Sept. 21, 1943. F. Z. FOUSE 2,329,832

UNCOILER

Filed Dec. 12, 1939 4 Sheets-Sheet 1

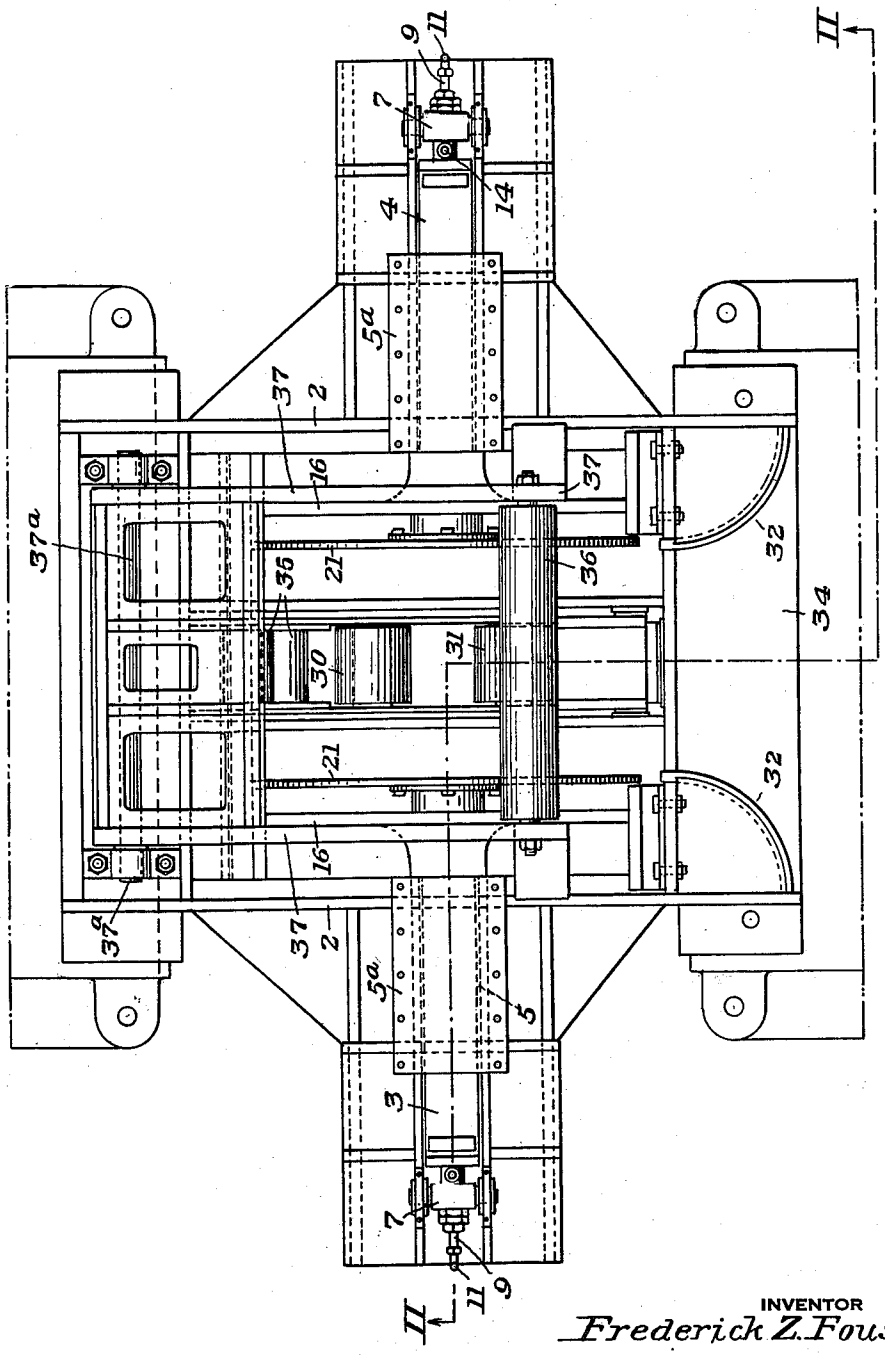


Fig. 1.

