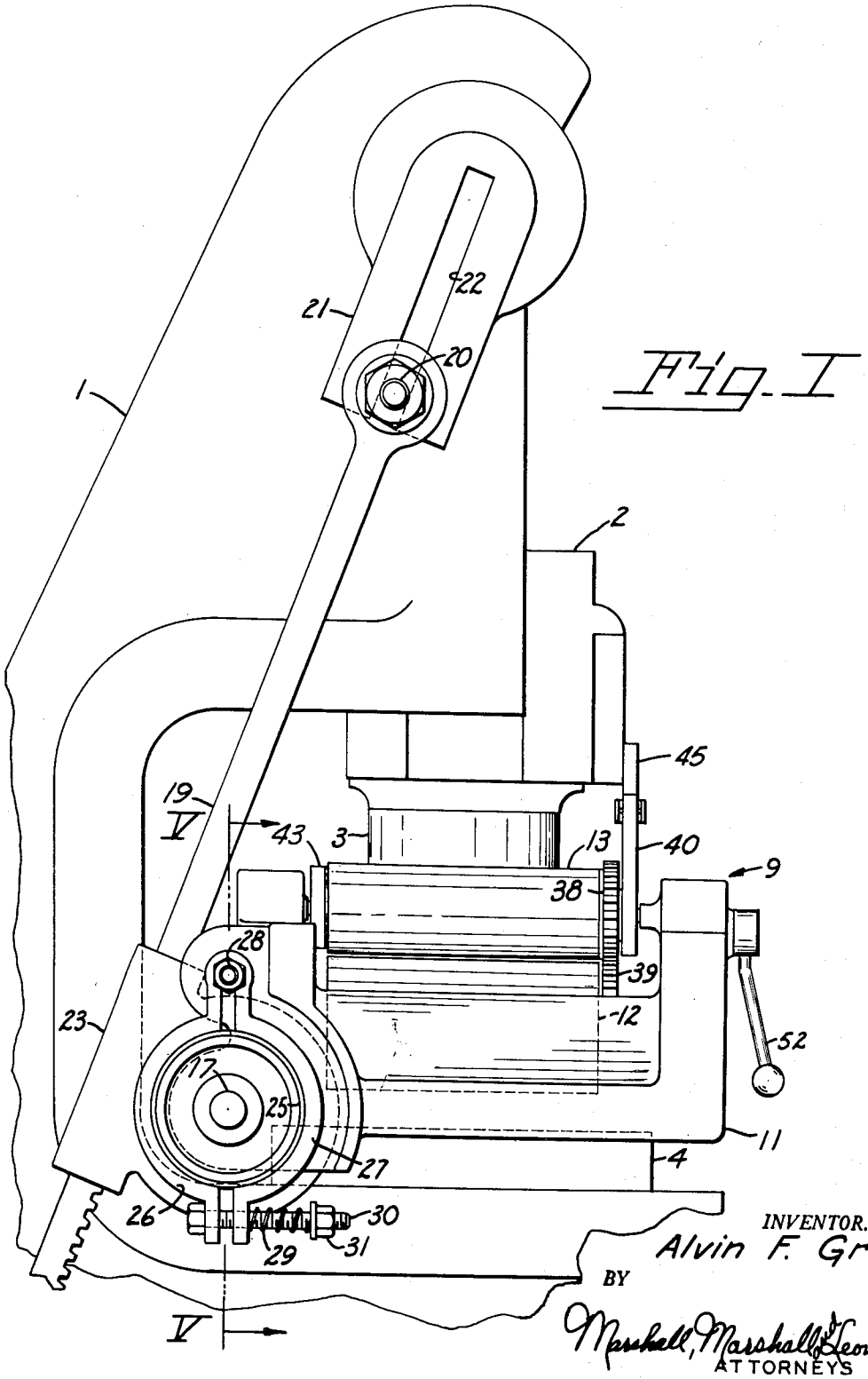


Fig. I

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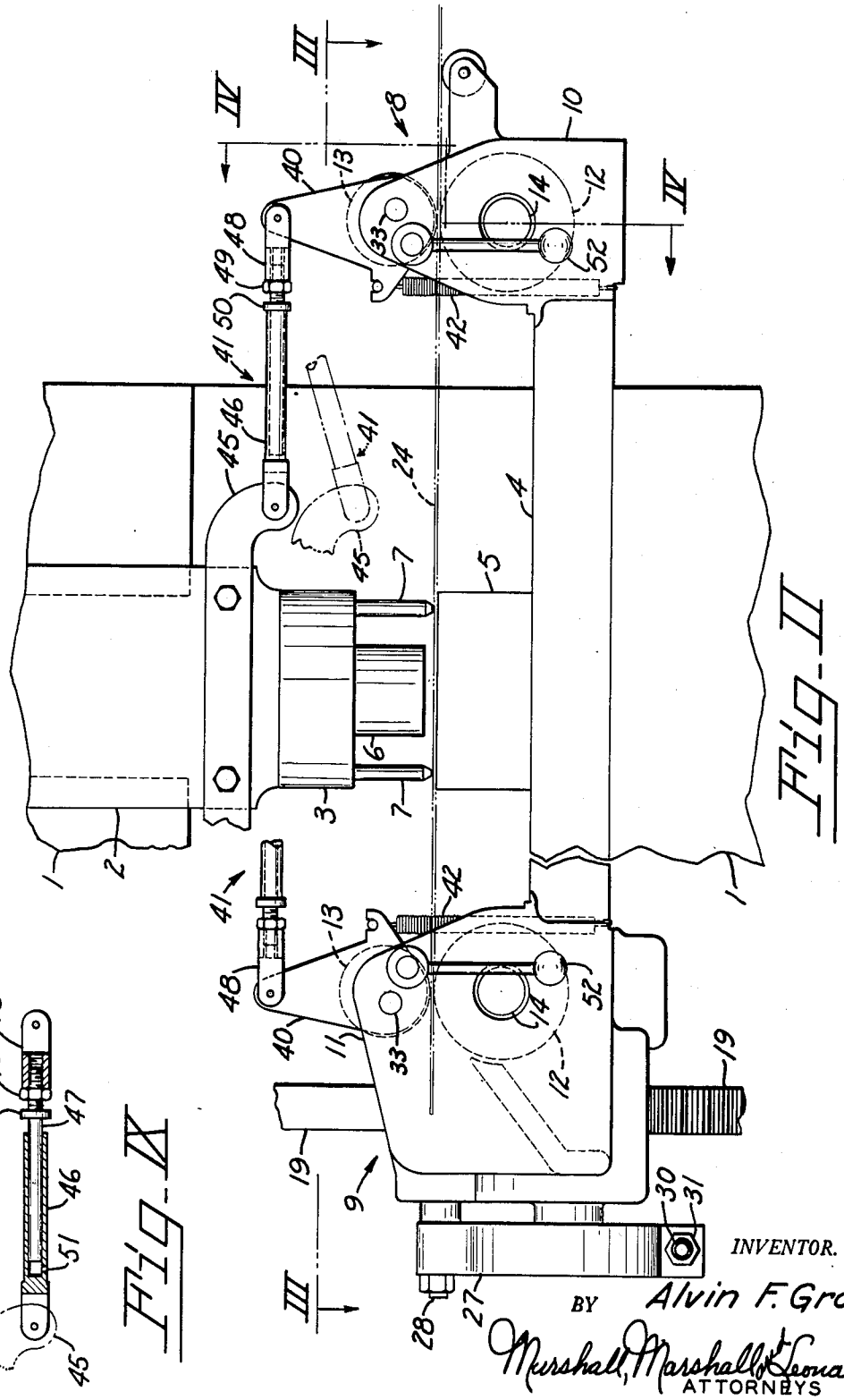


