March 24, 1942. W. ELSER 2,277,514

MECHANISM FOR FEEDING STRIP STOCK

Filed Feb. 17, 1940 5 Sheets-Sheet 1

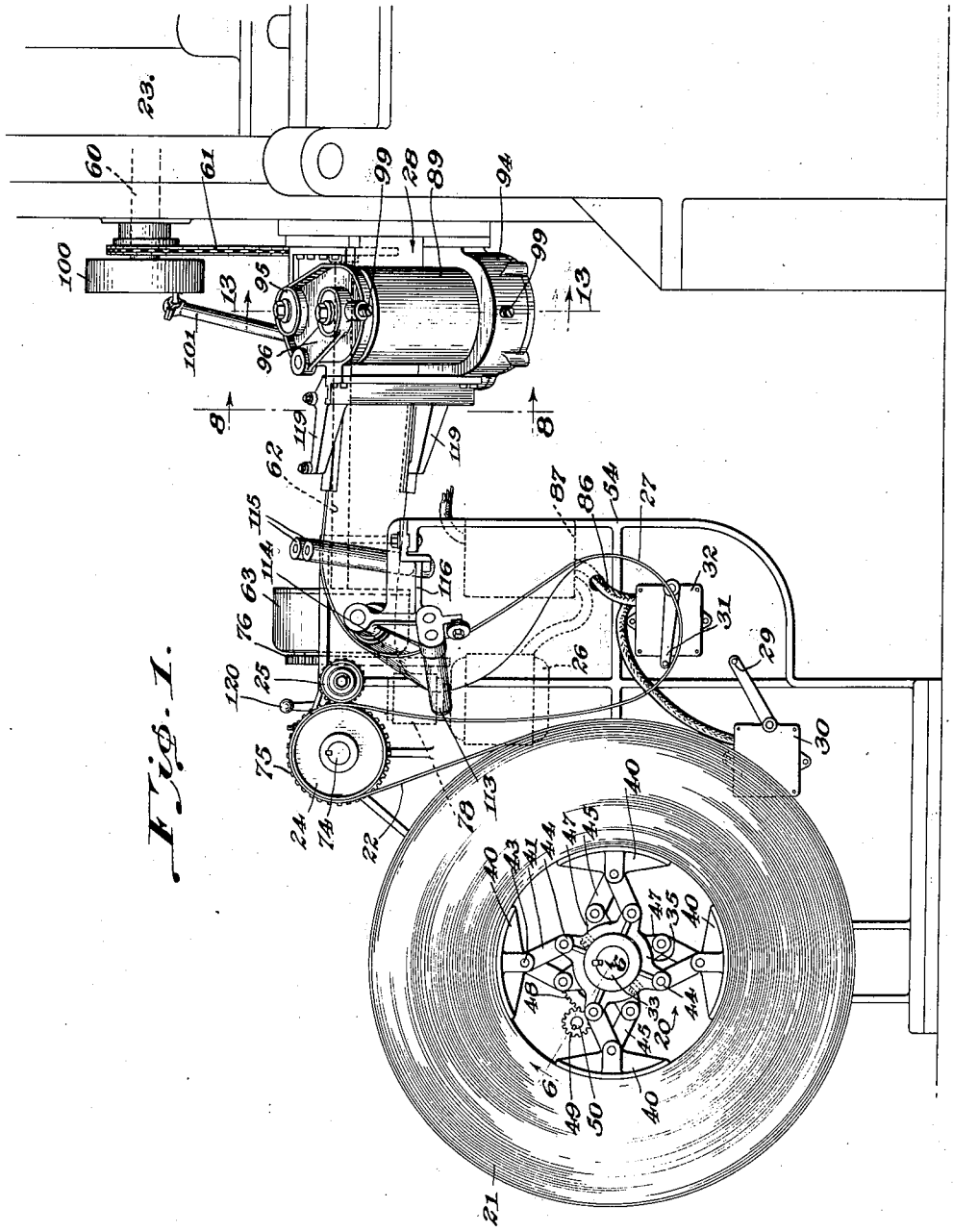


Fig. 1.