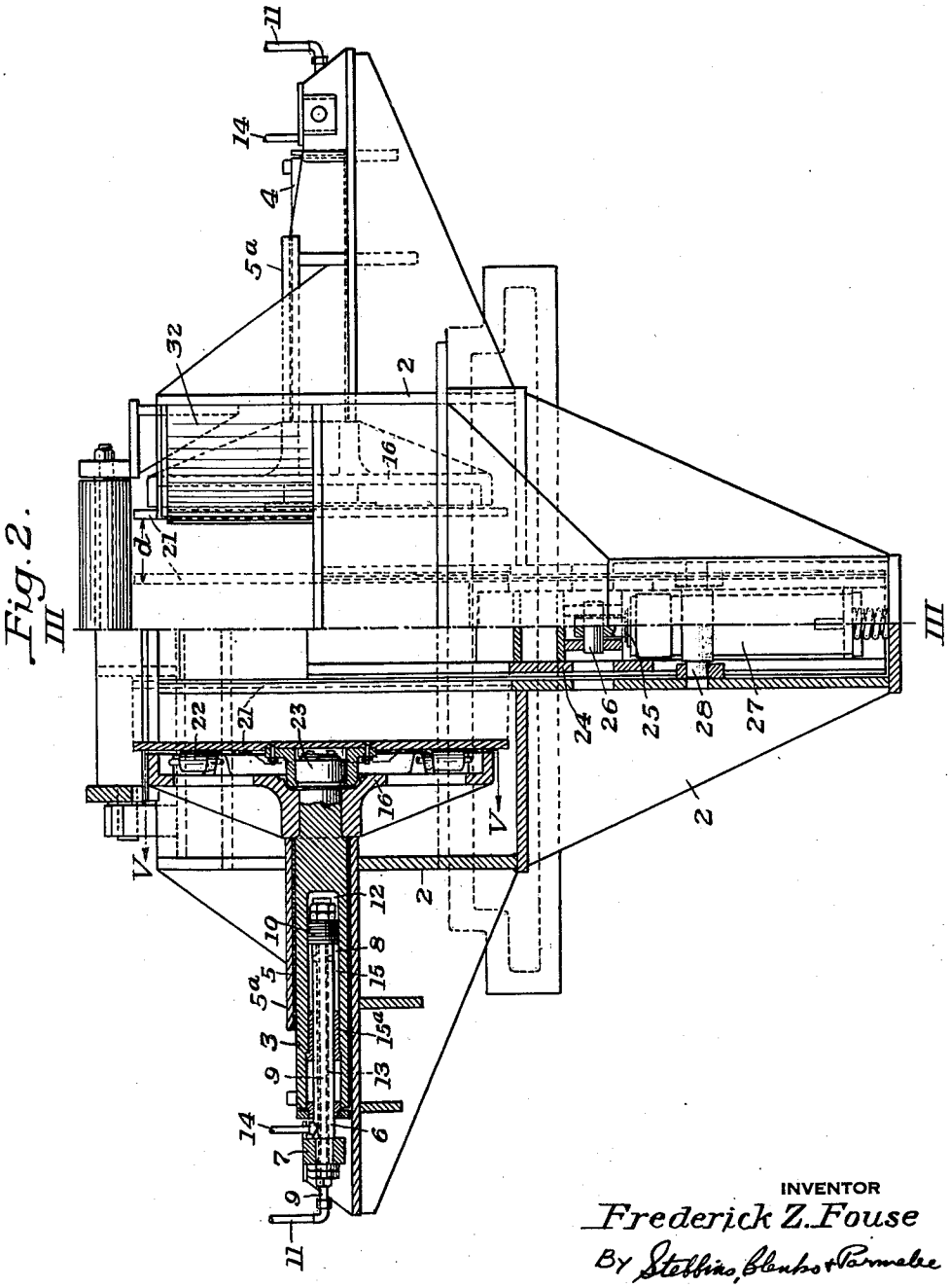
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Fig. 2.



