Nov. 13, 1928. 1,691,703

A. F. CLARKE

GUIDE APPARATUS FOR STRIP ROLLING MILLS

Filed May 27, 1927 4 Sheets-Sheet 1

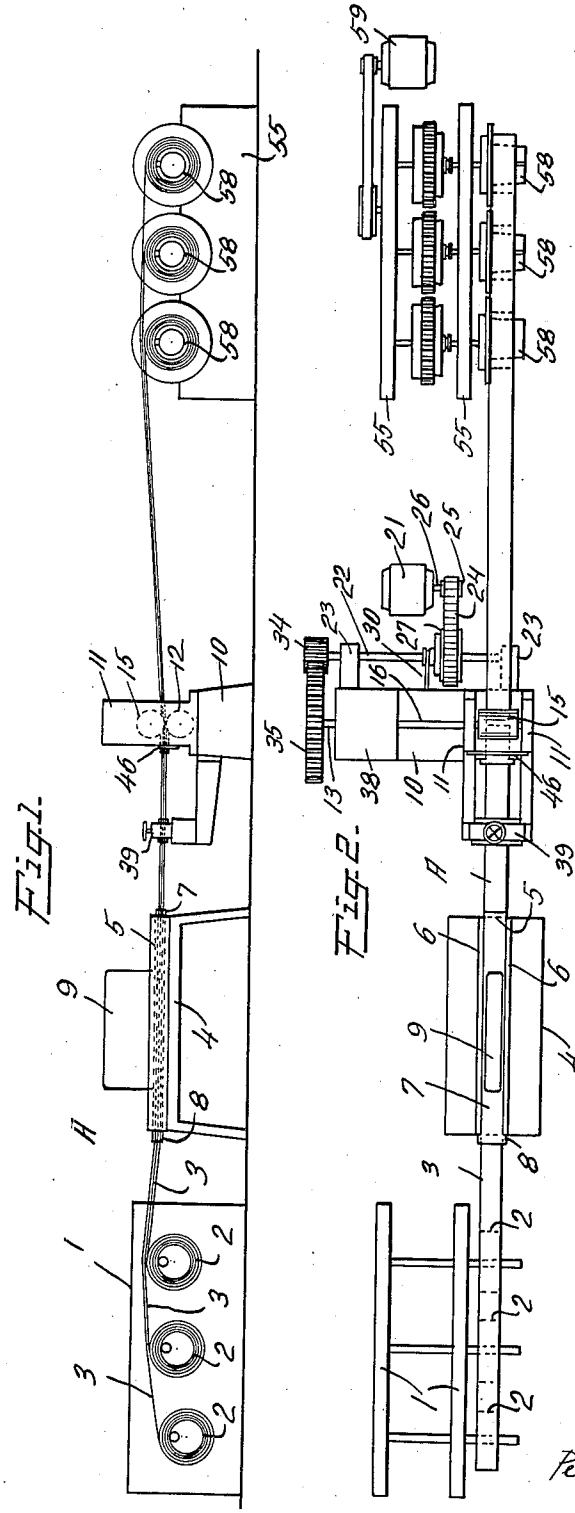


Fig. 1.

Fig. 2.

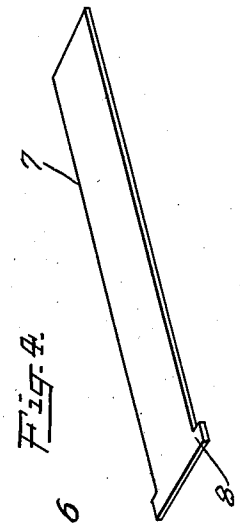


Fig. 4.

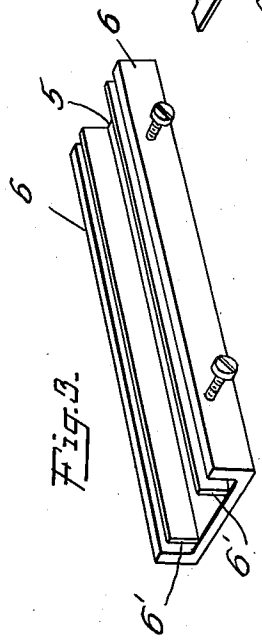


Fig. 3.