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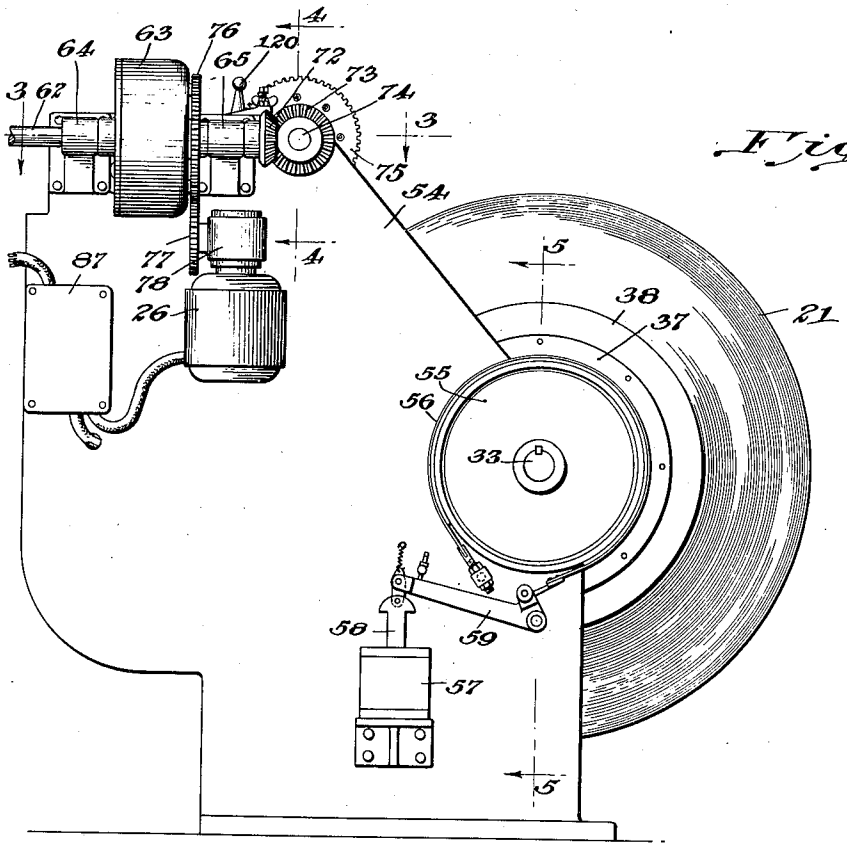


Fig. 2.

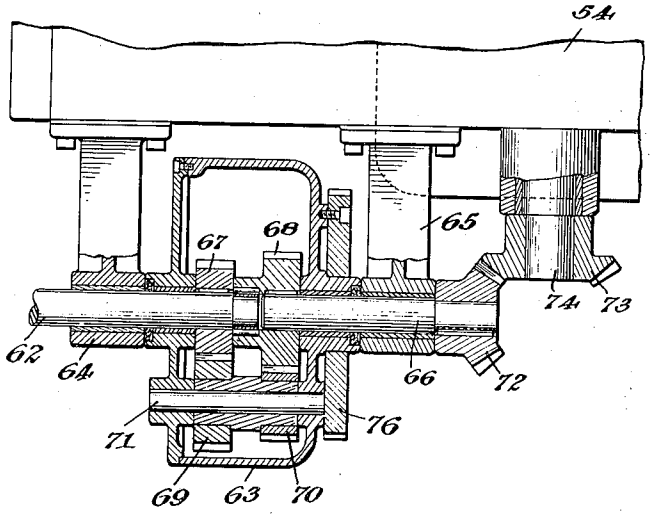


Fig. 3.

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MECHANISM FOR FEEDING STRIP STOCK

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Fig. 4.

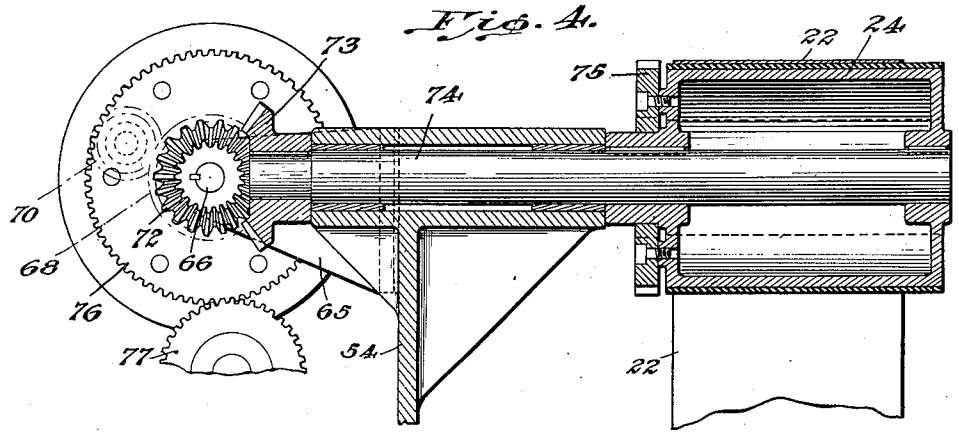


Fig. 5.