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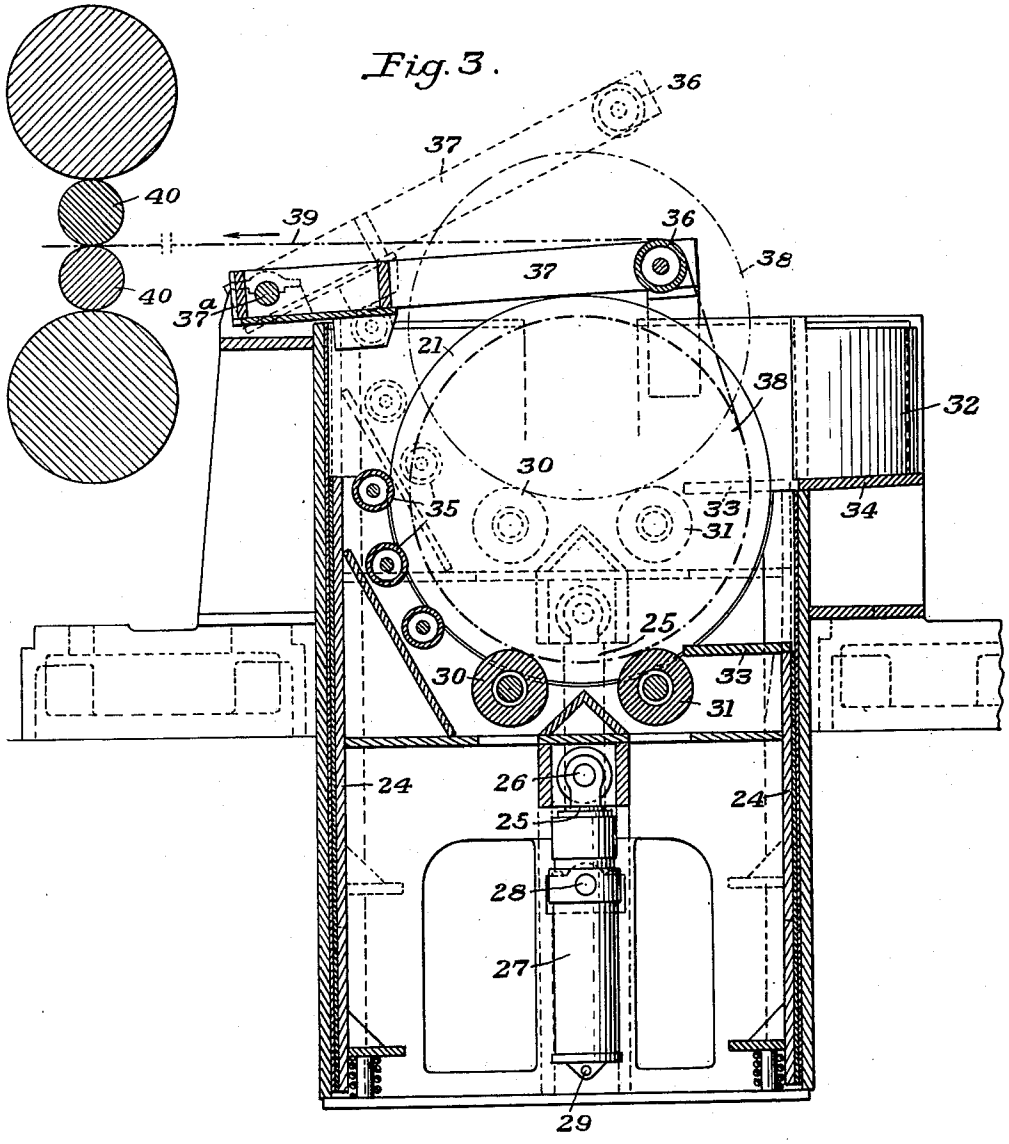
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Fig. 3.



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Fig. 4.