FIG. II

FIG. IX

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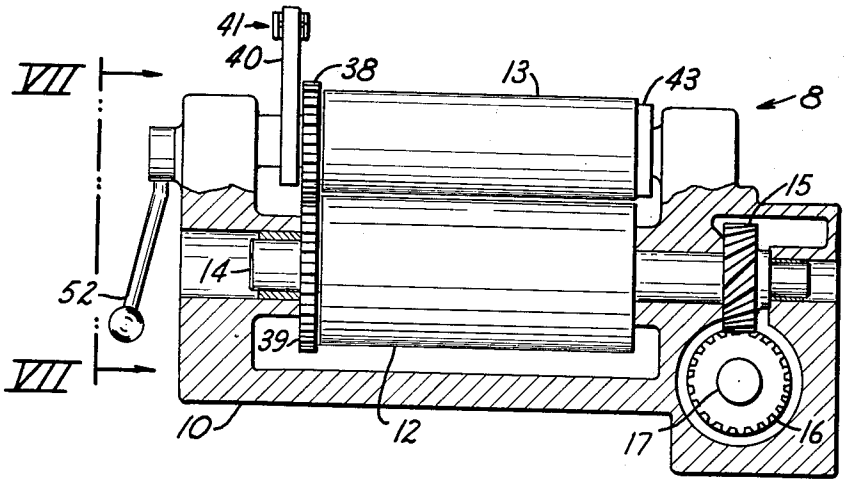


