March 4, 1941. R. J. MILLER ET AL 2,233,547

STRIP COILING MACHINE

Filed June 13, 1939 3 Sheets-Sheet 1

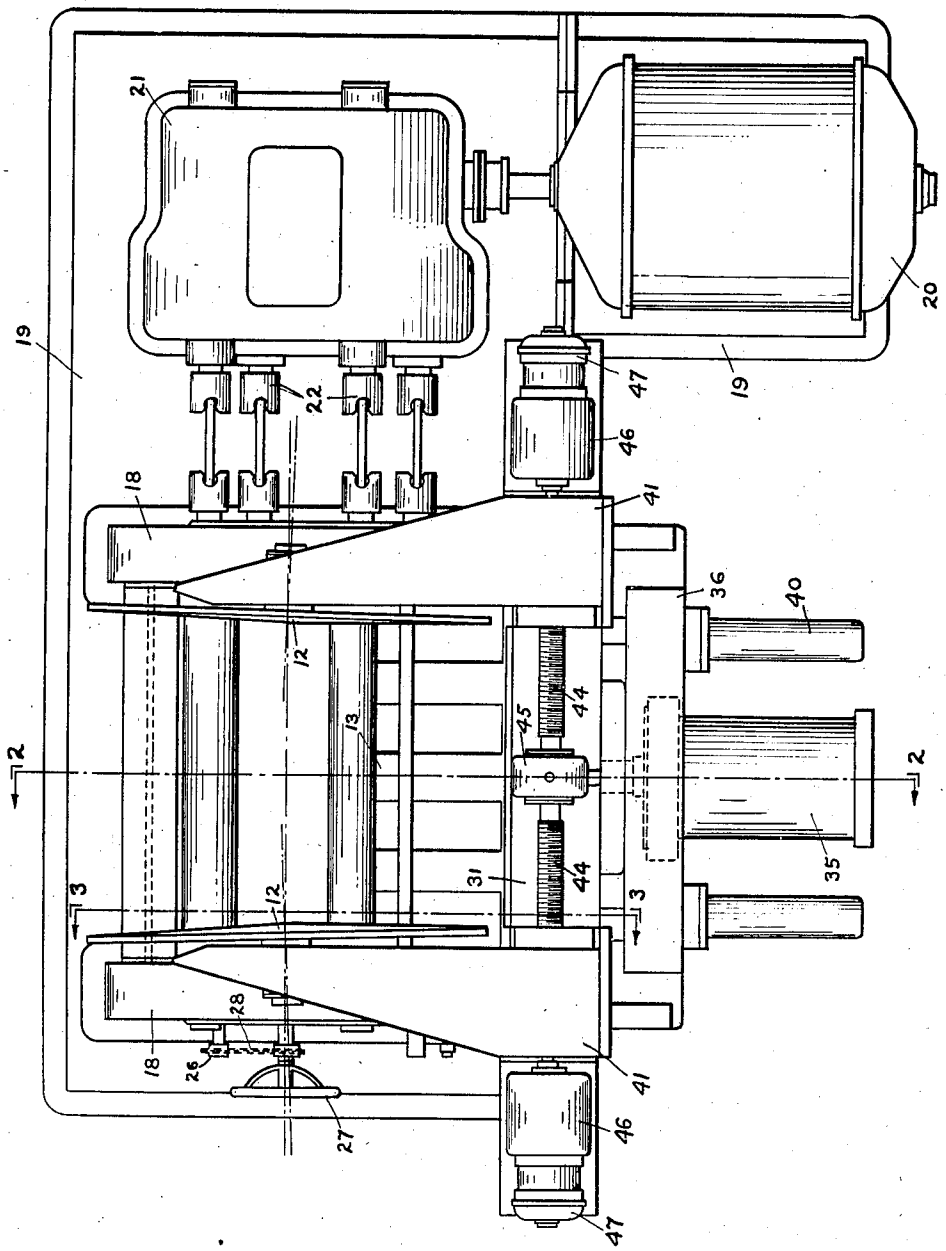


FIG. 1.