INVENTOR
Alexander F. Clarke
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

Nov. 13, 1928.

1,691,703

A. F. CLARKE

GUIDE APPARATUS FOR STRIP ROLLING MILLS

Filed May 27, 1927

4 Sheets-Sheet 2

Fig. 5.

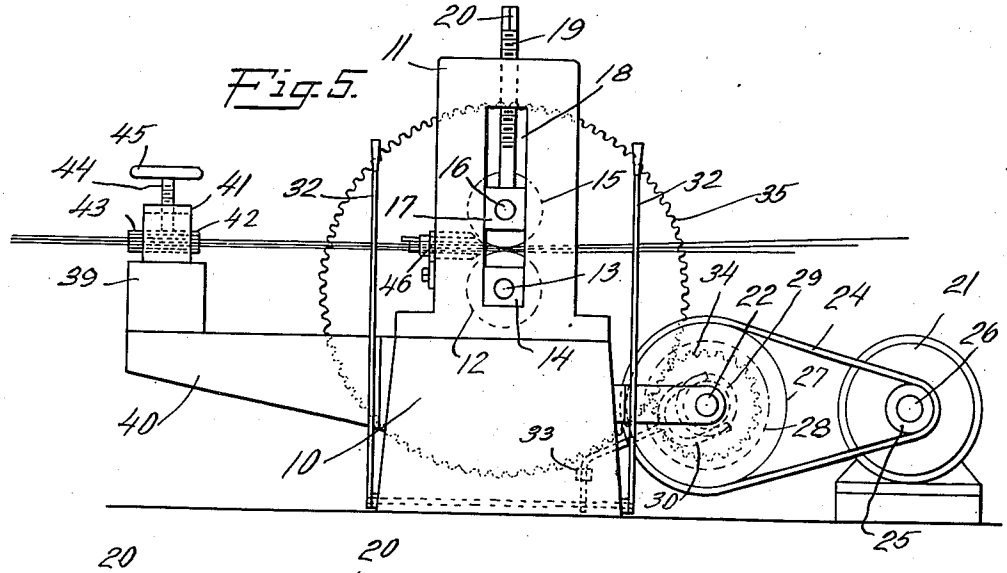


Fig. 6.

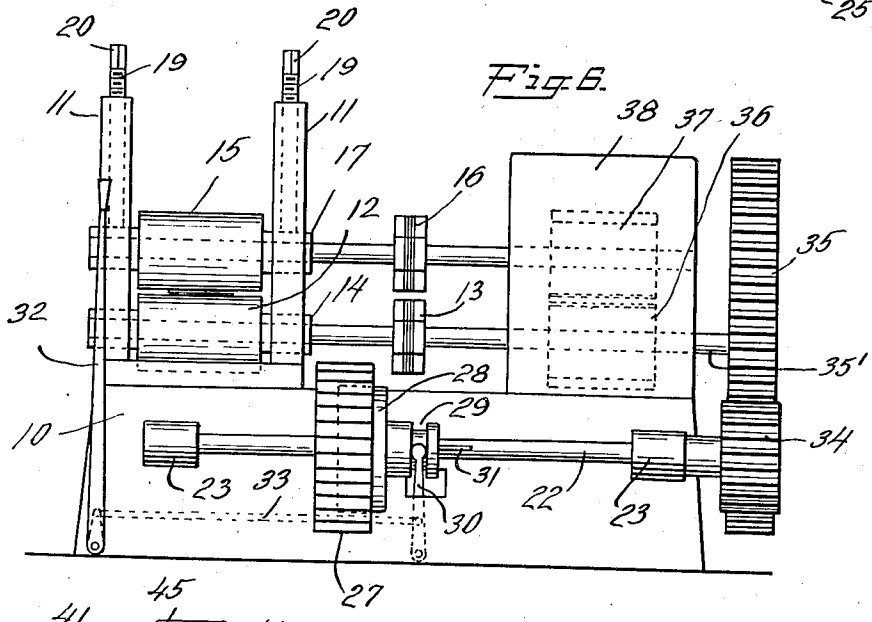


Fig. 7.