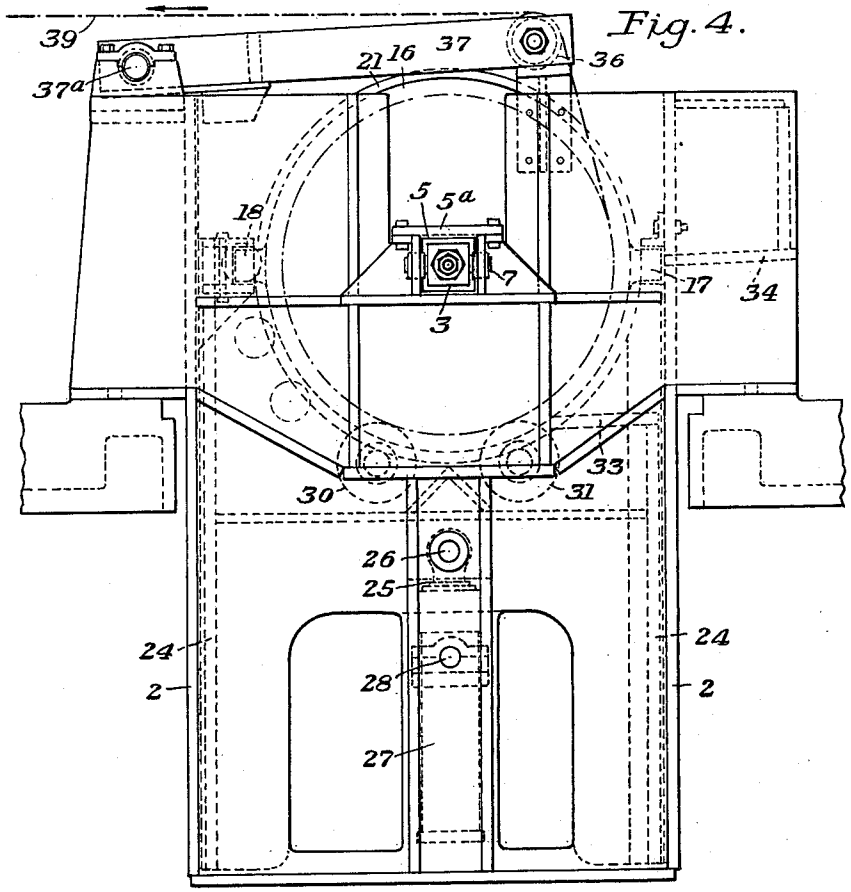
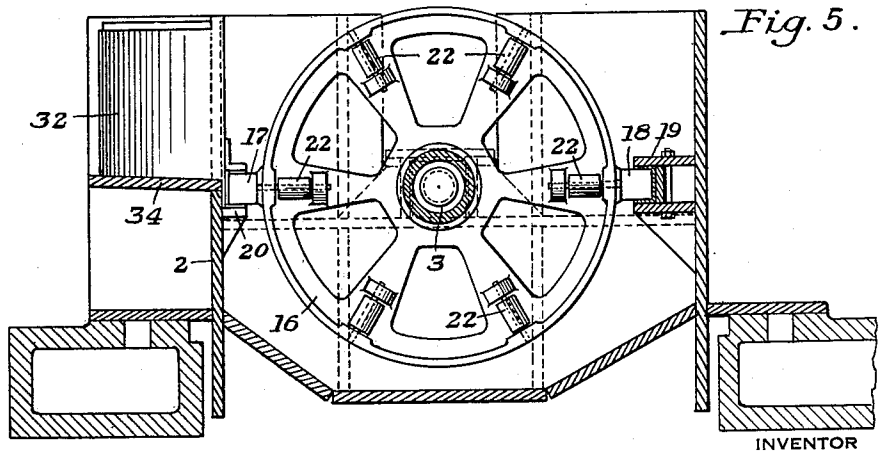


Fig. 5.



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UNITED STATES PATENT OFFICE

2,329,832

UNCOILER

Frederick Z. Fouse, Steubenville, Ohio

Application December 12, 1939, Serial No. 308,789

9 Claims. (Cl. 242—78)

My invention relates, in general, to an uncoiler for use in connection with uncoiling strip-like material. The invention is particularly adapted for use in connection with the uncoiling of long strips of sheet-like metal and will be described as applied thereto. It is to be noted, however, that my invention may be used to advantage for uncoiling strips of other material. The term "strip metal" or the word "strip" is used herein to designate metal which is rolled in lengths many times greater than its width and such as is commonly referred to in the trade as "strip," "sheet," and "strip sheet."