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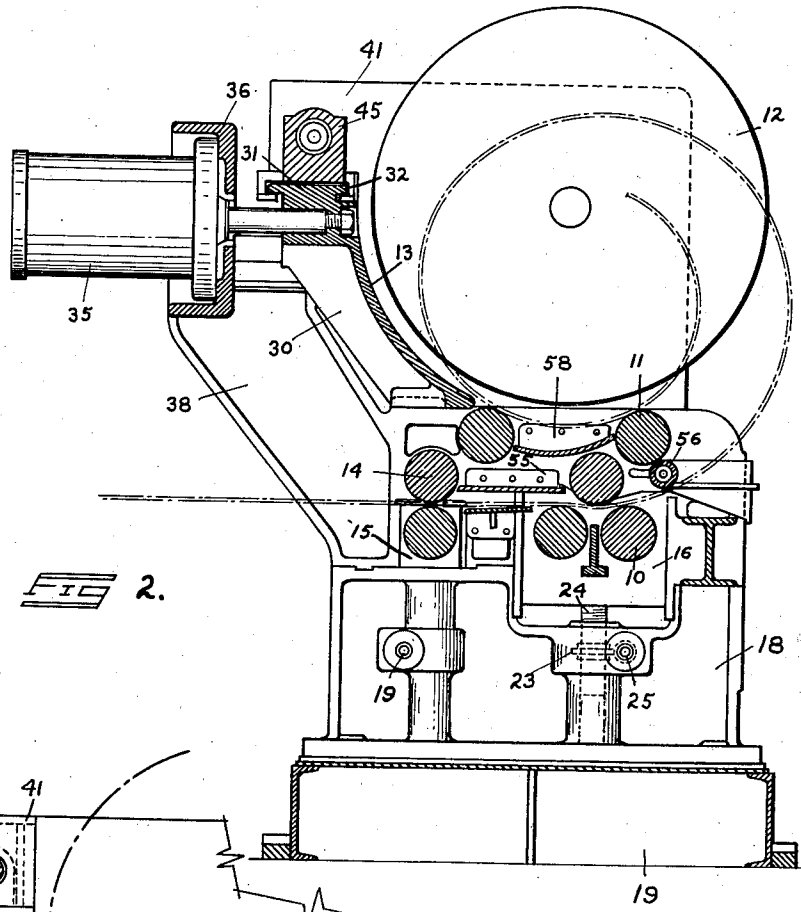


FIG 2.

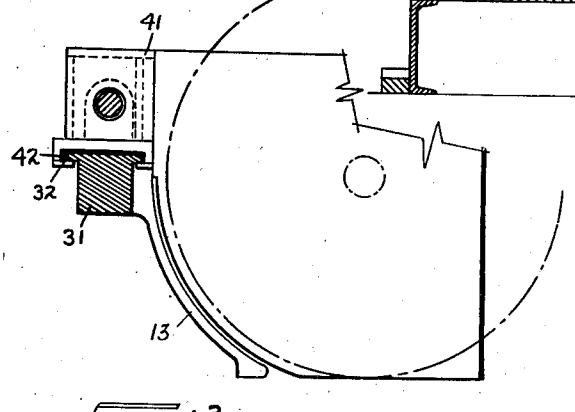


FIG 3.