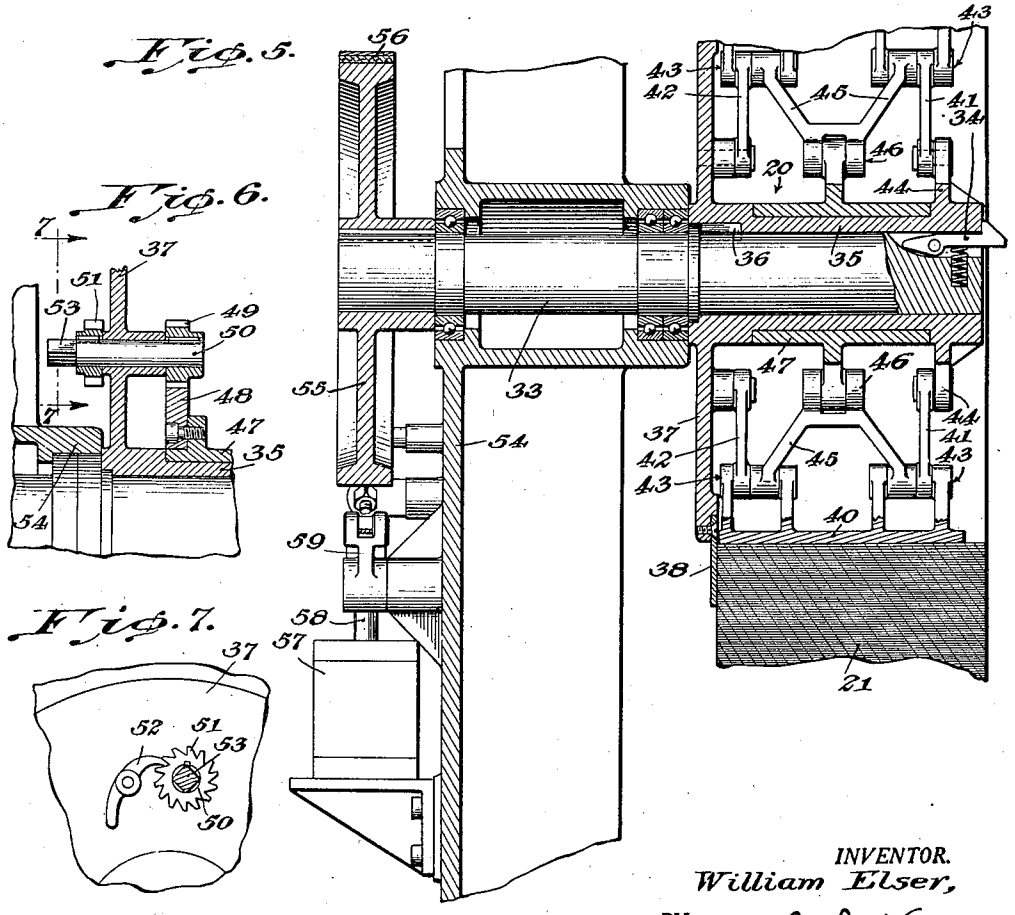


Fig. 6.

Fig. 7.

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Fig. 8.

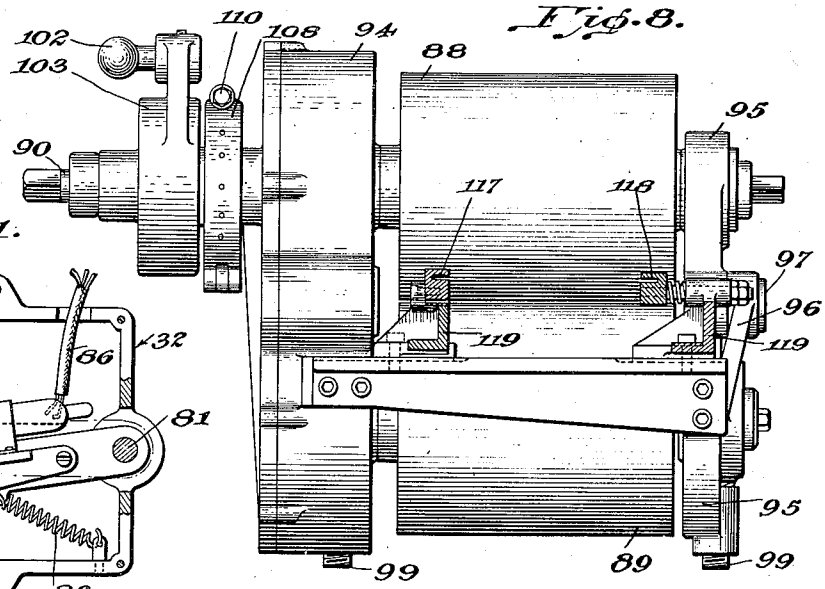


Fig. 11.

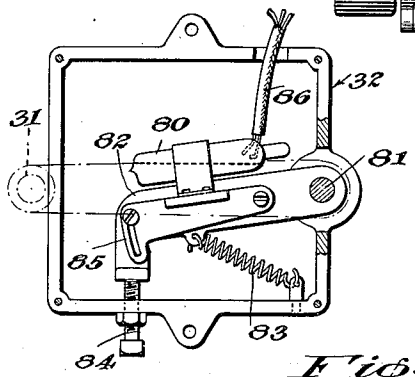


Fig. 12.

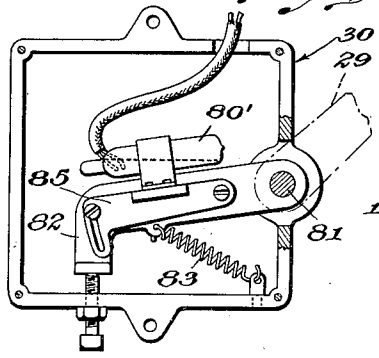
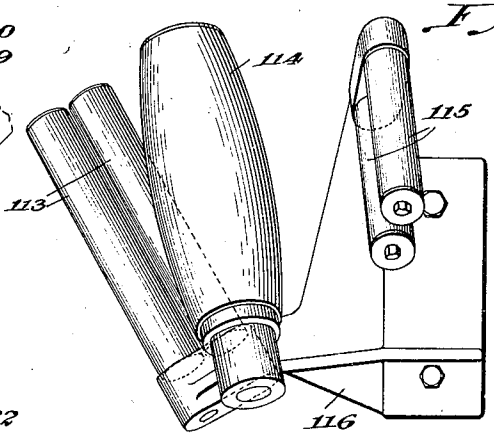


Fig. 9.