In the process of rolling what is known as strip, it is the modern practice to roll metal to a desired width, length, and thickness (usually about 0.08") on a hot mill and to coil the hot strip into a hollow cylindrical coil or spool by means of a power-driven coiler or winding drum. The practice of winding the strip into coils or spools greatly reduces the space required by the mill over that which would be required if the strip were allowed to run out its full length. The metal so coiled is easy to handle and the area required for storage thereof is at a minimum.

In order to further reduce the metal in thickness, it is customary to pass the strip through a cold reducing mill. To accommodate the coil an uncoiling apparatus is provided closely adjacent the rear or entering side of the mill, in which apparatus the coil may be placed with its longitudinal axis substantially parallel to the mill rolls. Quite frequently the strip as it comes from the hot mill has uneven edges and it is desirable that these coils be so handled in the uncoiler that the edges are not disturbed since, if pieces of metal are dislodged from the edges or the edges turned over, fragments may fall on the surface of the strip. If the fragments are carried through the rolls, they will injuriously mark the strip and may seriously injure the rolls.

By my invention I provide apparatus which will support the coil and will allow the coiled material to be unwound from the coil in such manner that the edges of the strip will not be deformed. To accomplish this, I provide an uncoiler including a coil support and revolvable vertical side guards or guide discs adapted to be positioned in contact with the strip edges and free to rotate with the unwinding coil. In order that the guide discs may have a peripheral speed at the point where the strip is unwound from the coil approximately equal to the linear speed of the unwinding strip, I provide means whereby the coil may be kept approximately centered with respect to the revolving guide discs. In some cases, it may be sufficient to keep the upper periphery of the coil above the axis of the discs. The movement of the coil-supporting means may be controlled manually or automatically. The pressure urging the guide discs together may be of such order that they will be spread apart by over-width portions in the length of the strip so that the edges of the strip at that point may not be deformed.

The coils vary both in width and diameter. By means of my invention, I provide an improved simple and inexpensive uncoiler which will accommodate coils of various widths and diameters in such manner that the edges of the strip will not be damaged during the unwinding process. The uncoiler is so positioned that the center line thereof is in line with the center line of the mill.

In the accompanying drawings, I have shown for purposes of illustration only a present preferred embodiment of my invention, in which:

Figure 1 is a plan view of the apparatus embodying my invention;

Figure 2 is a view partly in section and partly in elevation along the line II—II of Figure 1;

Figure 3 is a vertical sectional view along the line III—III of Figure 2;

Figure 4 is an end elevation; and

Figure 5 is a vertical sectional view along the line V—V of Figure 2.

In the drawings, wherein like reference characters indicate like parts throughout, the numeral 2 designates a frame which supports two plungers or thrusters 3 and 4, which are oppositely disposed in spaced apart relationship on a common horizontal axis and equidistant from the vertical center line of the mill with which it is associated. Inasmuch as both plungers and the apparatus connected thereto are similar to each other, but disposed in opposite directions facing each other and symmetrically, only one will be described. The plunger 3, which is preferably square in section, is slidably received in a sleeve 5 having a removable cover plate 5a, secured to the frame 2. The outer end of a hollow piston rod 6 is secured to a block 7 trunnioned in the outer end of the sleeve 5. The piston rod extends into a cylindrical bore 8 in the plunger 3. The plunger 3 moves lengthwise relative to the piston 6, which is fixed. A centrally located pipe 9 extends through the piston rod and through the piston 10 thereon. The outer end of the pipe terminates in the supply and discharge conduit 11 and the inner end terminates in the space 12 at the inner end of the cylindri-

cal bore 8. Between the pipe 9 and the piston rod is an annular space 13, to the outer end of which is connected the supply and discharge conduit 14. Radial ports connect the inner end of space 13 to the annular space 15 between the outside of the piston rod 6 and the walls of the cylindrical bore 8, and between the piston and a sleeve 15a, secured in the plunger bore intermediate its ends.