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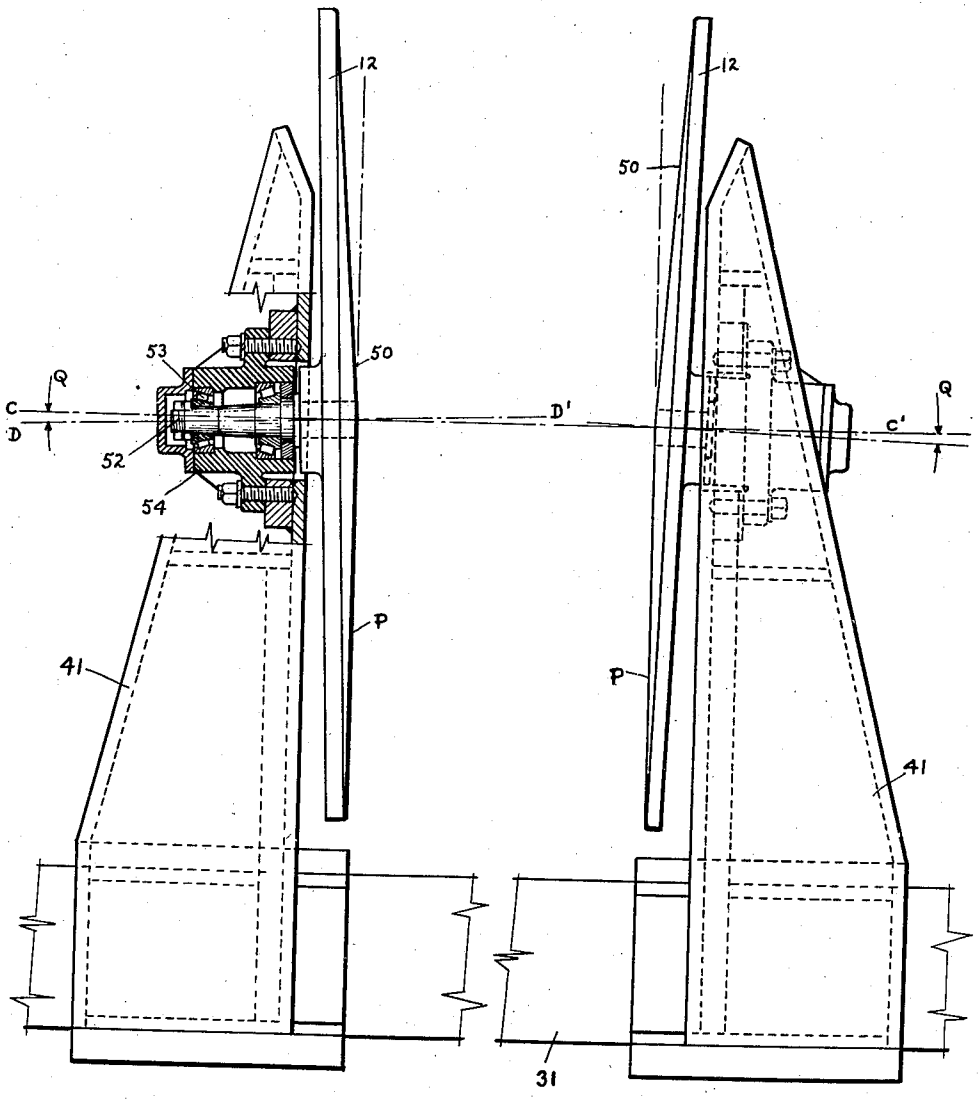
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STRIP COILING MACHINE

Filed June 13, 1939 3 Sheets-Sheet 3

FIG 4.



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Patented Mar. 4, 1941

2,233,547

UNITED STATES PATENT OFFICE

2,233,547

STRIP COILING MACHINE

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Application June 13, 1939, Serial No. 278,856

10 Claims. (Cl. 153—54)

This invention relates to the art of handling metal strip and more particularly to a machine for coiling lengths of such strip into compact coils to facilitate transportation and handling of the same. The coiling machine, when used in conjunction with continuous processing equipment as a pickling and scrubbing assembly, for example, must necessarily be capable of converting the lengths of strip issuing from such equipment into coils at a speed determined by the speed of the various constituent machines of the assembly. For economy of production a high speed of operation is desired and the coiling machine at the end of the assembly must therefore be capable of coiling the strip stock rapidly.

