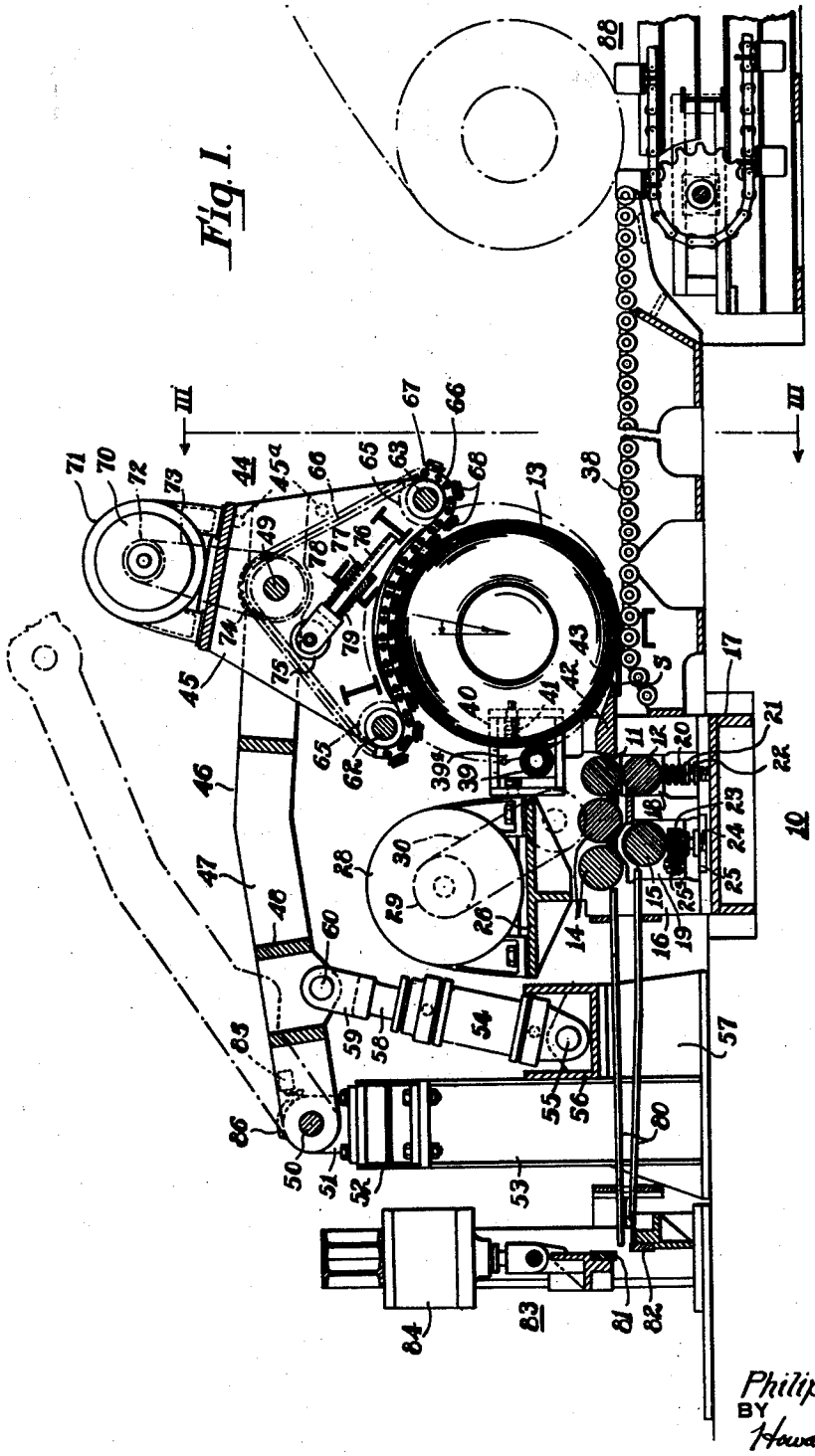
Oct. 10, 1950 P. P. APPLEBY 2,525,254

COIL OPENING APPARATUS

Filed Jan. 15, 1947 2 Sheets-Sheet 1

Fig. 1.