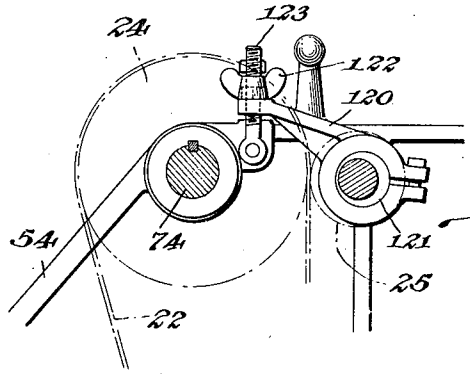


Fig. 10.

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MECHANISM FOR FEEDING STRIP STOCK

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Fig. 13.

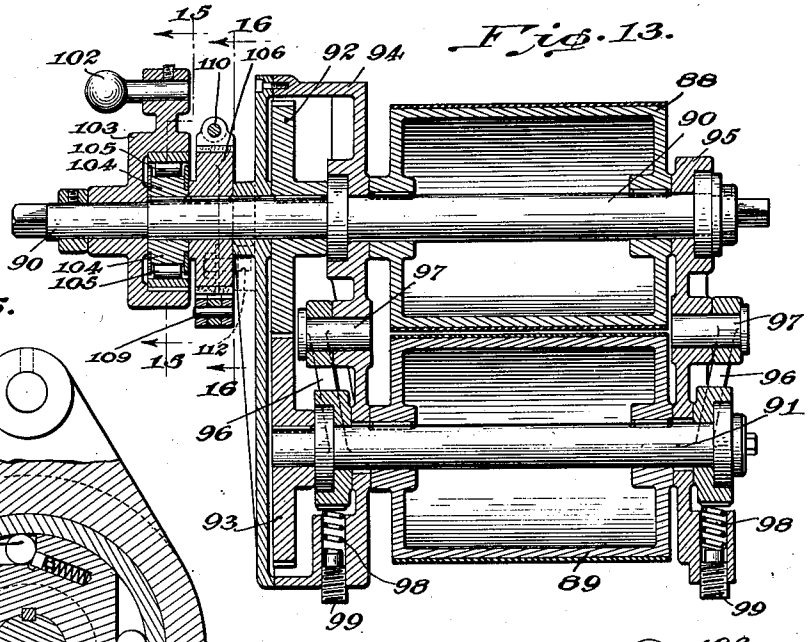


Fig. 15.

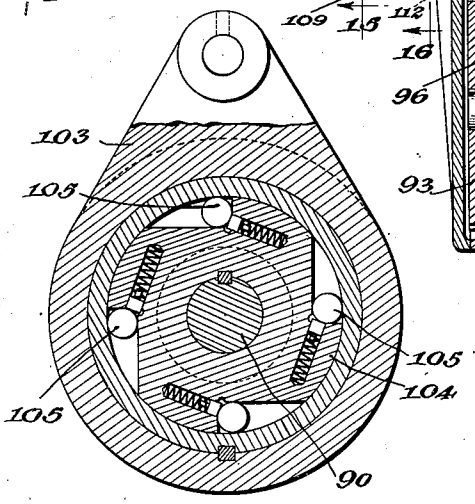


Fig. 14.

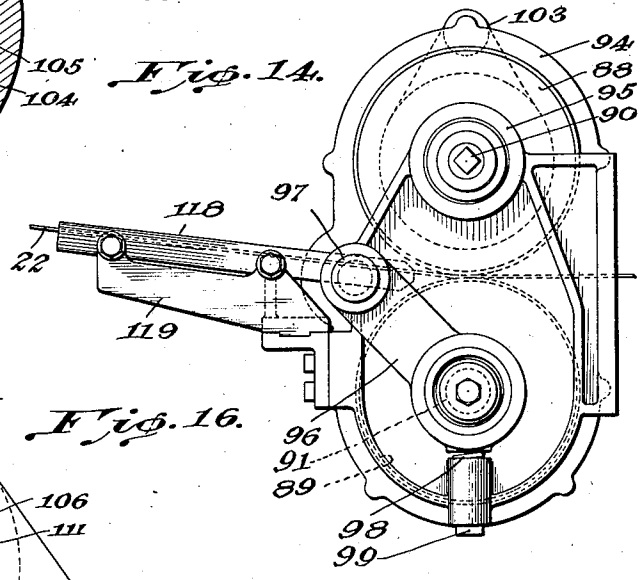
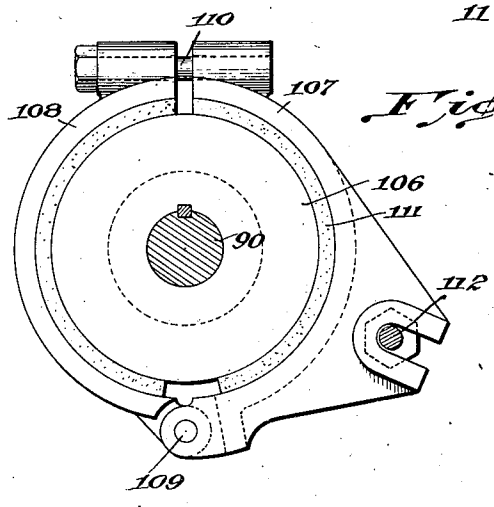


Fig. 16.