By the manipulation of suitably disposed valves (not shown) connected to the conduits 11 and 14, fluid under pressure can be supplied to the space 12 or the space 15, to move the plunger 3 to the right or left as viewed in Figure 2, as the case may be. The supply of fluid under pressure to the right-hand plunger 4 (Figure 2) can be controlled so that the plunger 4 moves to the right or left, as the case may be. Alternatively the movement of plungers 3 and 4 toward and away from each other may be controlled by the operation of a single valve (not shown). By using hydraulic plungers to move the guide discs (later to be described), it is possible to employ a fluid supply under a pressure of an order that will not cause sufficient force to be exerted against the guide discs to urge them so strongly against the coil edges as to injuriously affect the edges, even though the strip be not of a uniform width, although the guide discs will be constantly maintained in snug engagement with the edges of the coil. It is also possible, of course, to adjust the guide discs so that they are close to, but not in actual engagement with the strip at all times during the unwinding process, but sufficiently close to act as guides.

Secured to the inner end of the plunger 3 and movable horizontally therewith is a circular, dished, vertically disposed backing plate 16 having a peripheral flange extending toward the center of the apparatus. The plate 16 has opposed trunnions 17 and 18, which project outwardly in a horizontal direction on each side of the plate. The trunnions are received in horizontal ways 19 and 20, respectively, which are secured to the frame 2 to permit the backing plate 16 to move axially toward and away from the center of the apparatus while restraining the plate 16 from rotating. Rollers 22 with radially disposed shafts are journaled in circumferentially spaced relation around the edge of the backing plate 16, the outer ends of the shafts being journaled in the upstanding flange of the plate. The peripheries of the rollers 22 project beyond the flange of the plate 16 and toward the center of the apparatus, as shown in Fig. 2.

A circular guide plate or guide disc 21 is concentrically supported for rotation in a vertical plane on the inner end of the plunger 3 by an antifriction bearing 23, journaled on the inner end of the plunger 3 and beyond the backing plate 16. The outer face of the guide plate or guide disc 21 bears against the radial rollers 22, supported on the backing plate 16. The arrangement is such that the non-rotatable backing plate 16, and the rotatable guide plate 21 can be moved toward and away from the center of the apparatus as a unit by the operation of the plunger 3. The diameter of the guide plate 21 is somewhat greater than the diameter of the largest coil which will be handled in the uncoiler.

The range of movement of the plungers 3 and 4 is indicated by the "open" position shown in full lines in Figure 2 and the "closed" position shown in dotted lines in Figure 2. The extent of the movement of the guide plate 21 is indicated in Figure 2 by the letter *d*.

A cage member 24 is mounted on the frame 2 for vertical sliding movement. The cage 24 is movable from the position shown in full lines in Figure 3 to the position vertically thereabove, shown in broken lines, by the operation of a hydraulic lift. This lift consists of a vertical piston 25, the upper end of which is pivoted to the cage member 24 by means of the pin 26. The opposite end of the piston is received in a cylinder 27, which is secured to the frame 2 by a ring having trunnions 28, the axes of which are parallel to the axis of the pin 26. Fluid under pressure from a suitable source is supplied to the interior of the cylinder 27 through a connection 29.

Supporting cylindrical rollers 30 and 31 are centrally disposed between the guide plates 21 and are journaled on the sides of the cage member 24 and arranged with their longitudinal axes parallel to the axes of the plungers 3 and 4, the axis of the pin 26, and the work rolls 40 of a mill with which the apparatus is associated. The apparatus is so arranged in connection with the mill that a vertical plane through the longitudinal center of the rollers 30 and 31 will pass through the longitudinal center of the work rolls of said mill. The axes of the rollers 30 and 31 lie in a horizontal plane below the horizontal axis of the guide plate 21 and above the axis of the pin 26 and are equally spaced on opposite sides of the vertical plane passing through the pin 26. The rollers are so disposed that when they are in the lower position shown in full lines in Figure 3, the rollers will be tangent to the circumference of a circle substantially concentric with the axis of rotation of the guide plate 21, but of slightly less diameter than the latter. When in their upper position, the rollers 30 and 31, as shown in dotted lines in Figure 3, are slightly below a guide throat 32.

