The invention relates to straightening and feeding machines for metal strip material and has reference in particular to novel mechanism for backing the feed rolls to prevent bending and deflection of the rolls during operation under pressure.

Metal working machines such as punch presses, die cutting machines, and the like, are operated in conjunction with feeding and straightening mechanism which conditions the metal strip material and feeds the same to the reciprocating plunger of the press for cutting, punching and similar operations. The strip material is unwound from a coil of such stock and the intermittent rotation of the feed rolls results in the feeding of measured lengths of said material which has been straightened and otherwise conditioned for subsequent operations. The pressures on the rolls for straightening the strip material are considerable, even for relatively thin strip material. However, as thickness of the strip increases the pressures become enormous, and as the width of the strip increases the rolls are more apt to bend and deflect due to their greater length. Generally, said pressures are more than sufficient to cause the straightening rolls to bend or deflect centrally thereof, which, of course, is highly objectionable since such bending adds to the wear and deterioration of the journal bearings in addition to limiting the efficiency of the entire mechanism.

An object of the invention is to provide improved straightening and feeding mechanism which will incorporate means for backing up the rolls in order that they may better resist the heavy pressures to which the rolls are subjected when operating on relatively thick strip material.

Another object of the invention is to provide feeding mechanism for feeding metal and other material in continuous strip form to punch presses and the like which will incorporate novel and improved means for backing the straightening rolls of the mechanism to prevent bending and deflection under pressure, and which will automatically center itself when contacting its roll so as to eliminate all binding stresses such as would otherwise result.

Another object is to provide straightening and feeding mechanism such as described which will employ one or more backing means for each of the straightening rolls, which will be spaced along the length of the roll in order to reinforce the same against bending pressures and which will have such contact with its respective straightening roll as not to interfere with its driving means or with the free rotation of the roll.

With these and various other objects in view the invention may consist of certain novel features of construction and operation, as will be more fully described and particularly pointed out in the specification, drawings and claims appended thereto.

In the drawings which illustrate an embodiment of the device and wherein like reference characters are used to designate like parts—

FIGURE 1 is a side elevational view of feeding and straightening mechanism, the same incorporating the improved means of the invention for backing up the straightening rolls of the said mechanism;

FIGURE 2 is a transverse sectional view taken through the mechanism of FIGURE 1 and showing a pair of straightening rolls with the backing means of the invention applied thereto;

FIGURE 3 is a sectional view on an enlarged scale showing the detail certain improved features in the construction of the backing means for the straightening rolls; and

FIGURE 4 is a sectional view taken substantially along line 4—4 of FIGURE 3.

Referring to the drawings and in particular to FIGURES 1 and 2, the straightening and feeding rolls of the mechanism selected for illustrating the present invention are suitably journalled within a frame 10 having the usual base 11, front and rear walls 12 and 13, side walls 14 and top supporting wall portions 15 and 16. The base 11 provides the bottom portions 17 and the bottom wall 18 as best shown in FIGURE 2. Adjacent the front and rear walls 12 and 13, respectively, the frame 10 provides suitable structure for journaling the front feeding rolls 20 and 21, and for journaling the rear feeding rolls 22 and 23. The said front and rear feeding rolls and straightening rolls to be presently described are operatively connected by conventional gearing and all of the rolls are driven simultaneously so that they rotate in unison. Reference is made to the patent to Miller 2,315,446, granted March 30, 1943, for a full disclosure of journalled feeding and straightening rolls with connecting gearing, and drive means for rotating the rolls for intermittent feeding operations.

The strip material from a coil of said material or from any other source of supply will enter the mechanism between the rear feeding rolls 22 and 23. The said rolls will feed and propel the strip material in a longitudinal direction through the frame 10 and into the bite of the front feeding rolls 20 and 21. The bite of said front feeding rolls and also that of the rear feeding rolls on the material can be adjusted by conventional means located and journalled within the housing members 24. The said members are supported by the top wall portions 15 and 16, respectively, and each said means is operatively connected with the journaling structure for the upper feeding rolls, namely 20 and 22. It will be understood that the lower feed rolls 21 and 23 rotate only, and they do not move bodily in a vertical direction as do the upper rolls. The said movement of the upper rolls is possible, since their journal bearings 25 and 26, respectively, are carried by bearing blocks which are mounted for movement in a vertical direction toward and from their coacting lower roll, whereby the feeding rolls at the entrance and exit end of the mechanism are conveniently adjustable for the purposes mentioned.

The frame supports 27 and 28, FIGURE 2, journal four lower straightening rolls identified by the numerals 30, 31, 32 and 33, FIGURE 1. Each of the rolls have stud shafts such as 34 and 35 extending from respective ends and said bearings 36 and 37 receive the said shafts respectively for journaling the rolls. The said lower straightening rolls do not move bodily in a vertical direction but rotate only, for which purpose the rolls are
operatively connected by gearing, not shown, and which may be fixed in the conventional manner to reduced extensions 33 provided by the stud shafts 35. The three upper straightening rolls 40, 41 and 42 are each located above and in alignment with the space between each pair of lower straightening rolls 30 to 33, inclusive. Each of the upper rolls have stud shafts 43 and 44 projecting from respective ends thereof and which are received by the bearings 45 and 46. The bearings are carried by movable bearing blocks 47 and 48 which are mounted in the frame supports 27 and 28 so as to have translational movement for effecting a straightening action on the metal strip material as it passes between the upper and lower rolls. The reduced portions 50 on the stud shafts 44 receive gears, not shown, which operatively connect the three upper rolls with each other and with the four lower rolls so that all the rolls rotate together.