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UNITED STATES PATENT OFFICE

2,277,514

MECHANISM FOR FEEDING STRIP STOCK

William Elser, Toledo, Ohio, assignor to Owens-Illinois Can Company, a corporation of Delaware

Application February 17, 1940, Serial No. 319,514

6 Claims. (Cl. 271—2.3)

My invention relates to automatic apparatus for drawing strip stock from a supply roll and feeding it to a punch press or other machine to which the stock is supplied.

An object of the invention is to provide an improved method and apparatus by which strip stock such as tin plate, black plate or other strip material is continuously drawn from a supply roll of the stock and fed by intermittent feed rolls to a punch press or the like, with means for automatically regulating the rate at which the strip is withdrawn from the supply roll to correspond with the rate at which the stock is fed into the press.

A further object of the invention is to provide an apparatus of the character indicated wherein the strip as it is withdrawn from the supply roll is fed into a loop between the drawing rolls and the intermittent feed rolls, with automatic means actuated by the loop for electrically controlling the rate at which the strip is unrolled from the supply roll, and thereby controlling the size of the loop within limits best suited for the intermittent feeding of the strip to the press.

A further object of the invention is to provide in an apparatus of the character indicated, means for drawing the feed strip from the supply roll continuously at a rate somewhat different from (either faster or slower than) that required to supply the punch press, together with electrically controlled means actuated by the strip for intermittently changing the speed of the drawing means in a manner to balance the rate of drawing and feeding the strip.

Other objects of the invention will appear hereinafter.

Referring to the accompanying drawings;

Fig. 1 is a side elevation of apparatus embodying the principles of my invention;

Fig. 2 is an elevation of a portion of said apparatus viewed from the opposite side thereof;

Fig. 3 is a section at the line 3—3 on Fig. 2 showing differential speed gearing for intermittently varying the speed of the drawing rolls;

Fig. 4 is a sectional elevation at the line 4—4 on Fig. 2, showing one of the strip drawing rolls and driving mechanism therefor;

Fig. 5 is a sectional elevation at the line 5—5 on Fig. 2 showing a portion of the reel on which the roll of strip stock is mounted;

Fig. 6 is a fragmentary section at the line 6—6 on Fig. 1 showing a portion of the mechanism for clamping the strip roll on the reel;

Fig 7 is a section at the line 7—7 on Fig. 6;

Fig. 8 is a sectional elevation at the line 8—8 on Fig. 1, showing the intermittent feed rolls and their mounting;

Fig. 9 is a view of a series of guide rolls for directing the stock strip in its passage to the feed rolls;

Fig. 10 is a detail view showing means for adjusting the pressure of the drawing rolls on the stock strip;

Fig. 11 is a sectional elevation of a switch box and switch mechanism therein for controlling a speed regulating motor and causing it to accelerate the rate at which the strip is drawn from the supply roll;

Fig. 12 is a similar view of a switch mechanism for retarding the rate at which strip is drawn;

Fig. 13 is a section at the line 13—13 on Fig. 1 showing the intermittent feed rolls and associated parts;

Fig. 14 is an end elevation of the same;

Fig. 15 is a section at the line 15—15 on Fig. 13 showing a one-way driving clutch for driving the feed rolls; and

Fig. 16 is a section at the line 16—16 on Fig. 13 showing a brake for the feed rolls.

Referring particularly to Fig. 1, the apparatus comprises a reel 20 on which is mounted a roll 21 of strip stock such as tin plate or the like from which a strip is fed to a machine 23 which may be, for example, a punch press of conventional construction. The strip 22 is drawn continuously from the supply roll by means of a pair of drawing rolls 24, 25, driven by the machine 23 and a supplemental electric motor 26 as hereinafter described. The strip passes downward from the drawing rolls and forms a loop 27 and thence passes over guide rolls by which it is directed to the intermittent feed mechanism 28 which includes a pair of intermittently driven feed rolls for feeding the strip to the press 23.

The drawing rolls 24, 25 are continuously driven by the press machine 23 through gearing designed to draw the strip at a rate closely approximating and preferably somewhat slower than is required to normally supply the press. This drawing speed, however, is increased by the motor 26, operating as hereinafter described, so that the strip accumulates in the loop 27 and extends it downward until it engages an arm 29 and actuates a switch contained in a switch box 30. This opens a control circuit of the motor 26 so that the latter is stopped and the strip is then drawn at a reduced speed. The feed rolls as they continue to operate take up the slack of the loop, drawing the latter upward until it engages a lever 31 and actuates a switch contained within

a switch box 32 for closing a control circuit for the motor 26 so that the latter is again started and the drawing speed again increased, all as more fully set forth hereinafter.

The reel 20 (Figs. 1 and 5) which carries the roll 21 of stock strip is removably mounted on a drive shaft 33 and held thereon by a latch 34. The reel comprises a hub or sleeve 35 which surrounds the shaft 33 and is held against rotation relative thereto by a key 36. Formed integral with the sleeve 35 at the inner end thereof is a circular plate 37. An annular flange or ring 38 attached to the periphery of the plate 37 provides an abutment for the roll 21.