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Filed Jan. 15, 1947 2 Sheets-Sheet 2

Fig. 2.

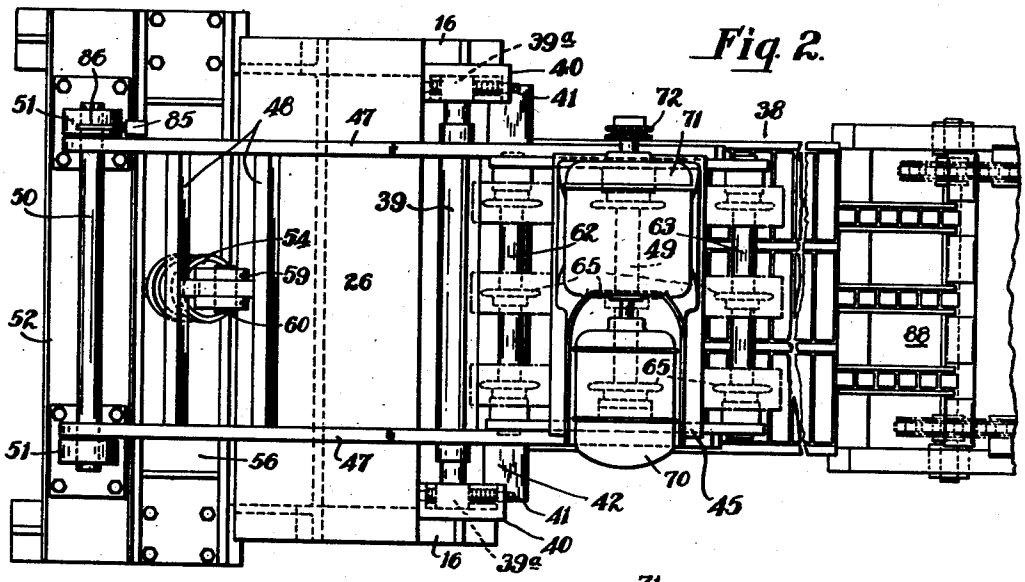


Fig. 3.

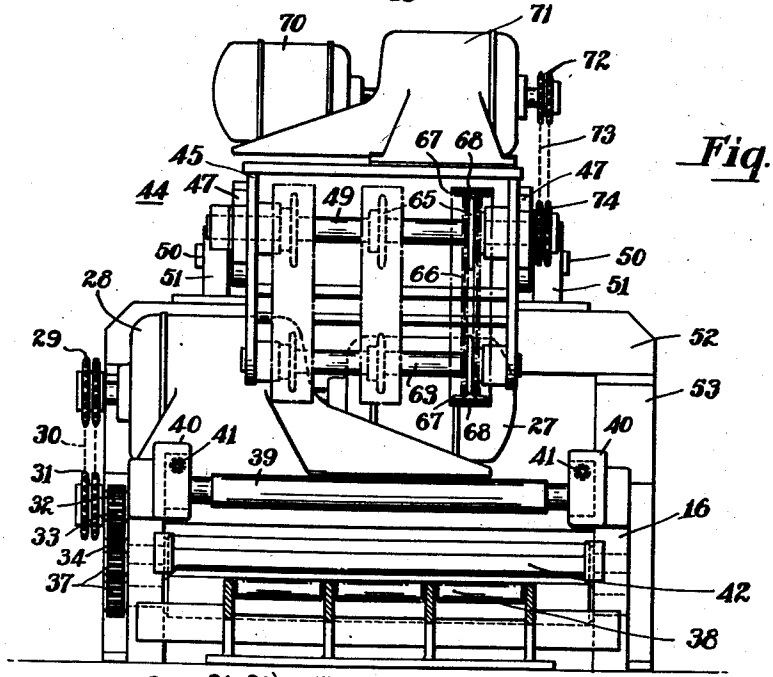
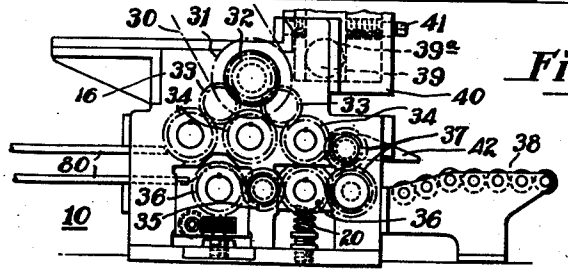


Fig. 4.



