

Dec. 6, 1960

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2,963,237

ROLLER WRAPPER MACHINE

Filed Jan. 16, 1958

2 Sheets-Sheet 1

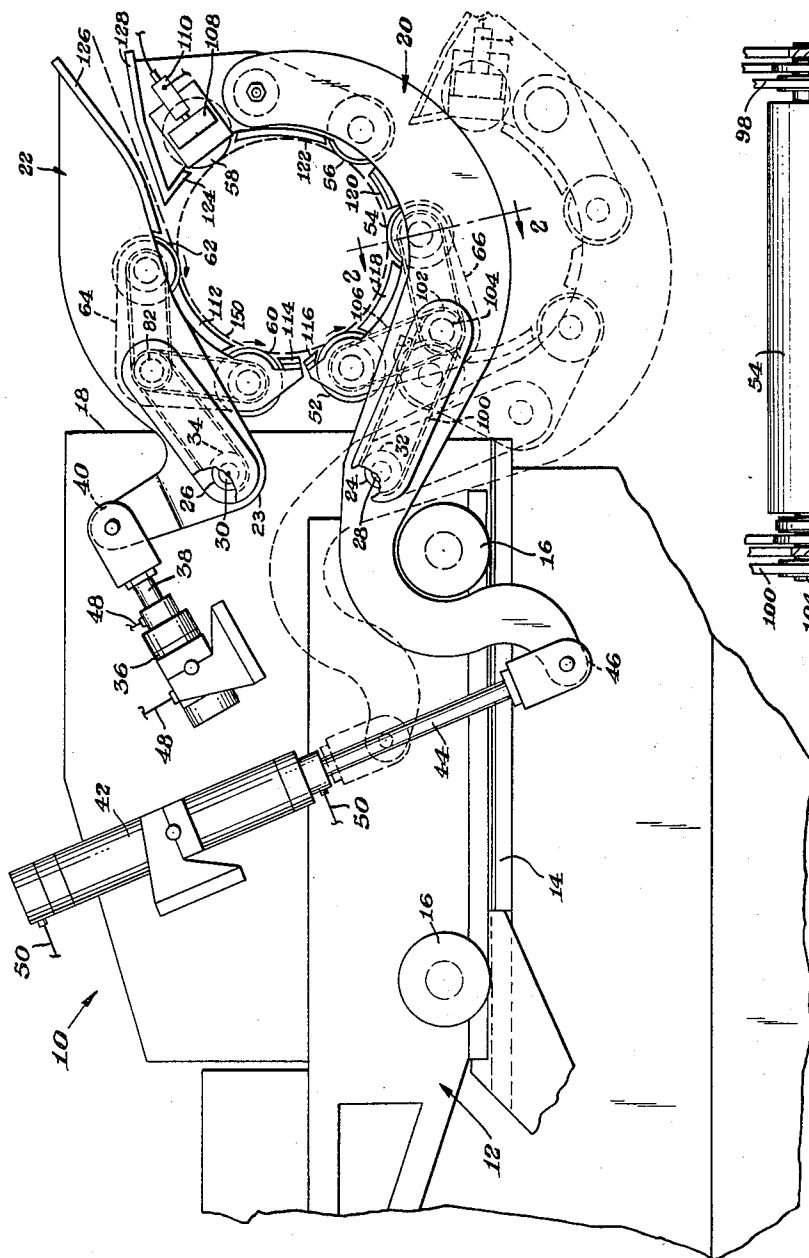


Fig. 1

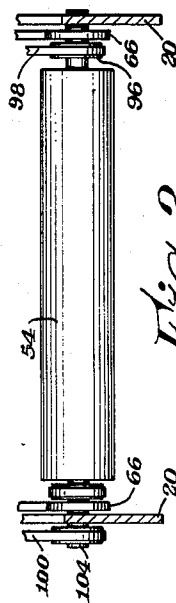


Fig. 2

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Filed Jan. 16, 1958, Ser. No. 709,245

7 Claims. (Cl. 242—78.4)

This invention relates to motor driven roller wrappers and particularly to apparatus for coiling continuous strips of metal as they issue forth from the exit end of a rolling mill.

The rolling of metal to successively thinner gauges has created a problem as to how to dispose of the sheet material as it leaves the mill. Common rolling mill practice has been to provide a run out table to support the sheet strip material. However, the length of a strip on rolling soon exceeds the practical and economical length of a run out table.