Means for causing the reel to grip the roll 21 and hold it securely in position, includes an annular series of gripping members or shoes 40 which engage the inner surface of the roll. The shoes are movable outwardly and inwardly for clamping and releasing the roll 21, by means of the following mechanism. Associated with each shoe is a pair of parallel links 41 and 42 pivoted at their outer ends to the shoe by pivot pins 43. The link 41 is pivoted at its inner end to a lug 44 on the hub 35 and the link 42 is pivoted at its inner end to the plate 37. A yoke 45 has a pivotal connection 46 with a sleeve 47 mounted for rotative movement on the hub 35. The arms of the yoke 45 are pivoted at their outer ends on the pivot pins 43.

It will be seen that with this construction rotation of the sleeve 47 in a counter-clockwise direction (Fig. 1) will operate through the yokes 45 to draw the shoes 40 inwardly, thereby releasing the roll 21. Rotation of the sleeve 47 in the opposite direction serves to move the clamping shoes outwardly for gripping the roll. Such rotative movement is effected by means of a rack 48 (see Figs. 1 and 6) secured to the sleeve 47 and a pinion 49 running in mesh with said rack. The pinion is keyed to a shaft 50 journalled in the plate 37. The shaft 50 extends through said plate and has keyed thereto on the outer side of said plate a ratchet 51 which is engaged by a pawl 52 (Fig. 7). The end 53 of the shaft is squared to receive a wrench for rotating the shaft and thereby rotating the sleeve 47 for operating the gripping shoes 40.

The reel shaft 33 is journalled in bearings in a frame 54 which supports the roll 21 and the mechanism for driving the drawing rolls. Brake mechanism may be provided for automatically stopping the roll 21 when the feeding mechanism is stopped. The brake mechanism comprises a brake drum 55 (Figs. 2 and 5) keyed on the reel shaft 33 and a brake band 56 surrounding the drum. The brake band is operated by a solenoid 57 having a core 58 connected through a lever 59 to the brake band. The solenoid is automatically operated to apply the brake when the punch press is stopped.

The drawing rolls 24, 25, are continuously driven by a continuously rotating drive shaft 60 (Fig. 1) which forms a part of the machine 23. Driving connections between the shaft 60 and the drawing rolls include a sprocket chain 61 which transmits motion from the shaft 60 to a shaft 62 extending into a gear case 63 (Figs. 1, 2 and 3). Bearing brackets 64 and 65 on the frame 54 support the shaft 62 and a shaft 66 in alignment therewith. The gear case 63 is journalled on the shafts 62 and 66 between the brackets 64 and 65. Differential gearing within the case 63 provides a driving connection between the aligned shafts. Such gearing includes gears 67 and 68 keyed respectively to the shafts 62 and 66. Gears 69 and 70 have a fixed mounting on a shaft 71 journalled in the gear case and mesh with the gears 67 and 68 respectively. Rotation of the shaft 62 operates through the gear 67 to rotate the gear 69 and with it the gear 70, the latter in turn rotating the gear 68 and shaft 66. As the gear 70 is of smaller diameter than the gear 69, and the gear 68 of larger diameter than the gear 67, the shaft 66 is rotated at a slower speed than the shaft 62. The rotation of the shaft 66 is transmitted through bevel gears 72 and 73 to a shaft 74 (Figs. 3 and 4) journalled in the frame 54. The drawing roll 24 is mounted on the shaft 74 and keyed thereto. A gear 75 on the roll 24 engages a gear on the drawing roll 25 for positively driving the latter at the same peripheral speed as the roll 24.

The gearing between the drive shaft 60 and the drawing rolls is preferably so proportioned that the drawing rolls will draw the strip 22 somewhat slower than it is fed to the punch press by the feed rolls. This holds true while the gear case 63 is held stationary. In order to accelerate the drawing rolls at intervals as needed to meet the requirements of the feed rolls, the electric motor 26 is operated at such intervals through driving connections for rotating the gear case 63 in a direction to accelerate the rotation of the shaft 66. It will be apparent that rotation of the gear case 63 in the same direction that the shaft 62 is being rotated by the power shaft 60, will increase the speed of the shaft 66. For example, if the gear case is rotated in the same direction and at the same angular speed as the shaft 62, there will be no relative rotation of the gears within the case, said gears and case all rotating as a unit so that the shafts 62 and 66 will also rotate at the same speed. In other words, the angular speed of the shaft 66 is stepped up to that of the shaft 62, thus increasing the speed at which the drawing rolls 24, 25, are driven. The extent to which the speed of the shaft 66 is increased evidently will depend upon and be in proportion to the speed at which the gear case is rotated. It will also be apparent that if the gear case is rotated in a direction opposite to that in which the shaft 62 is rotated, the speed of the shaft 66 relative to that of the shaft 62 will be reduced.