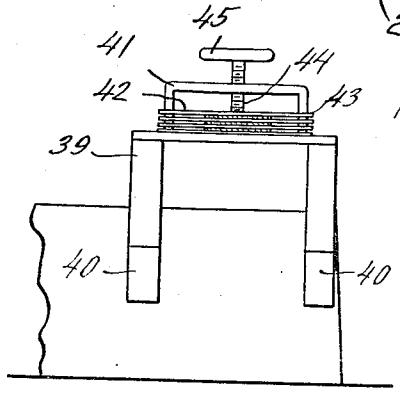
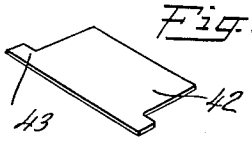


Fig. 8.



INVENTOR
Alexander F. Clarke
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

Nov. 13, 1928. 1,691,703

A. F. CLARKE

GUIDE APPARATUS FOR STRIP ROLLING MILLS

Filed May 27, 1927 4 Sheets-Sheet 3

Fig. 9.

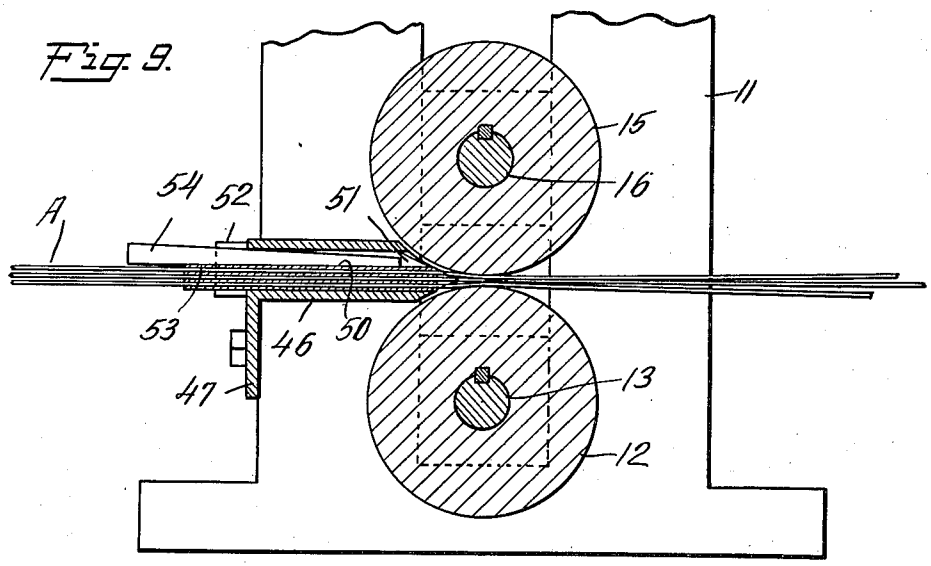


Fig. 10.

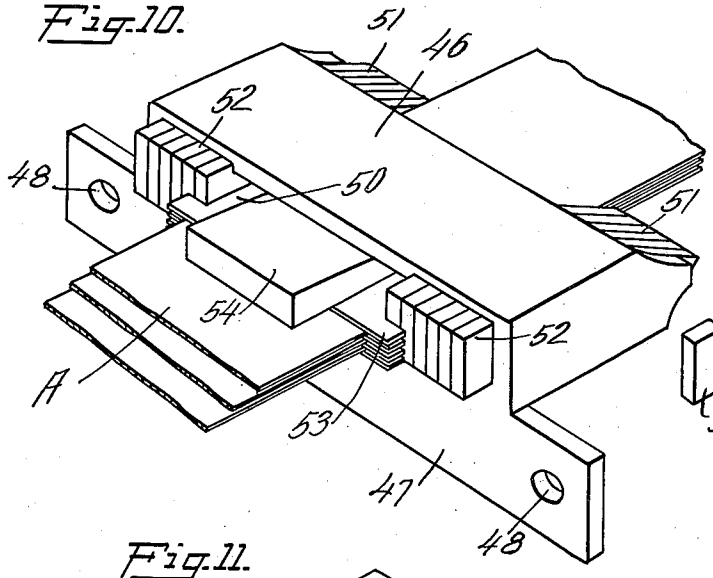


Fig. 12.