Heretofore, in machines for the purpose stated, considerable difficulty has been encountered in satisfactorily guiding the rapidly moving stock as it assumes the coil form. To provide a satisfactory coil which may be expeditiously handled by machines in subsequent processes, the side edges of the strip constituting the coil must be reasonably aligned and this requires considerable pressure on one or the other of the side edges of the strip depending on the direction of movement taken by the particular strip increment. The arrangements heretofore used to guide the side edges of the strip into proper alignment caused considerable damage to the side edges by tearing and bending and the guide surfaces themselves, being subjected to excessive wear by action of the strip, required frequent replacement.

Therefore, the primary object of the invention is the provision of metal strip guiding means for use in conjunction with a strip coiler which will enable an accurate alignment of the side edges of the strip of the coil to be maintained without injury to the side edge of the strip, and without excessive wear of the guiding surfaces employed.

Another object of the invention is the provision of an arrangement for the purposes stated which is economical to construct, rugged and dependable in service, and which does not require any substantial changes in the design of acceptable machines well suited for the purpose of coiling strip.

A further object of the invention is to provide a strip guiding device of improved design.

These and other objects and advantages of the invention will become apparent from a consideration of the following detailed specification and the accompanying drawings wherein there is specifically disclosed a preferred embodiment of the invention as applied to a strip coiling machine of the pyramid bender type.

In the drawings:

Figure 1 is a plan view of a strip coiling machine embodying the principles and teachings of the invention;

Figure 2 is a cross-sectional view of the machine of Figure 1, the section being taken along the line 2—2 of Figure 1;

Figure 3 is a fragmentary sectional view taken along the line 3—3 of Figure 1; and

Figure 4 is a plan view, partly in section, of a portion of the machine of Figure 1.

The machine illustrating the invention consists essentially of a trio of bending rolls 10, a pair of coil supporting cradle rolls 11, and a sliding assembly including a pair of rotary side guides 12 and an abutment 13 which engages the coil to eject the same upon completion of the coiling operation. A pair of pinch rolls 14 are provided to engage and feed the strip through the bending rolls and the lower roll of this pair, together with the two lower bending rolls, are journaled in suitable vertically movable chocks 15 and 16, respectively, for the purpose of varying the pressure exerted by the pinch rolls 14 and the radius of bending by the bending rolls 10. Cradle rolls 11, upper pinch and bending rolls and the chocks mentioned are suitably supported in the parallel housings 18 which in turn are secured to and supported by a base assembly 19. The rolls thus provided are driven by a suitable motor 20, also mounted on the base 19, through suitable gearing (not shown) housed within gear case 21. Flexible couplings 22 connect the gear drive with the various rolls mentioned, thereby enabling the lower of the pinch rolls and the two lower bending rolls to be adjusted vertically at will.

Chocks 16 are vertically guided in the housings 18 and are supported by screws 24 which extend downwardly into bores provided in the housings. Worm wheels 23 internally threaded to receive screws 24 and driven by worms 25 are provided to raise and lower chocks 16. The worms 25 are carried on a shaft 26 which is driven by hand wheel 27 through chain 28. A similar arrangement including a shaft 29 is provided to raise and lower chock 15.

Slidably mounted on the housings 18 in suitable guides (not shown) is the transverse member 30 having an arcuately shaped abutment 13 and a transversely extending bar 31 provided with laterally extending flanges 32 for a purpose to be later described. Member 30 is moved longitudinally along the housings 18 by cylin-