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Patented Oct. 10, 1950

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UNITED STATES PATENT OFFICE

2,525,254

COIL OPENING APPARATUS

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8 Claims. (Cl. 242—78)

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This invention relates to improvements in apparatus for uncoiling coiled strip metal, and more particularly to apparatus for opening a coil and forming a straight tail thereon.

One object of the invention is to provide an apparatus of this character by which the outer or leading end of the coiled strip is uncoiled and straightened into an elongated tail by power mechanism in a single operation without manual engagement and manipulation of the end of the strip once the operation is initiated.

Another object of the invention is to provide a self-adjusting fluid operated tractor device for engaging and holding a coil in a fixed position and rotating the same relative to a fixed deflector bar or guide member by which the leading end of the strip is deflected substantially tangentially away from the coil and continuously guided until it is entered between feed rolls. A further object is to provide a mechanism of the type referred to which is of a simplified and improved construction, efficiently and safely operable, and which is adapted to operate on coils of various sizes and of various metal gages and tempers without marking, scratching or otherwise damaging the surfaces of the strip metal.

A particular embodiment which the invention may take is illustrated in the accompanying drawings wherein Fig. 1 is a longitudinal vertical sectional view; Fig. 2 is a plan view of a portion of the apparatus of Fig. 1; Fig. 3 is a sectional view on the line 3—3 of Fig. 1; and Fig. 4 is a side elevational view of a portion of the apparatus of Fig. 1.

The present invention is designed particularly for use in a coil handling system as disclosed in U. S. Patent to Lane et al. 2,324,855, dated July 20, 1943, and constitutes an improvement in the reversing tail puller mechanism therein disclosed. However, the invention as a whole as well as various features thereof, is also suitable for use in various other relations.

Referring now more particularly to the drawings, the mechanism comprises a tail puller indicated generally by the numeral 10 which incorporates a pair of feed or pinch rolls 11 and 12 for feeding strip metal, for instance, from a coil represented by the numeral 13 rearwardly between upper and lower bending and straightening rolls 14 and 15. In the instant case, only two upper rolls 14 and one lower roll 15 have been illustrated, but a greater number of such rolls can be used, as desired. The lower roll 15 is disposed midway between the axes of the rolls 14 and cooperates therewith to bend the strip as it passes

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therebetween in a direction reversely to its coiled curvature. As a result the strip will leave the straightening rolls in substantially a flattened condition.

The feed rolls 11—12 and the bending rolls 14—15 are mounted between side housings 16 that are supported on a suitable stand or frame 17 (Fig. 1). The upper rolls 11 and 14 are suitably journalled in the housings 16 with their lower sides disposed in a common horizontal plane or pass line, while the lower rolls 12 and 15 are journalled in bearing blocks 18 and 19, respectively, that are vertically slideable in suitable windows provided in the housings 16. The lower feed roll 12 is adapted to be pressed or urged against the underside of the upper feed roll 11 by means of springs 20 that are interposed between the underside of the bearing blocks 18, in which the roll is journalled, and the upper face of adjusting screws 21. Each adjusting screw 21 is threaded into a nut member or threaded plate at the lower end of the window in the side housing, a jam nut 22 being provided to lock the screw 21 in adjusted positions. By adjusting the screws 21, the pressure of the feed roll 12 against the feed roll 11 can be increased or decreased by controlling the loading of the springs 20, it being desired to pinch the strip between the rolls sufficiently to effect feeding thereof without slippage.

Vertical adjustment of the lower bending roll 15 with respect to the upper rolls 14 is accomplished by actuating gear nuts 23 that are mounted in apertures in the bearing blocks 19 and have driving engagement with vertical screws 24 which are threadedly received in nut members 25 located at the lower edge of the vertical windows in the side housings 16. A cross shaft 25a having pinions thereon in mesh with the gear nuts 23 extends through the slide blocks 19 and may be rotated from either end to effect simultaneous turning of gear nuts 23. Normally, the bending roll 15 will be adjusted relative to the rolls 14 so as to reversely bend the strip to an extent sufficient to overcome the set in the strip as withdrawn from the roll.