The driving connections between the motor 26 and the gear case 63 include a gear wheel 76 secured to the gear case and a pinion 77 meshing with the gear 76. Said pinion is driven from the motor shaft through speed reduction gearing within a gear box 78 (Fig. 2). The operation of the motor 26 is controlled by the amount of stock strip in the loop 27. While the length of the loop remains within predetermined limits, the motor 26 remains at rest with its controlling circuit open. Normally the feed rolls, which are operated at regular time intervals, will, at each operation, draw from the loop somewhat more strip than is advanced into the loop by the drawing rolls 24, 25, during such a time interval. This gradually shortens the loop until it engages the arm 31 of the controller in the switch box 32 and operates a mercury switch 80 (Fig. 11) within the switch box.

The switch mechanism comprises the arm 31 fixed to a rock shaft 81 to which is also secured a rock arm 82 carrying the mercury switch. A coil spring 83 normally holds the parts in the position shown with the switch open. A stop screw 84 permits adjustment of the switch arm

31 for adjustably varying the minimum size of the loop 27. An arm 85 adjustable on the rock arm 82 permits readjustment of the mercury switch after the arm 31 has been adjusted. A cable 86 carries the conductors leading from the switch to control box 87 containing the motor controls which may be of conventional construction.

When the loop 27 is shortened and operates the switch as above described, the motor 26 is started and rotates the gear case 63 in a direction to accelerate the shaft 66, thereby increasing the speed of the drawing rolls 24, 25. The stock strip 22 is thus advanced at a more rapid rate, thereby increasing the size of the loop 27. This continues until the strip engages the switch arm 29 on the lower switch box 30 and operates a switch mechanism therein. Ths mechanism (Fig. 12) is substantially identical with that in the upper switch box except that the mercury switch 80' is arranged normally to remain closed while the switch arm 29 is free. When the arm 29 is engaged by the loop and thus moved downward, it opens the switch and stops the motor 26 so that the gear case 63 is brought to rest, and the drawing rolls are slowed down. The cycle of operation is repeated automatically as required to supply the strip to the feed rolls.

Although the gearing between the drive shaft 60 and the drawing rolls has been described as preferably proportioned to draw strip from the supply roll at a somewhat slower rate than needed to normally supply the feed rolls, it will be understood that by slightly varying the gearing, the driving rolls may be caused to draw the strip at substantially the same speed as required to supply the feed rolls or at a somewhat greater speed. If the latter arrangement is adopted, the lower switch device comprising the arm 29 may be adjusted so that it will serve to reduce the speed of the electric motor or stop it when actuated by the loop, and the upper switch device comprising the arm 31 will serve to start or accelerate the motor. If the gearing is so proportioned that the drawing rolls normally supply strip to the feed rolls at the same rate as the latter feed the strip to the press, then the switches 31 and 29 may be arranged to operate the electric motor in opposite directions. As a further variation the electric motor may be operated continuously for rotating the gear case 63 and the switch arms 29 and 31 may serve to actuate a rheostat for changing the speed of the motor under the control of the loop, as required to maintain a proper balance between the feeding and drawing of the strip.

The intermittent feed mechanism includes a pair of feed rolls 88 and 89 (Figs. 8, 13, 14) mounted respectively on shafts 90 and 91. Intermeshing gears 92 and 93 are keyed respectively to the drive shaft 90 and the driven shaft 91 for positively rotating the rolls at the same speed. Said gears are housed within a gear casing 94. The upper shaft 90 is journalled in the casing 94 and also has a journalled bearing in a plate 95 at the opposite end of the rolls. The lower shaft 91 is journalled in the lower ends of a pair of rock arms 96, which are mounted to swing on pivot pins 97 carried in the casing 94 and plate 95. This mounting permits the slight up and down movement of the lower roll 89 needed for maintaining the required pressure of the feed rolls against the stock strip. The lower roll is held against the upper roll or the strip therebetween with a yielding pressure supplied by coil springs 98 held under compression and bearing against the lower ends of the arms 96. The pressure is adjustable by means of screw plugs 99 threaded in the sockets containing said springs.

The feed rolls are driven with an intermittent movement to advance the stock strip step by step to the punch press. The driving means includes a wheel 100 (Fig. 1) on the continuously rotating shaft 60 and a connecting rod 101 having a ball and socket connection with the wheel 100. The rod extends downward and at its lower end is connected by a ball and socket joint, including a ball 102 (Figs. 8 and 13), with a rock arm member 103 mounted to rock on the shaft 90. The arm 103 forms one member of a one-way driving clutch which includes a clutch member 104 keyed to the shaft 90. The inner clutch member 104 is formed with recesses to receive rolls 105 which provide clutching engagement between the clutch members. The rotation of the wheel 100 operates through the connecting rod 101 to oscillate the driving arm 103 about the shaft 90, thereby rotating the latter step by step in a conventional manner.

A friction brake may be provided for preventing overrunning of the feed rolls. Such brake, as shown in Figs. 13 and 16, includes a brake drum 106 keyed to the shaft 90 and a brake band including sections 107, 108, pivoted at 109. A clamping bolt 110 connecting the free ends of the brake band is adjustable for variably adjusting the braking pressure. A brake lining 111 may be provided. A bolt 112 anchors the brake band to the gear case 94.