der 35 supported by a strut 36 spanning the upper ends of extensions 38 of the housings 18. Guide pins 40 are secured to member 30 and pass through bushed apertures and strut 36 to aid in guiding member 30 along the path of travel. A pair of closed guide carriers 41 are slidably mounted on the bar 31 and extend out over the rolls mentioned and rotatably support adjacent their free ends the rotary guides 12. As shown in Figures 2 and 3, members 41 are provided with recesses 42 into which the flanges 32 of the bar 31 are received to provide means to guide and maintain the alignment of guide carriers 41. The latter are adapted to be moved along the bar 31 by the screws 44 which are journaled at their inner ends in the bearing block 45 supported on bar 31 and at their outer ends in the reduction gear casings 46. Screws 44 are rotated by the motors 47 through suitable reduction gearing housed within the casings 46 and since screw threaded connections are provided between screws 40 and carriers 41 rotation of the screws results in sliding movement of the carriers toward or away from each other to accommodate strips and coils of different widths.

Referring now to Figure 4, the improved strip guiding means of the invention consists of a pair of disk-like rotary guide members 12 each having a conically shaped outer surface 50. Each of the guides 12 is carried by a spindle 52 which is journaled in antifriction bearings 53 carried by the housing 54 suitably secured to carrier 41. The axes of the spindles 52 and consequently the axes of rotation of the rotary guides carried thereby are angularly disposed in relation to the parallel axes of the rolls and a line connecting the high center points of the surfaces 50 to provide, in effect, movable guiding incremental surfaces which move toward each other as they approach a horizontal plane extending to one side of the line connecting the two center high points of the conical surfaces 50. Theoretically, therefore, a coil or other object having plane parallel side surfaces positioned between the surfaces 50 and contacting the latter surfaces will contact such surfaces only along two spaced parallel lines which are indicated on Figure 4 by the latter P. This arrangement is accomplished by rotating the axis of rotation of the rotary members 12 about vertical lines and through the angles indicated at Q. In the figure the line C—C' connects the center high points of the surfaces 50 and is parallel with the axes of the various rolls of the coiling machine. Line D—D' represents the axis of rotation of one of the rotary guides.

In operation, strip material is fed into the machine through the pinch rolls 14 and by means of suitable guides 55 is guided through the bending rolls 10. A small idling roll 56 in contact with one of the cradle rolls 11 is provided to guide the bent material away from such cradle roll in the manner shown. The material moves upwardly and backwardly and as its leading end approaches the theoretical plane bounded by the lines C—C' and P it will engage the surfaces 50 if it has not already done so causing such surfaces to freely revolve about with the side edges of the material. Due to the converging action of the surfaces 50 the side edges of the material will be progressively slowly brought into proper alignment reaching its final stage when the lines P P are reached. Because of the progressive nature of the aligning process and the fact that the guiding surface moves along with the side edges of the stock the side edges of the stock will be kept free from injury and little wear imposed on the guide surfaces. Moreover, since the final effective alignment action by the surfaces 50 is in normal operation evenly distributed throughout the entire areas of the surfaces 50 localized wearing will not take place and consequently the rotary disks constituting the guides will have long life.

The primary purpose of roll 56 is to prevent the bent stock from engaging adjacent roll 11 which by reason of the fact that it rotates in a clockwise direction, as viewed in Figure 2, would present a surface moving in the opposite direction to that of the stock thereby resulting in excessive wear and damage to the surface of the stock. As the coil is formed between the guides 12 it rests on the cradle rolls 11 and the center supporting plate 58 and upon completion of the coiling operation of the particular length of strip, cylinder 35 is actuated thereby sliding abutment 13 along housings 18 and moving the formed soil to the end of the housing where it will fall from between the guides 12.

The above specifically described embodiment of the invention should be considered as illustrative only as obviously many changes may be made therein without departing from the spirit or scope of the invention.