Fig. IV

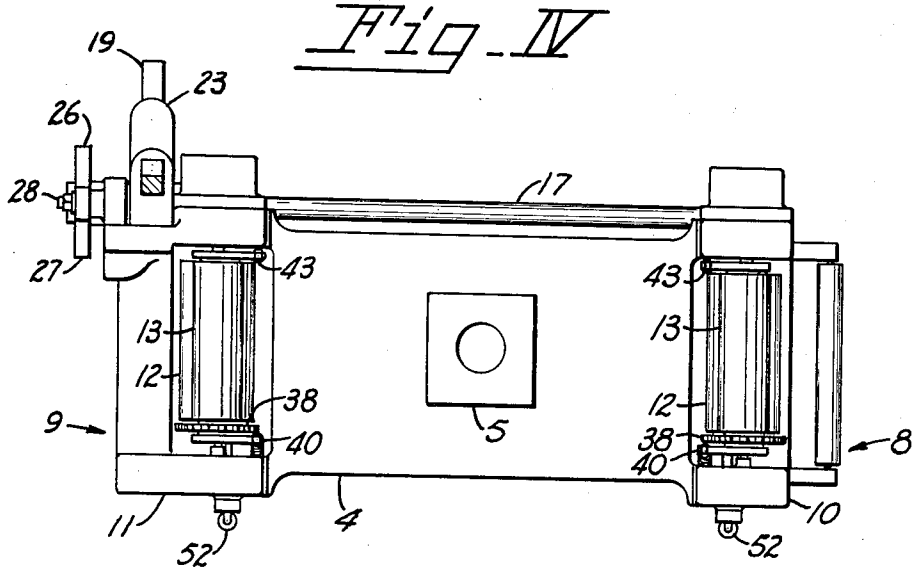


Fig. III

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STRIP STOCK FEEDERS

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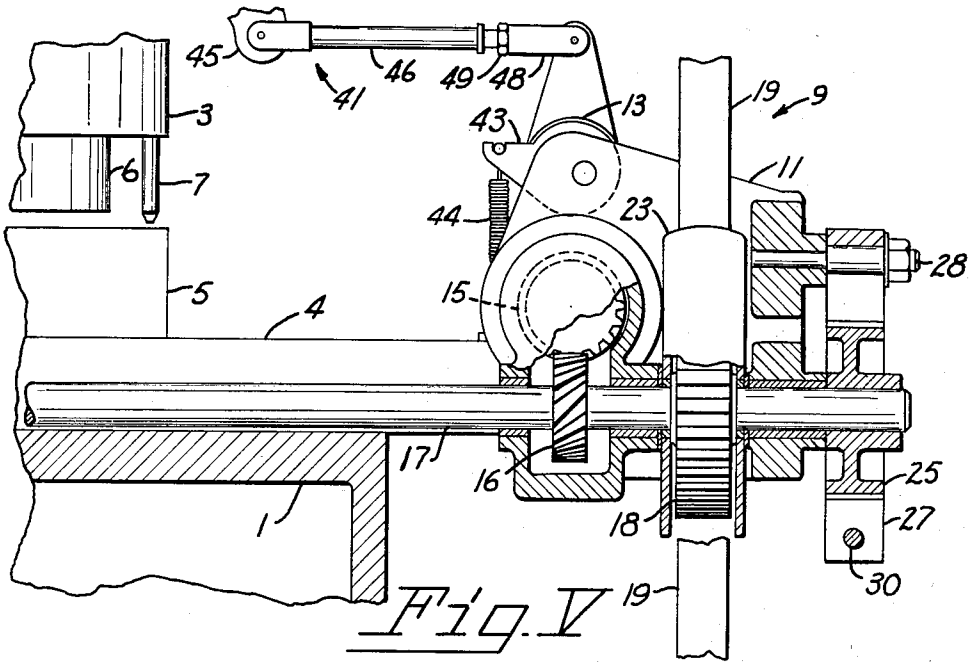