The stock strip 22 in its passage beyond the loop 27 to the feed rolls is guided by a series of guide rolls by which the plane of the strip is changed to correspond with the angular relation of the feed rolls to the supply roll. These guiding rolls include a pair of rolls 113 between which the strip moves upwardly from the loop 27, a longitudinally convex roll 114 over which the strip is guided, and a pair of rolls 115, all of said rolls being mounted on a bracket 116 and arranged at angles corresponding to the desired path of the strip. The edges of the strip as it approaches the feed rolls are directed along grooves in guide rails 117 and 118 mounted on arms 119.

The pressure of the drawing rolls 24, 25, on the strip 22 is adjustable by means of the adjusting device shown in Fig. 10. Said adjusting means includes a rock arm 120 clamped to an eccentric bearing 121 in which the shaft of the roll 25 is journalled. The rock arm is adjustable for adjusting the roll toward or from the roll 24. A nut 122 on a screw rod 123 holds the parts in adjusted position.

Modifications may be resorted to within the spirit and scope of my invention.

I claim:

1. Apparatus for drawing and feeding sheet metal strip stock, which comprises drawing rolls for drawing the stock from a source of supply, a pair of feed rolls having their axes extending in a direction inclined to the axes of the drawing rolls, means for driving the feed rolls and drawing rolls, means for guiding the strip of stock in a path extending from the drawing rolls to the feed rolls, and means for twisting the strip during its movement along said path and thereby changing the angle of the strip to correspond to the inclination of the feed rolls, said twisting means comprising pairs of guiding rolls, the strip

being passed between the rolls of each said pair, the pairs of guiding rolls being arranged at different angles.

2. Apparatus for drawing and feeding sheet metal strip stock, which comprises drawing rolls for drawing the stock from a source of supply, a pair of feed rolls having their axes extending in a direction inclined to the axes of the drawing rolls, means for driving the feed rolls and drawing rolls, means for directing the strip in its passage from the drawing rolls to the feed rolls in a path forming a loop, and means for twisting the strip during its passage along said loop and thereby bringing the strip into a plane parallel with the axes of the feed rolls, said twisting means comprising pairs of guiding rolls, the strip being passed between the rolls of each said pair, the pairs of guiding rolls being arranged at different angles.

3. Apparatus for drawing and feeding sheet metal strip stock, which comprises a pair of horizontal drawing rolls between which the strip is directed, a pair of inclined feeding rolls in advance of the drawing rolls, means for directing a strip in its passage from the drawing rolls to the feed rolls and causing it to advance in a loop between the drawing rolls and feed rolls, and means for twisting a strip during its travel through the loop and thereby bringing it into a plane parallel with the feed rolls, said twisting means comprising pairs of guiding rolls arranged at different angles and an intermediate roll having its axis at an angle intermediate to the said angles of said pairs and having a longitudinal convex surface over which the strip is guided.

4. Apparatus for drawing and feeding sheet metal strip stock, which comprises a pair of horizontal drawing rolls between which the strip is directed, a pair of inclined feeding rolls in advance of the drawing rolls, means for directing a strip in its passage from the drawing rolls to the feed rolls and causing it to advance in a loop between the drawing rolls and feed rolls, and means for twisting a strip during its travel through the loop and thereby bringing it into a plane parallel with the feed rolls, said twisting means including a plurality of pairs of twisting rolls between which the strip is guided, said twisting rolls being arranged at different angles for progressively twisting the strip.

5. Apparatus for drawing and feeding sheet metal strip stock, comprising a reel mounted for rotation about a horizontal axis and forming a support for a roll of the strip stock, a pair of drawing rolls arranged to draw the strip from the reel and direct it downwardly, a pair of feed rolls arranged at an angle to the horizontal, means for driving the drawing rolls and feed rolls, means for directing the strip in its passage from the drawing rolls to the feed rolls and causing it to advance in a path forming a loop extending downward from the drawing rolls, twisting means comprising pairs of twisting rolls between which the strip passes and an intermediate longitudinally convex roll over which the strip is directed as it advances toward the feed rolls and by which the strip is twisted into a plane parallel with the feed rolls, means for controlling and adjusting the speed of the drawing rolls to correspond to the requirements of the feed rolls including an electric motor, switch devices controlling the motor, one of said switch devices located within said loop and operated by the loop when the latter is shortened to a predetermined minimum length, the other switch device being positioned exterior to and normally spaced below the loop and operated thereby when the loop is extended downward to a predetermined maximum length, and differential gearing driven by said motor and operatively connected with the said means for driving the drawing rolls and operative to regulate the speed of the drawing rolls for maintaining said loop within said predetermined lengths.

6. Apparatus for drawing and feeding sheet metal strip stock, comprising a pair of horizontally disposed drawing rolls for drawing stock from a source of supply and arranged to feed the stock downwardly from the rolls in a freely suspended loop, a pair of feed rolls, a drive shaft, driving connections between said shaft and the said rolls for intermittently driving the latter, driving connections between the drive shaft and drawing rolls for continuously driving the drawing rolls including differential gearing, an electric motor operatively connected to said differential gearing for regulating the speed thereof, and controlling means for said motor comprising an electric switch positioned within said loop and a second electric switch positioned beneath said loop and normally spaced therefrom, said switches operative alternately by the loop as the latter is shortened and lengthened.

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