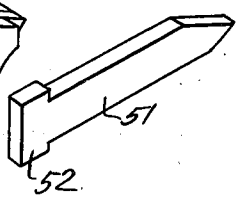
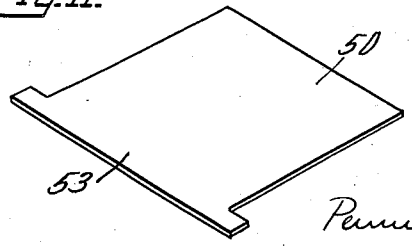


Fig. 11.



INVENTOR
Alexander F. Clarke
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

Nov. 13, 1928. 1,691,703

A. F. CLARKE

GUIDE APPARATUS FOR STRIP ROLLING MILLS

Filed May 27, 1927 4 Sheets-Sheet 4

Fig. 13.

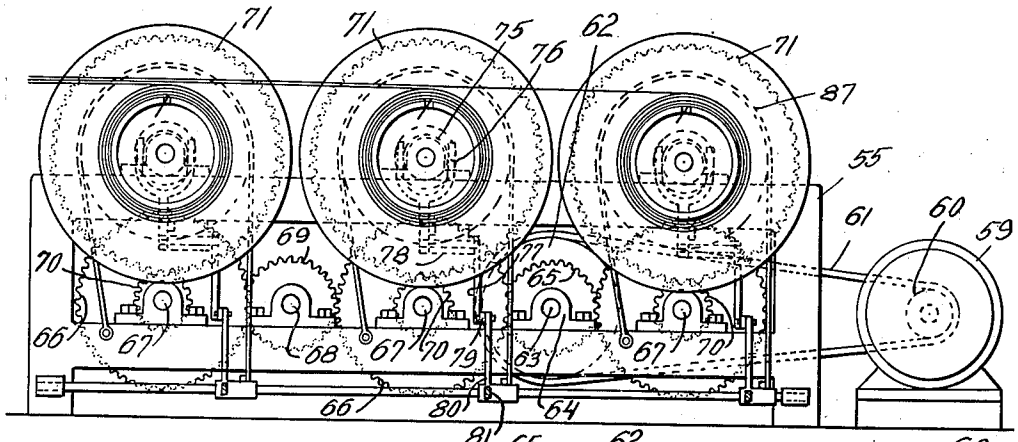


Fig. 14.

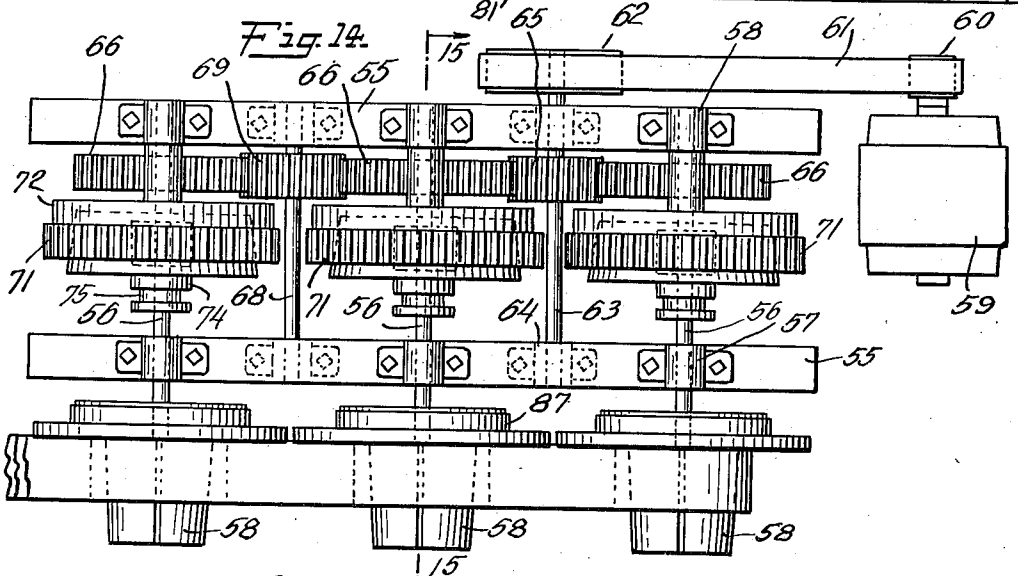


Fig. 15.