Fig. V

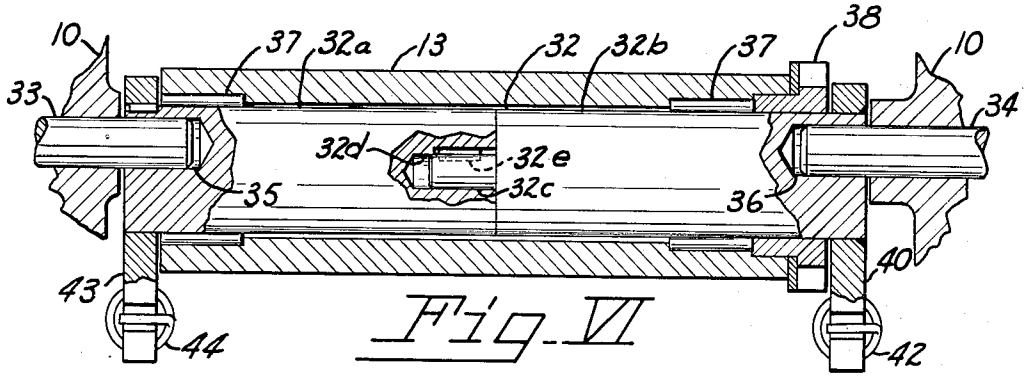


Fig. VI

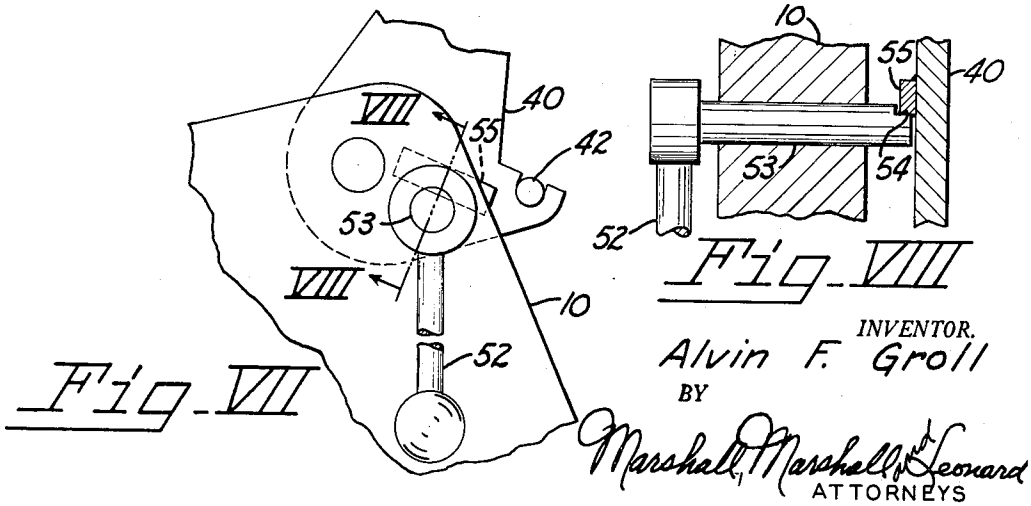


Fig. VII

Fig. VIII

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STRIP STOCK FEEDERS

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Application August 31, 1949, Serial No. 113,395

5 Claims. (Cl. 271—2.4)

This invention relates to strip material feeders such as are employed in punch presses and in particular to improvements in the construction of such feeders and the mounting of the feeders on the press.

Many punch presses are arranged for automatic operation and in such presses it is necessary that some means be provided for automatically advancing the stock to be worked the proper distance during each stroke of the press. While feeders have been designed to accomplish this result they are usually complicated in structure and are difficult to align so that they accurately feed the stock while maintaining even pressure across the width of the stock. Many of these feeders also obstruct valuable working space around the front of the press thus making it difficult to inspect and replace punches and dies or other equipment on the bed of the press.

The principal object of this invention is to provide a strip stock feeder for a press which feeder is simple to construct and yet which is very sturdy and reliable in operation.