It has been found that a more satisfactory solution to the problem of what to do with the long lengths of sheet material is to wrap the sheet material on a reel or mandrel. Usually a belt is brought to bear against the leading edge of the sheet to force the sheet or strip to bear against the reel or mandrel during the initial turns of the strip around the mandrel or reel.

While so-called belt wrappers work well when thin, flexible sheet or strip material is being coiled, belt wrappers have been less satisfactory when used to coil heavier, less flexible sheet or strip materials.

Broken belts have often occurred, but the most serious problem with belt wrappers is that they result in loosely wound material, scored material, and excessive wear on the belts.

Despite the fact that belts have been made of many materials such as leather, rubber, fabric and wire screen, they all wear and are generally unsatisfactory except when used in coiling thin gauge sheets or strips.

To replace or repair a belt because it is stretched, worn or broken is a serious maintenance problem when it is considered that the rolling mill, which produces hundreds of feet of strip material per minute, must be shut down while repairs are made to the wrapper.

Since the rolling of metal strip is often carried out with tension on the strip as it passes through the rolls, slippage occurs if the strip material is not coiled tightly on the reel and the resulting coils are frequently irregular in shape. Slippage also gives rise to scoring the surface of the strip which may make it useless for many purposes.

It is, therefore, a principal object of this invention to provide an improved apparatus for coiling individual lengths of strip metal and which is adaptable for use with sheet material of various gauges.

Another object of this invention is to provide an improved roller wrapper which is adapted for use with heavy gauge sheet metal feed material.

In accordance with this invention there is provided retractable apparatus having a pair of movable jaws containing a plurality of rollers which engage and, with the jaws, shape the sheet feed material entering the jaws (when they are in the closed or operating position) around a coiling mandrel. At least part of the rollers are powered.

The invention, as well as other objects and advantages thereof, will best be understood when the follow-

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ing detailed description is read in connection with the accompanying drawings, in which:

Fig. 1 is a side elevational view, partly broken away of a roller wrapper made in accordance with this invention;

Fig. 2 is a fragmentary side elevational view, partly in section of one of the powered rollers of the apparatus shown in Fig. 1;

Fig. 3 is a plan view, partly broken away of the forward part of the roller wrapper shown in Fig. 1, and

Fig. 4 is a diagrammatic view showing the drive motor 68 coupled to the shafts 28, 30.

Referring to Figs. 1 and 3, there is shown a roller wrapper, indicated generally by the numeral 10, made in accordance with this invention. The roller wrapper 10 comprises a body, indicated generally by the numeral 12, which is supported on tracks 14 by wheels 16 on each side and end of the body 12. Extending from the forward end 18 of the body are lower jaws 20 and upper jaws 22, each of the jaws being mounted on hollow pivots, only one of each pivot being visible in Fig. 1. The pivots 24 are for the lower jaws and the pivots 26 are for the L-shaped upper jaws 22 having a knee part 23. The pivot 24 and pivot 26 shown in Fig. 1 each have rotatable shafts (28, 30 respectively) extending through the hollow part of the pivot. The shafts 28, 30 each have a pulley (32, 34 respectively) coupled to the end of each shaft which extends outside of the body 12.

The lower jaws 20 are of a somewhat S-shaped configuration when viewed from the side in order that one end (the forward end) of the jaw may present a generally semi-circularly shape to a rotatable mandrel (not shown) and the rear part of the lower jaw may bend around the (front) wheel 16. The upper jaw 22, when viewed from the side, is somewhat L-shaped and is pivoted at the "knee" of the L.

Hydraulic means for advancing and retracting the jaws are provided. The hydraulic cylinders 36 each have a piston 38 coupled to the rear end 40 of the upper jaws 22. The hydraulic cylinders 42 each have a piston 44 which is coupled to the rear end 46 of each lower jaw 20. The hydraulic cylinders 36, 42 are coupled to suitable driving and control means (not shown) through leads 48, 50 respectively.