What we claim is:

1. In a machine for coiling metal strip, the combination of a base, a pair of spaced housings mounted on said base, strip bending rolls spanning and journaled in said housings, a pair of spaced parallel cradle rolls positioned above said bending rolls and spanning and journaled in said housings, a frame member spanning said housings and adapted to move longitudinally therealong and normal to the axes of rotation of said rolls, a pair of spaced supports adjustably carried by said member in preselected spaced relation, a guide comprising a disk having a conically-shaped inner surface freely rotatably carried by the inner side of each of said supports, the relation of the parts being such that when said member is in its normal retracted position a line connecting the center high points of said surfaces will be parallel with, substantially midway of and above the axes of said cradle rolls, the axes of rotation of said guides being angularly related to said line, means to rotate said rolls, and means to move said member.

2. In a machine for coiling metal strip, the combination of a base, strip bending rolls rotatably supported on said base, a pair of spaced parallel cradle rolls positioned above said bending rolls, strip guiding means carried by said base comprising a pair of opposed freely rotatable disks each having a conically-shaped inner surface, said disks being so mounted that during the normal coiling operation of the machine, a line connecting the center high points of said surfaces will be parallel with, substantially midway of, and above the axes of said cradle rolls, the axes of rotation of said disks being angularly related to said line, and means to rotate said rolls.

3. In a machine for coiling metal strip, the combination of a base, continuous strip bending means supported on said base, a pair of spaced parallel cradle rolls for the rotatable support of the coil being formed supported on said base, a pair of spaced guiding disks rotatably supported for free rotation above said cradle rolls, said disks having conically-shaped opposing surfaces and

being so mounted that a line connecting the center high points of said surfaces will normally be substantially parallel with, midway of, and above the axes of rotation of said cradle rolls, the axes of rotation of said disks being horizontally angularly related to said line whereby a horizontal plane including said line will intersect said surfaces along two spaced substantially parallel lines.

4. In a machine for coiling metal strip, the combination of a base, continuous strip bending means supported on said base, a pair of spaced parallel cradle rolls for the rotatable support of the coil being formed supported on said base, a pair of spaced guiding disks supported for free rotation above said cradle rolls, said disks having conically-shaped opposing surfaces and being so mounted that a line connecting the center high points of said surfaces will normally be substantially parallel with, midway of, and above the axes of rotation of said cradle rolls, the axes of rotation of said disks being angularly related to said line whereby a plane including said line will intersect said surfaces along two spaced and substantially parallel lines.

5. In a machine for coiling metal strip, the combination of a base, continuous strip bending means supported on said base, means on said base to rotatably support the coil being formed, and means to engage and guide the side edges of the strip as it moves into the coil comprising a rotatable disk positioned on either side of said coil supporting means, each of said disks being mounted for free rotation having a conically-shaped inner surface, said disks being mounted in such manner that a plane including a line connecting the center high points of said surfaces will intersect said surfaces along two spaced substantially parallel lines.

6. A guiding assembly for a metal strip coiling machine comprising a pair of spaced disks each having a conically-shaped inner surface, said disks being mounted for free rotation in such manner that a plane including the line connecting the center high points of said surfaces will intersect said surfaces along two spaced substantially parallel lines.

7. Apparatus according to claim 6 further including means to move said disks along said first mentioned line.

8. Apparatus according to claim 6 further including a support below the space between said disks for the coil being formed, and means to move said disks in a horizontal direction relative to said support.

9. Apparatus according to claim 6 further including a support below the space between said disks for the coil being formed, means to move said disks individually along said last mentioned line, and means to move said disks together in a horizontal direction relative to said support.

10. In a machine for coiling metal strip, the combination of a base, means supported on said base to impart a continuous bend to strip continuously fed into said machine, means to support the coils formed by the bending means, a movable frame member having a coil engaging abutment and a pair of spaced supporting elements mounted on said base, a freely rotatable guide carried by each of said supporting elements, said guides being positioned on either side of said coil support and being provided with conically shaped inner faces, the axis of rotation of said guides being angularly arranged whereby a plane including a line interconnecting the high points of the inner surfaces of said guides will intersect said inner surfaces along spaced parallel lines, means to move said guides toward and away from each other, and means to move said member in a direction normal to said line to move the completed coil from its support.

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