Another object of the invention is to arrange the drive for a strip stock feeder so that such drive does not interfere with any of the normal operations of the press.

Another object of the invention is to carry the pressure roll of a strip stock feeder on an eccentrically mounted axle arranged so that limited rotation of the axle varies the spacing between the rollers.

An ancilliary object of the invention is to provide an overcenter strut and lever arrangement for rocking the pressure roller axle through a small angle during a selected portion of the midstroke of the press.

More specific objects and advantages are apparent from the following description of a preferred embodiment of the invention.

According to the invention the pressure roller of the feeder is eccentrically journaled on an axle that is rockable about an axis parallel to but offset from that of the pressure roller. The pressure roller and a cooperating driving roller are driven by mechanism including a shaft located beneath the level of the drive rollers and extending transversely of the press in the space generally behind and below the die plate of the press. The drive for the rollers is taken from the crank shaft of the press and by a gear and overrunning clutch is converted to intermittent one way rotation of the rollers to advance the strip block. The pressure of the pressure rollers is released by overcenter strut and lever connections that rock the pressure roller axle during such time as piloting punches are actively engaged in locating the stock. This arrangement makes it possible to inspect or replace die plates and punches without dismantling the feeder; it makes it possible to employ ordinary gears in the drive between the main feeder roller and the pressure roller since only small separations of the rollers occur during a stroke of the press; and by journaling the pressure roller on a heavy rockable axle provides a maximum of rigidity with a minimum of material.

A specific embodiment of the invention is illustrated in the accompanying drawings.

In the drawings:

Figure I is a side elevation of the upper portion of a press showing the improved feeder mounted thereon.

Figure II is a front elevation of the intermediate portions of the press showing the location of the feeders with respect to the punch and die block.

Figure III is a plan view showing the location of the feeders and the drive therefor with respect to the bolster or die plate of the press and the die block mounted thereon.

Figure IV is an elevation, partly in section, as seen from the line IV—IV of Figure II.

Figure V is a fragmentary rear elevation taken generally along the line V—V of Figure I.

Figure VI is an enlarged plan view of one of the pressure rollers and fragments of the supporting frame.

Figure VII is a fragmentary end elevation as seen from the line VII—VII of Figure IV.

Figure VIII is a fragmentary detail taken along the line VIII—VIII of Figure VII.

Figure IX is a view partly in section of the strut that cooperates with an arm of the pressure roller axle to cause release of the feeding pressure during selected portions of the midstroke of the press.

These specific figures and the accompanying description are intended merely to illustrate the invention and not to impose limitations on the claims.

As an example, the improved strip feeder is shown as it is employed in a mechanically operated punch press. Such a press is usually constructed with a C-shaped frame 1 such as may be seen in Figure I. A crank shaft and connecting rod, not shown in the figure, are included in the upper portion of the press and arranged to drive a punch carrier 2 which is in the nature of a cross-head carried in ways in the front upper face of the C-shaped frame 1. The lower face of the punch carrier 2 is fitted to receive a chuck 3 in which various punches or other tools may be mounted. A bolster 4 (see also Figure II) is securely mounted from the bottom portion of the C-shaped frame 1 in such position that it may support a die plate and die 5 in position to cooperate with a work punch 6 and piloting punches 7 carried from the punch block 3. The die and die plate 5 and punch 6 are shown generally since their particularly shape varies according to the article being formed.

Any conventional drive may be employed to drive the crank shaft of the punch and since such drives are well known none is illustrated in the drawings.

Referring now to Figure II in particular, the complete feeder preferably comprises two feeder assemblies 8 and 9 that are mounted one on either side of the die plate 5 and preferably from either the bolster 4 or an extension of the die plate 5. If desired the feeder assemblies 8 and 9 may be rigidly mounted in spaced apart relation on a separate base that has a flat center section that may be substituted for the bolster 4 or interposed between the bolster and the die plate 5.

The feeder assemblies 8 and 9 include sturdy generally U-shaped frames 10 and 11 in which feeder rolls 12 and pressure rolls 13 are mounted. The feeder rolls 12 are mounted on heavy shafts 14 (see also Figure IV) that are journaled in the frames 10 and 11 with the upper surfaces of the rolls 12 at substantially the same level as the face of the die on the die plate 5. The feeder roll shafts 14 are each provided with a spiral gear 15 (see Figures IV and V) that meshes with a spiral gear 16 mounted on a drive shaft 17. The drive shaft 17 passes beneath and at right angles to the feeder roll shafts 14 and the gears 15 and 16 are of such size that the drive shaft 17 is located near the same level as the bottom of

the bolster 4 thus placing it well below the die and die plate 5.