The side frames 16 are joined at their upper sides by a cross plate 26 which constitutes a platform support for a gear motor unit consisting of motor 27, Fig. 3, and gear reduction mechanism 28 by means of which the various rolls of the tail puller are driven. A double sprocket wheel 29 is mounted on the output shaft of the gear reduction unit 28 and through suitable chain 30 drives a similar double sprocket wheel 31 (Fig. 4) that is mounted on a stub shaft secured to one of the

side housings 16. A gear 32 mounted on this stub shaft and keyed thereto meshes with idler gears 33 which in turn mesh with gears 34 each secured to the outer end of a shaft extension of the rolls 11 and 14. Idler gear 35 meshes with gears 36 mounted on stub shaft extensions of the lower rolls 12 and 15 and these gears are driven by means of idler gears 37 from gear 34 on the end of roll 11. It is to be noted that each of the rolls 11—12 and 14—15 is thus positively driven and preferably at the same peripheral speed so as to eliminate roll slippage. The driving motor 27 is of the reversing type so that the rolls may be driven either in a clockwise or a counter-clockwise direction.

In front of the tail puller, a coil support preferably in the form of a horizontally elongated roller table 38 is provided. This roller table consists of a plurality of small rollers that are suitably journalled at their ends in longitudinally extending supporting bars. The tops of the rollers are preferably located in a plane common with the pass line of the feed rolls 11—12. A coil 13 which is to be opened is adapted to be positioned on its side on the roller table 38 and moved along the roller table toward the tail puller until it engages a stop roll 39. Roll 39 is attached to the front side of the tail puller above the plane of the roller table 38 in position to be engaged by the coil 13. At each end, the roll 39 is journalled in a slide bearing 39a slideably mounted in horizontal guides of a box frame 40 which in turn is secured to the adjacent side housing 16. Adjusting screws 41 are journalled in the vertical sides of the box housing and have threaded engagement with the slide bearings 39a. By engaging the outer squared ends of the adjusting screws 41 with a suitable wrench, the screws may be rotated to effect horizontal shifting of the stop roll 39 into adjusted positions.

Also attached to the tail puller housings 16 is a forwardly extending strip deflector and guide bar 42 which is disposed in front of the upper feed roll 11. The underside of the bar 42 is spaced slightly above and substantially parallel to the pass line of the feed rolls. At its forward edge, the bar 42 is pointed and formed with a rounded nose as indicated at 43 (Fig. 1). With a coil 13 supported in unwinding position on the roller table 38 and engaged against the stop roll 39, the nose 43 of the deflector bar 42 will be disposed just out of contact with the coil 13. In other words, the stop roll 39 will preferably be so adjusted horizontally that when the coil is urged or pressed thereagainst, the body of the coil will just clear the nose of the bar 42, the inclined top surface of the bar affording clearance with respect to the overlying portion of coil 13. By adjustment of roll 39, coils of various diameters may be accommodated to this fixed position, with respect to the deflector bar 42, for uncoiling.

In order to hold the coil in this uncoiling position and also effect rotation thereof, a tractor device indicated generally by the numeral 44 is provided. This tractor device comprises a substantially inverted U-shaped frame 45 which is supported on the free end of a substantially horizontal swinging frame 46, by oscillation of which the tractor device may be moved downwardly and upwardly relatively to the coil 13. The supporting member 46 consists of cantilever arm members 47 joined at suitable intervals by cross bars 48. At their free ends, the arms 47 flank the sides of the U-frame 45, and a shaft 49 extending through the arms and the frame affords a pivotal supporting connection for the tractor device to permit rocking thereof. The frame 45 is provided with suitable stops 45a positioned above and below arms 47 to limit the extent of rocking movement of the tractor device 44 relatively to the supporting member 46. At its rear end, the swinging frame 46 is mounted on a shaft 50 that is secured by bearing blocks 51 to the upper side of a cross beam 52 supported at its ends on uprights 53. A power cylinder 54 is pivotally connected at its lower end at 55 to a crossbeam 56 supported at its ends on stands 57. The cylinder contains a piston which is connected with a piston rod 58 having a clevis 59 pivotally connected at 60 to the underside of the cantilever supporting frame 46 to oscillate it vertically.