Each pair of bearing blocks 47 and 48 are structurally connected by a metal bridge 52 which is bolted at 53 to the block 47 and at 54 to the block 48. The bridges are similar in construction as shown in FIGURE 3, the same including a bottom plate 55, side plates 56, and a pair of internally threaded ring members 57.

The bodily movement of the three upper straightening rolls 40, 41 and 42 is produced by power means in the form of an electric motor 60 supported on the fixed platform 61 forming part of the frame structure. The endless belt 62 connects the motor with the speed reducing gear 63 which drives the intermediate gears 64 and 65, which in turn drive the gears 66, 67 and 68. Each last mentioned gear has a geared relation with a worm gear 70, FIGURE 2, which is fixed to a threaded rod 71. The said rod at its threaded end is secured to the frame support 47. The said gears 66, 67 and 68 are each fixed to a reverse shaft 72 which drives, in a similar manner the rod 73 having threaded relation with frame support 48. The drive from the electric motor 60 is thus complete to each of the frame supports, and said supports are accordingly elevated or lowered in unison and to a like extent by operation of the said power means. When heavy stock is passing through the machine, the upper rolls can be lowered for effecting the desired deformation of the said stock material for straightening the same. For relatively thin stock, the reverse bending deformation need not be so great and in such cases the upper rollers can be elevated to the required extent.

The straightening action imparted by the rolls subjects them to enormous pressures and which progressively increase as the width and thickness of the strip material increases. These pressures are generally high enough to produce a bending of the rolls in a transverse direction with the greatest bending and deflection occurring substantially at the center of the length of the rolls. In order to counter any such bending, while at the same time permitting free and unrestricted rotation of the rolls, the invention provides backing up means of the character as shown in detail in FIGURES 3 and 4. The backing-up means for the lower rolls is indicated in its entirety by numeral 75 and the backing up means for the upper rolls is similarly indicated by numeral 76.

Referring to FIGURE 2 which shows the units 75 in detail, it will be seen that each unit includes a trunnion rod 77 threaded at its base as at 78 and having a ball seating 80 at its upper end. The ball seating 80 is suitably bolted at 82 to the spacing ring 83 which is either welded to the bottom wall 18 or secured thereby by means of said bolts. Each trunnion rod 77 has threaded relation at its base with the internally threaded end of the adapter, whereas the upper end of the trunnion rod 77 is guided by the top plate 84. Adjustment of the trunnion rod 77 can thus be effected by rotating the rod by using a tool on the squared end 85. When once adjusted the trunnion rod can be locked in position by the lock nut 86. The ball formation 88 as regards each unit supports a carriage consisting of a block 87 and two pairs of rollers 88 and 90, FIGURE 4. The structural details of the carriage will be described in connection with the units 76 for the upper rolls, it being understood, however, that a pair of rollers are disposed on each of the straightening rolls 30 to 33, inclusive. Each of the upper rolls have stud shafts 43 and 44 projecting from respective ends thereof and which are received by the bearings 45 and 46. The bearings are carried by movable bearing blocks 47 and 48 which are mounted in the frame supports 27 and 28 so as to have translational movement for effecting a straightening action on the metal strip material as it passes between the upper and lower rolls. The reduced portions 50 on the stud shafts 44 receive gears, not shown, which operatively connect the three upper rolls with each other and with the four lower rolls so that all the rolls rotate together.

Each pair of bearing blocks 47 and 48 are structurally connected by a metal bridge 52 which is bolted at 53 to the block 47 and at 54 to the block 48. The bridges are similar in construction as shown in FIGURE 3, the same including a bottom plate 55, side plates 56, and a pair of internally threaded ring members 57.

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Referring to FIGURE 2 which shows the units 75 in detail, it will be seen that each unit includes a trunnion rod 77 threaded at its base as at 78 and having a ball seating 80 at its upper end. The ball seating 80 is suitably bolted at 82 to the spacing ring 83 which is either welded to the bottom wall 18 or secured thereby by means of said bolts. Each trunnion rod 77 has threaded relation at its base with the internally threaded end of the adapter, whereas the upper end of the trunnion rod 77 is guided by the top plate 84. Adjustment of the trunnion rod 77 can thus be effected by rotating the rod by using a tool on the squared end 85. When once adjusted the trunnion rod can be locked in position by the lock nut 86. The ball formation 88 as regards each
having contact with one of said straightening rolls on respective sides of its longitudinal center line, a carriage block providing journaling means for the rollers, a fulcrum rod having a ball and socket connection with the carriage block, and means providing for adjustment of the fulcrum rod towards and from its particular straightening roll.

3. A feeding and straightening machine for strip material as defined by claim 2, wherein certain of said straightening rolls comprise upper rolls and wherein the remainder comprise lower rolls, and additionally including frame structure providing bearing elements for journaling the said rolls, said frame structure also providing supporting means with which the fulcrum rods of the back-up units respectively have threaded relation for adjustment purposes.

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