Referring to Figure III it will be noticed that the drive shaft 17 passes between the bolster 4 and the back of the opening in the C-shaped portion of the press frame 1. This location for the drive shaft 17 is particularly advantageous because it is out of the way of any chutes that may be used to direct finished articles from the die through an opening in the back of the press frame as is sometimes done and it is not in a position to bar access to the die and punch. Thus the die and punch may be inspected or changed at will without dismantling any portion of the feeder.

The drive shaft 17, within the limits of the U-shaped frame 11, carries an overrunning clutch and gear assembly 18 to the gear of which meshes with a rack 19. The upper end of the rack 19 is pivotally connected to an adjustable crank pin 20 of a crank 21 mounted on the end of the crank shaft of the press. The adjustable crank pin 20 may be moved along a slot 22 to adjust the length of the stroke of the rack 19. A rack guide 23 pivotally mounted on the drive shaft 17 or a bushing concentric therewith serves to hold the rack 19 in mesh with the gear of the assembly 18 even though the rack rod executes a connecting rod motion because of its connection to the crank arm 21.

The crank arm 21 is angularly oriented with respect to the main crank of the press so that the rack rod 19 reaches an end of its stroke at generally the same time that the pilot punches 7 are ready to enter previously punched pilot holes in a strip of stock or sheet material 24 being fed through the press. The direction of engagement of the overrunning clutch and gear assembly 18 and the orientation of the crank arm 21 is such that the drive shaft 17 is driven from the time that the punch leaves the work on its upward stroke until it is again approaching the work near the middle of its down stroke.

Referring to Figures I and V, a brake drum 25 is mounted on the end of the drive shaft 17 and a pair of brake shoes 26 and 27 pivotally mounted from a stud 28 are arranged to cooperate with the brake drum 25. The pressure of the brake shoes 26 and 27 is controlled by a helical compression spring 29 that is circumjacently mounted on a bolt 30 passed through openings in the free ends of the brake shoes 26 and 27, the spring being held compressed between the end of the brake shoe 27 and a nut 31 on the bolt 30. This brake provides sufficient retarding torque on the drive shaft 17 to overcome the inertia of the drive rolls 12 and the strip stock which would otherwise cause the strip to overrun and the drive shaft 17 to coast ahead of the position determined by the drive from the rack rod 19 through the gear and overrunning clutch assembly 18.

Referring now to Figures IV, VI, VII and VIII each upper roller 13, the pressure roller, is journaled on a divided axle 32 having sections 32*a* and 32*b* carried in the corresponding ones of the U-shaped frames 10 or 11. As shown in Figure VI, a tenon 32*c* projecting axially from the axle section 32*b* fits into a bore 32*d* of the axle section 32*a* to hold the sections in axial alignment. One or more keys 32*e* loosely fitted into keyways in the tenon 32*c* and bore 32*d* serve as a positive clutch to permit limited rotary movement of one axle section with respect to the other. The support for the axle 32 comprises a pair of sturdy pins 33 and 34 inserted through holes in the upstanding ends of the frame 10 to engage aligned holes 35 and 36 drilled into the ends of the axle 32 and offset from its axis. The pressure roll 13, in the form of a sleeve slipped over the axle 32, is carried by roller bearings 37 to minimize the friction between the sleeve forming the roll 13 and the axle itself. At one end each pressure roll 13 is provided with a gear 38 that meshes with a gear 39 (Figure IV) carried on the shaft 14 supporting the cooperating drive roll 12.

A two armed plate 40 is welded to one end of the axle 32 with one of the arms extending upwardly to engage one end of an extensible strut 41 and with the other arm extending generally horizontally to receive the upper end of a heavy tension or compression spring 42 the lower end of which is fastened at the bottom of the U-shaped frame 10.