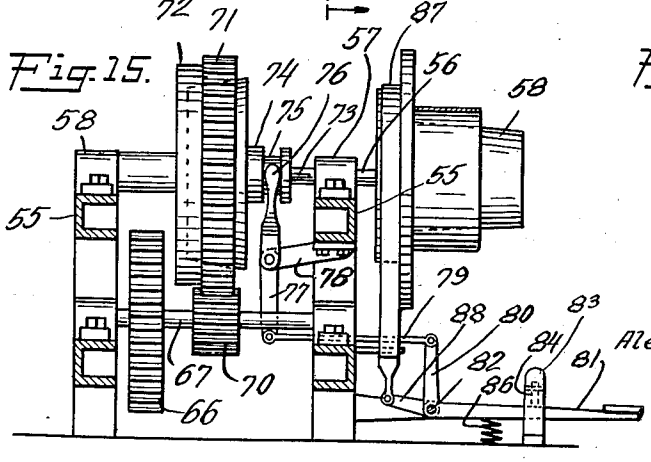
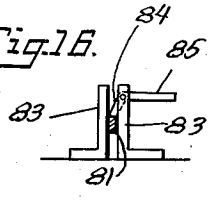


Fig. 16.



INVENTOR
Alexander F. Clarke
BY
Pennie, Davis, Marvin & Edmonds
ATTORNEYS

Patented Nov. 13, 1928. 1,691,703

UNITED STATES PATENT OFFICE.

ALEXANDER FIELDER CLARKE, OF PITTSBURGH, PENNSYLVANIA.

GUIDE APPARATUS FOR STRIP-ROLLING MILLS.

Application filed May 27, 1927. Serial No. 194,612.

This invention relates to methods and apparatus for pack rolling metal strips. In practicing the process of the present invention, I pass a plurality of superposed strips of metal between a pair of rolls in a single operation and guide the strips into the rolls so that they are properly aligned when passing through the rolls.

There are numerous advantages to be gained by my process of pack rolling. When a pack of two or more superposed strips is passed through the rolls, each strip of the pack can be reduced in thickness to the same amount as would ordinarily be possible with a single strip, thus bringing about a material saving in time and labor, and an increase in the output of the apparatus. My process of pack rolling is very useful in the cold rolling of metal strips.

In prior attempts to roll a plurality of strips in a single operation, difficulties have been encountered in maintaining the strips in transverse alignment as they pass through the rolls. If one or more of the strips of a pack are out of alignment so that their edges project beyond the sides of the pack on either side, the rolls tend to sheer off the projecting portion producing strips non-uniform in width and having ragged edges.

In the application of pack rolling to the cold rolling of strips, a serious difficulty is met with because the strips as prepared for the mill are usually slightly thicker in the center than on the edges. Accordingly, when the strips are arranged in packs, the edges of the strips are not in as close contact with each other as are the centers. The fact of the edges of the strips not having adequate support gives them an opportunity to creep transversely and obliquely and to turn up on the extreme edge when in contact with the side guides, and this throws the strips out of alignment.

In practicing the process of the present invention, I avoid the difficulties heretofore encountered by providing a system of guides adjacent to the rolls through which the pack passes and which deliver the strips to the rolls in proper alignment. These guides preferably consist of a plurality of flat plates for separating the strips one from another. The flat plates may be used with side members which may be varied to accommodate strips of different widths and which are adapted to contact with the side edges of the strips and properly align them. The flat plates separating the strips provide adequate support for each strip out to the extreme edges of the same.

The invention further comprises suitable apparatus consisting of a plurality of reels for delivering the strips to be rolled, a pair of pressure rolls, guides arranged adjacent the pressure rolls and a plurality of take-up reels to receive the strips after the rolling operation has been completed. Separate drive motors may be provided for each unit of the apparatus and each of the take-up reels may be provided with independent control means.