The cage member 24 has a shelf 33, which extends from one side thereof inwardly to a position closely adjacent to and in substantially the same horizontal plane as the upper side of the roller 31. The shelf 33, when the cage member 24 is in the upper position is substantially in line with the bottom plate 34 of the throat 32. A coil may, therefore, be rolled through the throat 32, across the shelf 33, and onto rollers 30 and 31 without heavy shock when the cage member is in the upper or coil-receiving position.

Stop rollers 35, three of which are shown in Figure 3, are arranged circumferentially on a circle of greater radius than the circle which contacts the tops of rollers 30 and 31, but of a smaller radius than that of the guide plate 21. These stop rollers are journalled in the cage member opposite the throat and present antifriction surfaces to the coil, should the coil be inadvertently tipped from the roller 30 or the contour of the coil be distorted during the uncoiling process.

Inasmuch as the rollers 30, 31, and 35 are moved up and down between the guide discs 21, it is necessary that they be slightly shorter than the distance between the latter 21 when they are in the "closed" position. Likewise the distance between the sides of the cage member in which the rollers 30, 31, and 35 are journaled should be slightly less than the distance between the guide discs when they are in the "closed" position.

A guide roller 36 is positioned above the discs 21 and to the right of a vertical plane through

the axes thereof (Figure 3). The guide roller 36 is somewhat wider than any coil which can be accommodated in the uncoiler and is journaled near one end of a pair of arms 37, which are substantially parallel to the discs 21. The other ends of the arms are pivotally mounted on the frame 2 on a cross shaft 37a. The guide roller 36 and the arms 37 occupy a position substantially as shown in full lines in Figure 3, while the coil 38 is unwinding, and when a coil is being placed in the uncoiler, the position is that shown in dotted lines in Figure 3. The unwinding strip 39 passes from the coil over the guide roller 36 in the direction of the arrow, to the pass line of a mill whose rolls 40 are shown diagrammatically to the left in Figure 3. The guide roller 36 and the associated arms are raised to the position shown in dotted lines in Figure 3, so that a coil may be placed on the supporting rollers 30 and 31 when they are raised to the top or loading position.

In operation, the guide discs 21 are first adjusted to a width slightly greater than the width of the coil to be handled. The cage member 24 is raised to the top or loading position so that the supporting rollers 30 and 31 are opposite the bottom of the throat 32 and the guide roller 36 is raised to clear the entering coil 38 which is then rolled or placed on the supporting rollers 30 and 31. The coil is so placed that the strip unwinds from the right upwardly to the guide roller 36, as shown in Figure 3. After the coil is placed in position, the cage member is lowered so that the coil will be substantially concentric with the guide discs 21. The guide plates are then moved toward each other so that both of them are in contact with or closely adjacent to the edges of the coil. The roller 36 is then lowered and the end of the coil is threaded over the guide roller 36 and into the working rolls 40 of the mill. By moving the guide discs 21 to the right or left as desired, while in contact with the coil, the coil may be centered with respect to the mill. While the coil is being unwound, the operator keeps the cage member 24 adjusted vertically by controlling the supply of fluid under pressure to the cylinder 27, so that the unwinding coil 38 is maintained substantially concentric with the guide plates 21. In some instances, it will be sufficient to keep the upper periphery of the coil a short distance above the center of rotation of the discs 21, but somewhat better results are obtained when the unwinding coil is kept substantially concentric with the discs 21.

The apparatus which I provide is economical to construct, is self-contained, compact, readily installed, requires comparatively small floor space, and can accommodate coils of various widths and of various diameters and insures that the strip will be properly guided while it is being unwound and in such manner that the edge thereof will not be injured by the rotating guide discs.

While I have illustrated and described a preferred embodiment of my invention, it will be understood that the invention is not limited to an uncoiler for use only in connection with a cold reducing mill, but may be used in connection with other apparatus and with other strip materials. Various changes may be made in the design and construction of the apparatus and my invention is not limited to the preferred construction which I have described, but may be otherwise embodied and practiced within the scope of the appended claims.