The lower jaws 20 have four rollers 52, 54, 56 and 58 extending therebetween. Each roller has a shaft (as seen in Figs. 2 and 3) which is journaled in a part of the jaw structure. The two rollers 60, 62 in the upper jaws are journaled in generally triangularly shaped plates 64. Each of the two plates 64 are secured to the inner or body facing side of an upper jaw 22. Two of the rollers (52, 54) disposed between the lower jaws 20, are journaled in a pair of plates 66, which are similar to the upper jaw plates 64. The lower jaw plates 66 are likewise secured to the inner side of the lower jaws 20. The two rolls (56, 58) which are disposed farthest forward with respect to the lower jaws 20, are journaled in the jaws and are freely turning (non-driven) rolls.

The rolls 60, 62 which are journaled in the upper jaw plates 64 and the rolls 52, 54 which are journaled in the lower jaw plates 66 are driven rolls. Power to drive the rolls is provided by a motor 68 (shown in Fig. 3 and in Fig. 4) which is coupled by means of belts or chains 70, 72 to pulleys on the rotatable shafts 28, 30 which extend through the hollow pivots 24, 26 respectively. For the sake of simplicity, the inner pulley 74 on only one shaft (the shaft 30) is shown in Fig. 3, as the inner lower shaft pulley, if shown, would be almost completely obscured by the pulley on the shaft 30. A pulley 76 on the other end of the shaft 30, is coupled by means of a belt or chain 78 to a pulley 80 on a jack shaft 82. The jack shaft 82 extends through the upper jaw 22 and upper jaw plate 64

and has a second and third pulley 84, 86 on the end of the shaft which extends from the jaw plate 64. The second pulley 84 and third pulley 86 are coupled by means of belts or chains to pulleys 88 and 90 on roll shafts 92 and 94, respectively. Only one side of each roll shaft 92 or 94 is driven, although if need be both sides may be driven. For the purpose of illustrating a dual driven roll, a pulley 96 and belt or chain 98 have been shown on the right hand end of the roll shown in Fig. 2.

The power source (motor) 68 is coupled, as mentioned previously, to a pulley on the shaft 28 which extends through the pivot 24 of the lower jaw 20. The power for driving the lower rolls 52, 54 is then transmitted via the pulley 32 and belt or chain 100 to a pulley 102 on the jack shaft 104. As seen by reference to Fig. 2, the roll 54 is coupled to the jack shaft 104 by means of a belt or chain 100 in the same manner as are the two driven rolls 60, 62 of the upper jaw 22. The second driven roll 52 of the lower jaw part is driven in a similar manner from the jack shaft 104 by means of the belt or chain 106.

Neither of the two "outer" rolls 56, 58 of the lower jaw part are driven. However, the shaft of the roll 58 is journaled in a slidable bearing 108 whose position is controlled by hydraulic cylinder devices 110 which are secured to the respective lower jaws 20.

Curved plates 112, 114, 116, 118, 120, 122 and 124 are disposed between the rolls of both jaws, the inner surface of the plates being disposed on the diameter of a circle whose radius is slightly larger than the radius of the smallest circle which would touch a surface of all the rolls 52 to 62 inclusive (assuming the retractable roll 58 to be in its normal operating position). Sheet entry plates 126, 128 are provided at the forward ends of the upper jaw 22 and lower jaw 20 respectively.

In operation, the roller wrapper 10, with jaws open as shown in the broken lines in Fig. 1, is advanced (by means of external power, for example) around the coiling mandrel (not shown) and then the jaws are closed by means of the hydraulic cylinders 36 and 42 to the jaw position shown in solid lines in Fig. 1.

The sheet to be rolled around the mandrel (not shown) enters between the plates 126, 128 and follows the rolls 62, 60, 52, 54, 56 and 58 around the mandrel. The rolls causing the sheet to be coiled to bear tightly against the mandrel for a few turns of the coiling process. The roll 58 may be advanced slightly towards the mandrel (not shown) by means of the hydraulic device 110, if need be, to force the entry end of the sheet being coiled to turn towards the mandrel as the first turns of the coiling occur.

After several turns of the coil 150 around the mandrel are made, the jaws 20, 22 are opened and the roller wrapper is retracted away from the mandrel until another coil is to be made on the mandrel (or spool). The curved plates 112-124 compel the sheet entering the roller wrapper to maintain a curved configuration as it passes between the rolls 52-62.

While the jaws are not opened until several turns of the coil have been made, the force against the coil may be controlled by the hydraulic pistons 36, 42 to permit the jaws to expand slightly as the coil diameter increases.