At the other end of the axle 32 a second plate 43 is welded to the axle, this plate 43 having a laterally extending arm that receives the upper end of a spring 44 which, like the spring 42, is also fastened at the bottom of the U-shaped frame. The springs 42 and 44 act as resilient members tending to rotate the eccentrically mounted axle 32 in a direction to force the pressure roll 13 against the drive roll 2. By the use of a two section shaft 32 like pressures are exerted over the complete width of stock. The use of the connecting clutch allows the releasing of the roll to be effected from one end only of the shaft 32. Also, if it is desirable to actuate roll release from both ends the connecting clutch, the key 32*e* or its equivalent, may be eliminated.

It is immaterial insofar as operation of the feeder is concerned whether the axle supporting pins 33 and 34 are rigidly set in the frame 10 or in the axle 32. From a constructional point of view it is preferable to lock the pins in the frame 10 so that by removal of the pins the pressure roll may be removed without further dismantling of the device. If the pins were positively secured in the axle itself it would be necessary to use split bearings in the frame thus complicating the construction of the frame of the feeder.

It was mentioned earlier that the pressure of the pressure roll 13 on the stock 24 is released, at least momentarily, at the end of the feeding stroke to permit the locating or pilot punches 7 to position the stock 24 and thus correct small errors in feed which would otherwise be wasteful of material. According to the invention this releasing movement is obtained by connecting the upper ends of the two armed plates 40 through extensible struts 41 to a bracket 45 bolted to the punch carrier 2. The bracket 45 is arranged at an elevation such that the struts 41 are level (extend at right angles to the direction of movement of the punch) as the centering punches 7 enter the material. The lengths of the struts are adjusted so that at this point the axles 32 and the plates 40 welded thereto have rotated far enough to raise the pressure rollers 13 off the stock 24. As the punch continues its downward movement the struts 41 permit the axle 32 to rotate forwardly again thus applying pressure to the now stationary strip stock 24. This pressure serves no useful purpose but it is preferable to allow the struts 41 to operate past center rather than to attempt to hold the pressure rollers 13 out of contact with the strip stock during the entire lower half of the stroke of the press. Cam or other more complicated mechanism would be required if the rolls were to be held separated a small distance and still separated at midstroke of the press. The overcenter strut permits the small separation when necessary and thus makes a very simple workable structure.

A long stroke of the punch carrier 2 above or below midstroke to accommodate long punches is permitting without interfering with the action of the strip stock feeders since the struts 41 are extensible. Thus as the punch carrier 2 moves up and down from its midposition the parts of the struts separate, one sliding within the other.

The construction of the strut itself is shown in detail in Figure IX. This strut comprises a tube 46 that is pivotally connected to the bracket 45 and that slidingly receives a stem 47 threadedly engaged in a coupling 48 that is pivotally connected to the upper end of the vertical arm of the plate 40. A lock nut 49 holds the stem 47 in its adjusted position. A collar 50 may be provided on the stem 47 to abut the end of the tube 46 when the strut is required to rock the axle 32 to release the pressure. Alternatively the collar 50 may be omitted and the end of the stem 47 allowed to bottom in the hole in the tube 46. If the

latter construction is employed the tube must be vented as by a hole **51** to permit the escape of air. As illustrated in the drawing the vent **51** is located a short distance from the bottom of the hole so that a small amount of air is entrapped to act as a shock absorber and soften the engagement of the two parts of the strut as the strut is shortening during the approach of the punch to its midposition.

By arranging the struts to release the pressure of the pressure rollers **13** only during that portion of the stroke when the stock **24** is being located in punching position the separation of the rollers is minimized and there is no danger of disengagement of the gears **38** and **39** that drivingly connect the drive roller **12** and pressure roller **13**.

It is sometimes desirable to stop the feeding action of the feeders without stopping the press or it may be required to stop the feeding action of one of the feeders while allowing the other to continue. To provide this manual control handles **52** are provided on the front side of each of the U-shaped frames **10** and **11** the handles being carried on short shafts **53** (Figure VIII) set in the U-shaped frames. The other ends of the shafts **53** are cut to provide a shoulder **54** that engages a lug **55** welded to the two-armed bracket **40**. The cut end of the shaft **53** serves as a cam which when in the position shown allows the pressure roller **13** to bear on the drive roller **14** and which when the shaft **53** is turned pushes upwardly on the lug **55** thus rocking the axle **32** until the pressure roller **13** is raised out of contact with the strip stock **24** being fed through the feeder.