I claim:

1. Apparatus for unwinding coils of strip material comprising opposed guide members supported for rotation about a common axis and having substantially plane exposed surfaces for engaging opposite ends of the coil to restrain it against axial movement while permitting radial movement thereof, supporting means on which the periphery of the coil rests when it is positioned between said guide members and during the unwinding of the coil, and means for adjusting said supporting means vertically whereby the axis of the supported coil may be positioned substantially coincident with the axis of rotation of the guide members.

2. Apparatus for unwinding coils of strip material comprising opposed guide members supported for rotation about a common axis and having substantially plane exposed surfaces for engaging opposite ends of the coil to restrain it against axial movement while permitting radial movement thereof, supporting means on which the periphery of the coil rests when it is positioned between said guide members and during the unwinding of the coil, means for adjusting said supporting means to maintain the axis of the supported coil substantially coincident with the axis of rotation of the guide members, and guide means disposed above and toward one side of said coil when resting on the supporting means, whereby said guide means is adapted to receive strip as it is unwound from one side of the coil.

3. Apparatus for unwinding coils of strip material comprising a supporting frame, a pair of opposed guide plates mounted on said frame for rotation about a common axis and having substantially plane exposed surfaces for engaging opposite ends of a coil to restrain it against axial movement while permitting radial movement thereof, means for moving said guide plates toward each other, supporting means on which the periphery of the coil rests when in unwinding position in the apparatus and during the unwinding of the coil, and means for adjusting said supporting means vertically to maintain the axis of the coil substantially coincident with the axis of rotation of the guide plates.

4. In a strip uncoiler, a frame, a coil entry throat on one side thereof, a cage reciprocable vertically in the frame, a coil support on said cage, a guide roll normally extending across said frame above said cage so as to obstruct movement of a coil through the throat and onto said support, said roll serving to guide strip from a coil on said support, and supporting arms pivoted to said frame, said roll being journaled in said arms, whereby said roll may be swung out of the way when a coil is being moved through said throat onto said support.

5. In a strip uncoiler, a coil support, axially alined thrusters on opposite sides of said support, movable axially of a coil thereon, back-up discs fixedly mounted on said thrusters, guide discs journaled on said thrusters inwardly of said back-up discs and adapted to engage the ends of a coil on said support, and anti-friction bearings spaced radially of said thrusters and mounted in circumferentially spaced relation on said back-up discs, adapted to engage the outer faces of said guide discs.

6. In a strip uncoiler, a coil support, thrusters on opposite sides of said support, movable axially of a coil thereon, annular back-up plates mounted on said thrusters, guide discs journaled on said thrusters inwardly of said back-up plates

and adapted to engage the ends of a coil on said support, and anti-friction rollers disposed radially of and mounted in circumferentially spaced relation on said plates, the outer faces of said discs engaging said rollers.

7. In a strip uncoiler, a box frame, a coil-holder therein including a box-like structure slidable vertically in said frame, means for moving the coil-holder vertically, coil-supporting rolls on said coil-holder, stop means on one side of said coil-holder effective to prevent horizontal movement of a coil therefrom, and guide discs journaled on said frame, spaced axially from said rolls and adapted to restrain a coil on the rolls against axial movement.

8. In a strip uncoiler, a box frame, a coil-holder therein including a box-like structure slidable vertically in said frame, means for moving the coil-holder vertically, coil-supporting rolls on said coil holder, stop means on one side of said coil-holder effective to prevent horizontal movement of a coil therefrom, and an entry throat having converging sides formed in one wall of said frame opposite said stop means.

9. In a strip uncoiler, a coil support, guide discs in opposed relation on opposite sides of said support, a thruster extending axially outward from each disc, fixed, aligned sleeves in which said thrusters are longitudinally slidable, said thrusters having bores extending thereinto from the outer ends thereof, pistons in said bores, and a piston rod secured to each piston and to the adjacent sleeve, said piston rods having passages therethrough whereby fluid under pressure may be admitted to and relieved from opposite sides of the pistons to actuate the thrusters.

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