Below the shaft 49 of the tractor device is a pair of shafts 62 and 63 journalled at their ends in the sides of the frame 45, the three shafts 49, 62 and 63 being disposed in substantially triangular relationship with shafts 62 and 63 denoting the base of the triangle and being located at opposite sides of the center of coil 13. Mounted in laterally spaced relation on the shafts 49, 62 and 63 are a plurality of sets of sprocket wheels 65, and an endless chain 66 encircles the sprocket wheels of each set. These chains are the usual roller and link type and each alternate link is provided with cross cleats or bars 67 and vulcanized or otherwise suitably secured on the cleats are pads 68 of rubber, neoprene or other suitable non-abrading material. These endless chains 66 and their padded cleats constitute endless traction elements or belts by means of which the upper periphery of a coil 13 is frictionally engaged and positive rotative movement imparted to the coil to rotate the same with respect to the deflector bar 42. While it is preferred to use these endless chain coil rotating elements, roller mounted belts of suitable known materials such as leather, fabric etc., may be substituted, if desired.

It will be seen that the axis of shaft 49 is located to one side or forwardly of the center of coil 13 so that when the tractor device is brought down to establish driving engagement between the traction elements 68 and the upper side of the coil, the frame 45 will rock on shaft 49 and impart a rearward thrust to the coil to move and hold the coil firmly against stop roller 39.

This rocking action also enables the tractor device to seat itself on the coil with the sprockets 65 properly centered with respect to the coil so that the load on each line of sprockets is equalized, regardless of coil diameter. Thus, the tractor device can take hold of coils of various sizes or diameters and move each of them into unwinding position against stop roller 39, without need initially to position each coil exactly with reference to stop roller 39.

The shaft 49 is adapted to be driven from a reversible motor 70 operating through a suitable gear reduction unit 71 having a double sprocket wheel 72 on its output shaft, which sprocket is connected through the medium of chain 73 with a similar double sprocket wheel 74 keyed to the projecting end of shaft 49. The drive unit 70—71 is suitably supported on the upper side of the frame 45. Each of the tractor belts 66 is provided with a takeup and tensioning device (Fig. 1) comprising a sprocket wheel or roller 75 that is mounted on the outer end of a rod 76 slideably supported in a guide bushing 77 of a transverse

channel bar 78 secured at its ends to the sides of the U-frame 45. A spring 79 urges the rod 76 and its chain engaging roller 75 outwardly to take up slack in the chain. The rod 76 has key connection with the guide 77 whereby rotation of the rod and consequently the sprocket wheel out of the running plane of the chain is prevented.

It will be observed that when the cantilever support 46 is in elevated position as shown in dotted lines in Fig. 1, the tractor device 44 will be elevated with respect to the coil supporting table 38 whereby the coil 13 may freely be moved along the table into and out of uncoiling position. With coil 13 in uncoiling position as indicated in Fig. 1, the tractor device will be lowered to engage the upper side of the coil with the pads on the endless belts, the belts arching to embrace a substantial portion of the coil as indicated. Thereby, the coil is firmly held in uncoiling position without danger of it rolling away from the tail puller, by reason of the backward component of the tractor device relative to the coil urging the latter against the stop roll 39, as indicated in Fig. 1. The coil, with the arrangement of parts as indicated in Fig. 1, will be disposed so that the coil will rotate in a clockwise direction when the strip is withdrawn from the underside thereof. Now by effecting rotation of the coil initially in either direction, its outer end will be brought to a point below the plane of the underside of the deflector bar 42.