The strip stock feeder illustrated in the drawings is very easy to construct and with a minimum of material provides a very rigid structure. The principal reason for the rigidity of the structure is the fact that an extremely sturdy axle is given considerable rotative movement on offset axes to move the pressure roller through a small distance. This provides a much more rigid structure than may possibly be obtained with a yoke that is moved through a very small angular movement in positioning the pressure roller. Likewise the structure is very simple to manufacture because there are few parts to become misaligned and none of the parts need be manufactured to extremely close tolerances.

Various modifications may be made in specific details of construction without departing from the spirit and scope of the invention.

Having described the invention, I claim:

1. In a punch press having a die plate and a vertically reciprocating punch, a strip feeder comprising, a frame mounted at an end of the die plate of the press, a lower roller carried on a shaft journaled in the frame, means for driving the shaft, an axle, means mounted in the frame and axle for pivotally supporting the axle, an upper roller journaled on the axle with its axis of rotation parallel to and displaced from the pivoting axis of the axle, means for drivingly connecting the upper and lower rollers, an arm attached to the axle and having a portion extending upwardly resilient means attached to the arm for urging pivotal rotation of the axle to force the rollers together, and extensible means connected to the arm and to a moving member of the press the path of which extends to either side of a plane that is normal to the path and that passes through the end of the arm for rocking said axle against the force of the resilient means during selected portions of the stroke of the press.

2. In a strip feeder, in combination, a frame, a lower roller carried on a shaft journaled in the frame, an axle pivotally mounted in the frame, an upper roller rotatably mounted on the axle with the axis of rotation eccentric to the rocking axis of the axle, said axle being divided between the ends of the upper roller, means for holding the sections of the axle in axial alignment and providing limited relative rotation therebetween, and resilient means for urging rotary movement of each axle section to bring the rolls together.

3. In a strip feeder, in combination, a frame, a lower roller carried on a shaft journaled in the frame, an axle pivotally mounted in the frame, an upper roller rotatably mounted on the axle with the axis of rotation eccentric to the rocking axis of the axle, said axle being divided between the ends of the upper roller, means for holding the sections of the axle in axial alignment and resilient means for urging rotary movement of each axle section to bring the rolls together.

4. In a strip feeder, in combination, a frame, a lower roller carried on a shaft journaled in the frame, an axle pivotally mounted in the frame, an upper roller rotatably mounted on the axle with the axis of rotation eccentric to the rocking axis of the axle, said axle being divided between the ends of the upper roller, means for holding the sections of the axle in axial alignment, resilient means for urging rotary movement of each axle section to bring the rolls together, and means for rocking the axle sections against the action of the resilient means for disengaging the feed.

5. In a punch press having a die plate and a vertically reciprocating punch, a strip feeder comprising, a frame mounted at an end of the die plate of the press, a lower roller carried on a shaft journaled in the frame, an axle, pins engaged in holes in the frame and in holes in the axle eccentric to the axis of the axle for pivotally supporting the axle, an upper roller journaled on the axle, means for driving the rollers, an arm extending radially from the axle and generally parallel to the path of the punch of the press, resilient means operatively connected to the axle for urging the rollers into contact and for urging the arm toward the path of the punch, and an extensible strut that is connected between the arm and a part of the punch located such that the strut is generally perpendicular to the path of the punch as the punch engages the work, said strut having a minimum length such that said axle is rotated to separate the rolls slightly before the punch first engages the work.

References Cited in the file of this patent

UNITED STATES PATENTS

199,657	McAnespey	Jan. 29, 1878
750,054	Hunter	Jan. 19, 1904
854,706	Eden	May 21, 1907
1,390,343	Disbrow	Sept. 13, 1921
1,480,044	Bowers	Jan. 8, 1924
1,715,271	Beck	May 28, 1929
1,851,753	Crane	Mar. 29, 1932
1,858,403	Littell	May 17, 1932
1,947,015	Littell	Feb. 13, 1934
2,138,142	Dietrich	Nov. 29, 1938
2,160,613	Crafts	May 30, 1939
2,165,026	Bernard	July 4, 1939
2,168,284	Crane	Aug. 1, 1939
2,261,703	Tetzlaff	Nov. 4, 1941
2,295,953	King	Sept. 15, 1942
2,339,962	St. Louis	Jan. 25, 1944
2,394,534	Conner	Feb. 12, 1946
2,463,108	Jacobson	Mar. 1, 1949