The invention also includes means for wiping or cleaning and aligning the strips as the pack is delivered from the feed rolls to the pressure rolls. Such means may consist of a trough-shaped base or support through which the strips pass and a plurality of plates adapted to separate the strips from each other and clean and align them, the plates being so shaped that the pull on them caused by the movement of the strips will retain them in place, the strips being held taut by friction pressure.

In the accompanying drawings, I have shown an organization of apparatus elements particularly suitable for use in practicing the process and forming a part of the invention. In these drawings,

Fig. 1 is a diagrammatic side elevation of the apparatus.

Fig. 2 is a diagrammatic plan view of the apparatus.

Fig. 3 is a perspective view of the base of the cleaning and aligning device.

Fig. 4 is a similar view of one of the plates.

Fig. 5 is a side elevation of the pressure rolls on an enlarged scale.

Fig. 6 is an end elevation of the pressure rolls viewed from the right in Fig. 5.

Fig. 7 is an end elevation of a tension device to assist in holding the strips taut, carried for convenience by the base or support of the pressure rolls.

Fig. 8 is a perspective view of one of the plates employed in the tension device.

Fig. 9 is a central, vertical, longitudinal, sectional view of the pressure rolls on an enlarged scale.

Fig. 10 is a perspective view of the guiding means arranged immediately in front of the pressure rolls.

Fig. 11 is a similar view of one of the separator plates employed in the guiding mechanism.

Fig. 12 is a similar view of one of the side plates.

Fig. 13 is a side elevation of the take-up reels and associated parts.

Fig. 14 is a plan view.

Fig. 15 is a vertical, transverse, sectional view substantially on line 15—15 of Fig. 14, and

Fig. 16 is a detail, sectional view of the clutch control lever of each of the take-up reels showing the locking mechanism therefor.

Referring to Figures 1 and 2 of the drawings which illustrate schematically the entire apparatus, the reference number 1 designates a suitable foundation or support on which a plurality of reels, 2, are mounted. These reels are adapted to contain the strips, 3, to be rolled. As shown, the strips are fed from the reels and arranged in superposed relation to form a pack, A. The number of strips to be rolled in a single operation may be varied under different conditions and the use of a pack formed of three strips is merely illustrative. After the pack is formed, the strips are fed through a cleaning, wiping and aligning apparatus supported on a suitable base or foundation therefor. As shown, this apparatus may consist of a trough-shaped member, 5, having side walls, 6. It is desirable to have this trough-shaped member adjustable to accommodate strips of different widths. This may be accomplished in any suitable manner, as by providing auxiliary side-wall strips 6′, adjustably secured to the walls 6.

Within the trough-shaped base, the opposite surfaces of the strips are adapted to contact with plates 7 (see Fig. 4). These plates may be made of any suitable material and are adapted to contact with the surfaces of the strips with sufficient pressure to remove oil or other material therefrom, and to keep the strips in alignment. As shown, one end of each plate is of increased width, as indicated at 8, and the projecting tabs so formed are adapted to engage the ends of the side walls 6, when the strips are in position. The movement of the strips through the cleaning and aligning trough will then retain the plates in position. The pressure of the plates on the strips can be obtained by placing a weight, 9, on the uppermost plate, and this pressure can, of course, be varied by varying the size of the weight, or by using a screw or the like.

The strips are passed through a rolling mill of the usual construction consisting of a suitable foundation or support 10 and a mill housing consisting of a pair of upright members 11 carried by the support. A lower pressure roll 12 is mounted in fixed bearings 14 carried by the upright member 11. An upper pressure roll 15 is mounted in vertically adjustable bearings 17. These bearings are adjustable in openings formed in the upright members. The pressure rolls 12 and 15 are provided with necks which extend through the bearings and are connected to flexible couplings 13 and 16 respectively. The upper bearing members 17 are adjusted by means of threaded rods or bolts 19 secured to the bearing blocks and passing through threaded openings in the upright members 11. The upper ends of the bolts are squared as at 20 for the reception of a wrench or other suitable tool to permit adjustment of the upper pressure roll with respect to the lower pressure roll to vary the pressure exerted on the strips.