It is desirable that the outer end of the coil be slightly spaced from the body of the coil and this may be effected in any suitable way. In the case of heavy gauge strip metal coiled on a three-roll coiler, the outer end of the strip may be left straight to form a tail several inches long. Thereby a slight gap will be present between the end of the coil and the body of the coil into which the nose of the deflector bar 42 is received so that the bar may intercept the end of the strip upon clockwise rotation of the coil. In cases where this short tail projects too far outwardly from the body of the coil that it might not pass under the coil without catching on the roller table, it is desirable to effect counter-clockwise rotation of the coil until this tail snaps below the deflector bar 42, to substantially the position shown in Fig. 1. Whereupon, the drive to the tractor elements 68 is reversed and the coil given a clockwise rotation, the end of the coil impinging against the underside of the deflector bar 42 and moving outwardly therealong and entering between the feed rolls 11—12. Since the rear end of the bar 42 is in close proximity to the feed roll 11, the bar continuously guides the end of the strip until it reaches the feed rolls. Thus, the need to bend the deflected end of the strip by hand into position to enter between the feed rolls is eliminated. These rolls grip the end of the strip, and impart pulling movement to the strip to feed the strip rearwardly between the straightening rolls 14—15 at which time the tractor device may be moved upwardly away from the coil. If desired, however, its functioning can be continued in order to assist in rotating the coil. As the straightened strip emerges from the straightening rolls it enters between rearwardly extending guides 80 disposed above and below the pass line to guide the strip rearwardly between upper and lower knives 81 and 82 of a shear 83, by means of which the ends of the strip may be cut off square if necessary. The movable blade 81 of the shear is adapted to be actuated by a power cylinder 84.

Subsequent to the coil opening operation, pressure is admitted to the cylinder 54 to lift the tractor device. During this raising movement, the driving motor 70 may be disconnected automatically from the supply line by operation of a limit switch 85 (Fig. 1) carried by the swinging support 46 and coming into engagement with an operating cam 86 on one of the bearings 51 when the arm 46 reaches a pre-determined elevated position. After the desired length of straight tail has been formed, the drive for the bending and straightening rolls will be reversed in order to eject the tail, the coil 13 being bodily moved along the roller table 38 by this ejectment movement. As soon as the tail clears the deflector bar 42, the operator may manually lift the tail and turn it to a forwardly projecting position, as indicated by broken lines in Fig. 1. Continued movement of the tailed coil along roller table 38 delivers the coil to a storage conveyor 88 by means of which successive tailed coils can be received and subsequently delivered one by one into uncoiling position at a rolling mill or other strip processing mechanism, as disclosed more fully in the patent above referred to.

By reason of the fact that the blunt pointed forward edge or nose of deflector bar 42 is adapted to enter the gap between the outer end of the strip and the body of the coil and deflect the end of the strip outwardly, the arduous and dangerous operation of manually pulling out and straightening even that length of tail needed to reach to feed rolls is eliminated. At the same time losses in time and damage to the metal, especially when operating on heavy gauge metal to form manually a short length of tail to reach the pinch rolls are eliminated, while the out of contact relation between the body of the coil and the nose of the deflector bar avoids danger of gouging and scratching the surfaces of the strip metal. If desired, the roller table 38 may be provided with a slightly downward gradient towards the storage conveyor 88 in order to assist in discharge movement of the coils, since the tractor device will prevent any movement of the coils in this direction during the opening and tail forming operation.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the spirit and scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

What is claimed is:

1. Coil unwinding mechanism comprising, in combination, a pair of driven feed rolls, coil supporting rollers adjacent to said feed rolls to support a coil on its side, a stop roller above said supporting rollers, a tractor device having a driven coil engaging element for holding said coil against said stop roller and imparting rotation to said coil, a fixed deflector bar extending between said feed rolls and the body of said coil in position to intercept the outer end of said coil during rotation of the coil and deflect and guide said end outwardly until it reaches said feed rolls, and means for moving said tractor device into and out of operative relation with said coil.

2. Coil unwinding mechanism comprising, in combination, upper and lower driven feed rolls,

coil supporting rollers forwardly of said lower feed roll to support a coil at its underside substantially in the plane of the pass line between said feed rolls, a fixed deflector bar in front of said upper feed roll above said pass line, and having a pointed forward edge, to engage the outer end of said coil and deflect the same outwardly to said feed rolls, and means to hold said coil in a fixed position relatively to said deflector bar and to rotate the coil, comprising a stop roller for engagement by said coil, and a pivotally mounted tractor device having an endless travelling belt movable downwardly into frictional driving contact with the upper side of said coil and adapted to press the coil against said stop roller.