I claim:

1. Apparatus for use in wrapping stiff, bendable sheet material around a core, comprising a body member, an upper jaw assembly and a lower jaw assembly, said upper jaw assembly including a pair of generally L-shaped upper jaws each having a rear end and a forward end, said jaws each being pivotally attached to the body member at the knee part of the L, a pair of upper jaw plates, one of said plates being secured to each upper jaw between the knee part and the forward end of the jaw, said upper jaw plates having at least three bearings therein, a pair of rolls each having a shaft, said shafts being journaled in two of the sets of bearings, an upper jaw jack shaft, said jack shaft being journaled in the third set of bearings,

power transfer means coupled between said jack shaft and said rolls, said lower jaw assembly comprising a pair of generally S-shaped lower jaws having a forward end and a rear end, said jaws being pivotally attached to the body member at a point nearer to the rear end than to the forward end of the jaws, a pair of lower jaw plates, one of said lower jaw plates being secured to each lower jaw, said lower jaw plates each having at least three bearings therein, a rear pair of lower jaw rolls each having a shaft, said roll shafts being journaled in two of the sets of bearings in the lower jaw plates, and a lower jaw jack shaft, said lower jaw jack shaft being coupled to the shafts of the rolls journaled in the lower jaw plate, a forward pair of lower jaw rolls, each roll having a shaft, a pair of forward roll bearings, said forward roll bearings being secured to said lower jaws, said forward rolls being journaled in said forward roll bearings, means for rotating said upper jaw jack shaft and said lower jaw jack shaft, means for opening and closing said jaws, and means for moving said body member in a translatable manner.

2. Apparatus in accordance with claim 1, wherein said means for opening and closing said jaws comprises two pairs of hydraulic cylinders, one pair of said cylinders being coupled to said upper jaws and the other pair of said cylinders being coupled to said lower jaws.

3. Apparatus in accordance with claim 1, wherein said means for moving said body member in a translatable manner includes an array of load carrying wheels.

4. Apparatus in accordance with claim 1, wherein said means for rotating said jack shafts includes a power source having a rotatable shaft and a second pair of shafts, said rotatable shaft of the power source being coupled to said upper and lower jack shafts through belts coupled to a second pair of shafts, one of said second pair of shafts being disposed at the pivot for one of the lower and upper jaws.

5. Apparatus in accordance with claim 1, wherein arcuately curved plates are provided between said rolls of both the upper jaw assembly and the lower jaw assembly.

6. Apparatus in accordance with claim 1, wherein means are provided for limited advancing and retracting of the most forwardly disposed roll of the lower jaw assembly with respect to said core.

7. Apparatus for use in wrapping stiff, bendable sheet material around a core, comprising a body member, an upper jaw assembly and a lower jaw assembly, said upper jaw assembly including a pair of generally L-shaped upper jaws each having a rear end and a forward end, said jaws each being pivotally attached to the body member at the knee part of the L, a pair of generally triangularly shaped upper jaw plates each having a base and an apex, the base of said plate facing downwardly, one of said plates being secured to each upper jaw between the knee part and the forward end of the jaw, said upper jaw plates having at least three bearings therein, one pair of bearings being adjacent to said base, a pair of rolls each having a shaft, said shafts being journaled in the base pair of bearings in the upper jaw plates, an upper jaw jack shaft, said jack shaft being journaled in the third set of bearings, power transfer means coupled between said jack shaft and said rolls, said lower jaw assembly comprising a pair of generally S-shaped lower jaws having a forward end and a rear end, said jaws being pivotally attached to the body member at a point nearer to the rear end than to the forward end, a pair of generally triangularly shaped lower jaw plates each having a base and an apex, the base of each plate facing upwardly, one of said lower jaw plates being secured to each lower jaw, said lower jaw plates each having at least three bearings therein, one pair of bearings being adjacent to said base of the lower jaw plate, a rear pair of lower jaw rolls each having a shaft, said roll shafts being journaled in the base pair of bearings in each of the lower jaw plates, and a lower jaw jack shaft, said lower jaw jack shaft being coupled to the

shafts of the rolls journalled in the lower jaw plate, a forward pair of lower jaw rolls, each roll having a shaft, a pair of forward roll bearings, said forward roll bearings being secured to said lower jaws, said forward rolls being journalled in said forward roll bearings, means for rotating said upper jaw jack shaft and said lower jaw jack shaft, means for opening and closing said jaws, and means for moving said body in a translatory manner.

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