The pressure rolls may be driven in any suitable manner. As shown a motor 21 may be arranged adjacent the foundation and a drive shaft 22 driven from the motor. This shaft is mounted in suitable bearings 23 carried by the base or foundation of the pressure rolls and is driven by means of a chain belt 24 passing over a gear 25 on motor shaft 26 and a gear 27 which is loosely mounted on the drive shaft. As shown (see Fig. 6) the gear 27 is carried by a hub 28 and this hub is provided with a circumferential slot 29 for the reception of the ends of a yoke 30. The shaft 32 is provided with a key 31 adapted to be received in a longitudinal groove in the hub 28, to connect the gear 27 to the drive shaft when it is moved on the shaft to the right in Fig. 6. The drive is controlled by means of a control lever 32 which is connected to the yoke 30 by a link 33. The drive shaft is provided with a pinion 35 meshing with a gear 35 carried by a shaft 35′. This shaft extends into a pinion housing 38 and carries a pinion 36 which drives a second pinion 37 also arranged in the pinion housing. The pinions 36 and 37 are connected to the flexible couplings 13 and 16 respectively to drive the pressure rolls 12 and 15.

In front of the pressure rolls, I provide a tension device 39, to hold the strips taut, mounted on a bracket 40, carried for convenience by the base of the pressure rolls. The auxiliary pressure device is provided with a substantially U-shaped frame 41, adapted to receive a plurality of separating plates 42. The ends of these plates are enlarged as at 43 to permit them to contact with the sides of the U-shaped frame and thus be held in position by the pull exerted by the moving strips. A threaded rod 44 passes through the U-shaped frame and is adapted to contact with the upper plate 42, to exert

the desired pressure on the strips. This rod may be controlled by a hand wheel 45.

Immediately in front of the pressure rolls 12 and 15, I provide suitable guiding mechanism to arrange the strips of the pack in transverse alignment before they enter the pressure rolls. This guiding mechanism consists of a box-like frame 46, the ends of which are open. At the front, the frame is provided with a depending flange 47, having suitable bolt openings 48 to permit it to be bolted to the pressure roll support 11, as shown in Fig. 9. In passing through the guiding and aligning mechanism, the strips are separated by plates 50, to permit freedom of movement of the individual strips. The strips are guided by means of side members 51, which are arranged in the frame. As shown, the guide members are of a height substantially equal to the frame of the guiding mechanism and are provided with enlarged ends 52, which engage the front of the frame to retain the guide members in proper position. When the apparatus is to be used, a suitable number of guide members are placed in each side to leave a space between the two sides equal to the width of the strips being rolled, so that the side edges of the strips will contact with the guide members. The separator plates 50 are likewise provided with enlarged ends 53, which engage the side members as shown in Fig. 10 of the drawings, to retain them in position. A tapered block or wedge 54, of substantially the width of the strips, is arranged between the upper separator plate and the top of the guiding frame, and this wedge may be driven in a suitable distance to regulate the pressure in the frame, to hold the strips and separating plates flat.

After the strips have been rolled, they are delivered to take-up reels of common design, carried by a suitable frame consisting of a pair of spaced side members 55. These side members are adapted to support shafts 56, which are mounted in suitable bearings 57, and carry the take-up reels 58. The take-up reels are driven from a motor 59, and are provided with independent controls. As shown, the motor shaft is provided with a pulley 60, adapted to receive a belt 61, which passes over a pulley 62, mounted on a shaft 63. The shaft 63 is supported in suitable bearings 64 carried by the frame of the take-up mechanism. This shaft is provided with a gear 65 adapted to mesh with gears 66 arranged on shafts 67 immediately below the shafts 56 of the take-up reels (see Fig. 15). Suitable intermediate shafts 68 are provided having pinions 69 by means of which the train from each gear 66 is completed to the next adjacent gear and shaft 67. The shafts 67 are provided with pinions 70, meshing with gears 71 carried by drums 72 on the shafts 56. The shafts 56 are provided with keys 73 adapted to be received in longitudinal grooves formed in the hubs 74 to the drums 72. The hubs 74 are provided with circumferential grooves 75, and the ends of a yoke 76 are received in each of these grooves. The yoke is carried by a lever 77, pivotally mounted on an arm or bracket 78, carried by the frame. A link 79 is connected to this lever and the other end of the link is connected to an arm or crank 80, carried by a control pedal 81. The pedal is pivotally mounted on the base of the machine as at 82, so that when it is depressed, the arm 80 is moved in a counter-clockwise direction exerting a pull on the link 79, and moving the clutch to an operative position. The pedal 81 passes between a pair of guides 83 (see Fig. 16) and is adapted to be locked in operative position by means of a gravity actuated latch 84, which is carried by one of the guides 83, and is adapted to assume the operative position shown in Fig. 16 when the pedal is depressed. The latch is provided with a lateral extension 85 to permit its release, and when the latch is released, the pedal is moved upwardly by a spring 86. A brake band 87 is arranged on the reel and the end of this brake band is connected to an arm 88, extending from the clutch pedal 81, so that when the clutch is released the brake is applied.