3. Coil unwinding mechanism comprising, in combination, upper and lower driven feed rolls, coil supporting rollers forwardly of said lower feed roll to support a coil at its underside substantially in the plane of the pass line between said feed rolls, a fixed deflector bar in front of said upper feed roll above said pass line, and having a pointed forward edge, to engage the outer end of said coil and deflect the same outwardly to said feed rolls, and means to hold said coil in a fixed position relatively to said deflector bar and to rotate the coil, comprising a stop roller for engagement by said coil, and a pivotally mounted tractor device having an endless travelling belt movable downwardly into frictional driving contact with the upper side of said coil and adapted to press the coil against said stop roller, said travelling belt consisting of a roller and link chain, cross cleats carried by said link chain in regularly spaced relation, and a pad of resilient material secured to each of said cleats for contacting the upper side of said coil.

4. In apparatus for forming a straight tail on coiled strip metal, the combination with a roller table for movably supporting a coil on its side thereon, a pair of feed rolls at one end of said table for pulling a tail from the underside of said coil, a plurality of reverse bending rolls for straightening the tail pulled by said feed rolls, and a reversible motor drivingly connected to said feed and bending rolls, of a stop roller for limiting movement of said coil towards said feed rolls, a tractor device overlying said roller table and carrying an endless travelling belt frictionally engageable with the upper side of said coil to impart rotative movement thereto, a deflector bar fixedly mounted in position above the plane of said table in substantially tangential relation to the underside of said coil to intercept the outer end of said coil during rotation of the coil and deflect and guide said end outwardly until it reaches said feed rolls, and means including a power cylinder for raising and lowering said tractor device into and out of operative relation with said coil.

5. The combination as set forth in claim 4 in which said stop roller is journalled at its ends in horizontal slide bearings engaged by adjusting screws by means of which shifting of said stop roller in a horizontal direction is effected to locate said coil with its periphery adjacent to but out of contact with the forward edge of said deflector bar.

6. The combination as set forth in claim 4 in which said tractor device is pivotally supported for rocking relatively to said coil, with the pivotal supporting axis located to one side of the center of the coil at that side of the center of the coil which is opposite said stop roller, to hold said coil against said stop roller when said travelling belt on the tractor device is in driving contact with said coil.

7. In apparatus for opening and unwinding coiled strip metal, a cantilever supporting member, means pivotally supporting the same at one end in an elevated position, a tractor device pivotally supported at the free end of said member, a power cylinder for actuating said member to raise and lower said tractor device, means comprising rollers for supporting a coil beneath said tractor device, a plurality of endless traction belts carried by said tractor device for frictionally engaging the upper side of said coil upon downward movement of said tractor device, means for driving said belts to rotate said coil around its axis, a fixed deflector bar positioned to intercept the outer end of said coil and deflect said end outwardly during rotation of the coil, and means including reverse bending rolls for receiving the deflected end of the coil and straightening the same.

8. Coil opening apparatus comprising, in combination, a pair of driven feed rolls, a fixed deflector bar in front of one of said rolls and extending outwardly therefrom, rollers for rotatably supporting a coil of strip metal with its body disposed adjacent to but out of contact with the outermost edge of said deflector bar, said coil having its outer end spaced out from its body prior to positioning the coil on said supporting rollers, traction devices movable into frictional driving contact with said supported coil, means to drive said traction devices to rotate said coil in a direction to engage said outer end against said deflector bar for deflection thereby tangentially outwardly to said feed rolls, a frame carrying said traction devices, and means pivotally supporting said frame for rocking movements on an axis paralleling that of said coil, whereby the pressure of driving contact of said traction devices on said coil is equalized.

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REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Name	Date
1,975,756	Summey	Oct. 2, 1934
2,280,564	Wilson	Apr. 21, 1942
2,324,855	Lane et al.	July 20, 1943

Certificate of Correction

Patent No. 2,525,254 October 10, 1950

PHILIP P. APPLEBY

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 5, line 59, after "rolls" and before the period insert the comma and words , *thereby assuring entry of the strip between the feed rolls*;

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 12th day of December, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.