In practicing the process, the number of reels on the base or support 1, and on the take-up unit 55, are first determined by the number of strips to be rolled in the pack. The strips are first led through the cleaning and aligning device 4, to remove any oil or other substance that may have remained on their surfaces from prior treatments, and to give the strips a preliminary alignment. The movement of the strips toward the right in Figs. 1 and 2 of the drawings exerts a pull which retains the separator plates 7 in place and the pressure exerted by these plates is controlled by the weight 9, or other device.

If the tension device 39 is employed, the pull of the strips likewise retains the plates 42 in position, and the pressure is regulated by the threaded rod 44.

Immediately before passing between the pressure rolls, the strips pass through the guiding mechanism 46. This is an essential feature of the invention, as it properly aligns the strips of the pack just before they are delivered to the rolls. The number of side members 51 is determined by the width of the strips being rolled, and these side members and the separator plates 50 are retained in position by their enlarged ends 52 and 53, respectively, and the pull exerted by the strips being fed through the apparatus. By employing the separator plates 50 in the guiding mechanism, the strips may more readily align themselves when their side edges contact with the side members 51. It is advisable to exert some pressure on the strips at this point to

prevent too free movement so that the strips will remain aligned as they pass through the pressure rolls. The wedge or tapered block 54, or other means, is employed for the purpose of obtaining this pressure, and the pressure can, of course, be varied by adjusting this block or other mechanism in the frame. The pressure rolls may be adjusted to exert any desired pressure on the strips by moving the upper roll 15 with respect to the lower roll.

After passing through the pressure rolls, the strips are arranged on the take-up reels 58, which are driven from the motor 59, and which are independently controlled in the manner heretofore described, so that any number of reels may be driven and used according to the number of strips being rolled in a single operation.

I claim:

1. In a device for pack rolling metal strips, a guide consisting of an open frame, separator plates arranged within the frame and side members arranged within the frame and adapted to contact with the sides of the strips.

2. In a device for pack rolling metal strips, cleaning mechanism consisting essentially of a support and a plurality of plates adapted to be arranged between the strips, said plates being retained in the support by the pull exerted by the moving strips.

3. In a device for pack rolling metal strips, a guide consisting of a frame, plates adapted to be arranged within the frame between the strips, and means for retaining said plates in position by the pull exerted by the moving strips.

4. In a device for pack rolling metal strips, a frame and plates adapted to be arranged within the frame between the strips, said plates being provided with enlarged ends adapted to engage the end of the frame to prevent the plates from passing through the frame.

5. In a device for pack rolling metal strips, a guide consisting of a frame and side members arranged within the frame and adapted to engage the edges of the strips to align them, said side members being retained in the frame by the pull exerted by the moving strips, and a plurality of plates arranged between the strips to hold the same out of contact with each other.

6. In a device for pack rolling metal strips, a frame and side members arranged within the frame and adapted to contact with the edges of the strips to align them, said side members being provided with enlarged ends adapted to engage the end of the frame to prevent displacement of said side members.

7. In a device for pack rolling metal strips, cleaning and aligning mechanism consisting of a support, plates adapted to be arranged within the support and between the strips, and means for exerting pressure on said plates to maintain them in contact with said strips.

In testimony whereof I affix my signature.

ALEXANDER FIELDER CLARKE.