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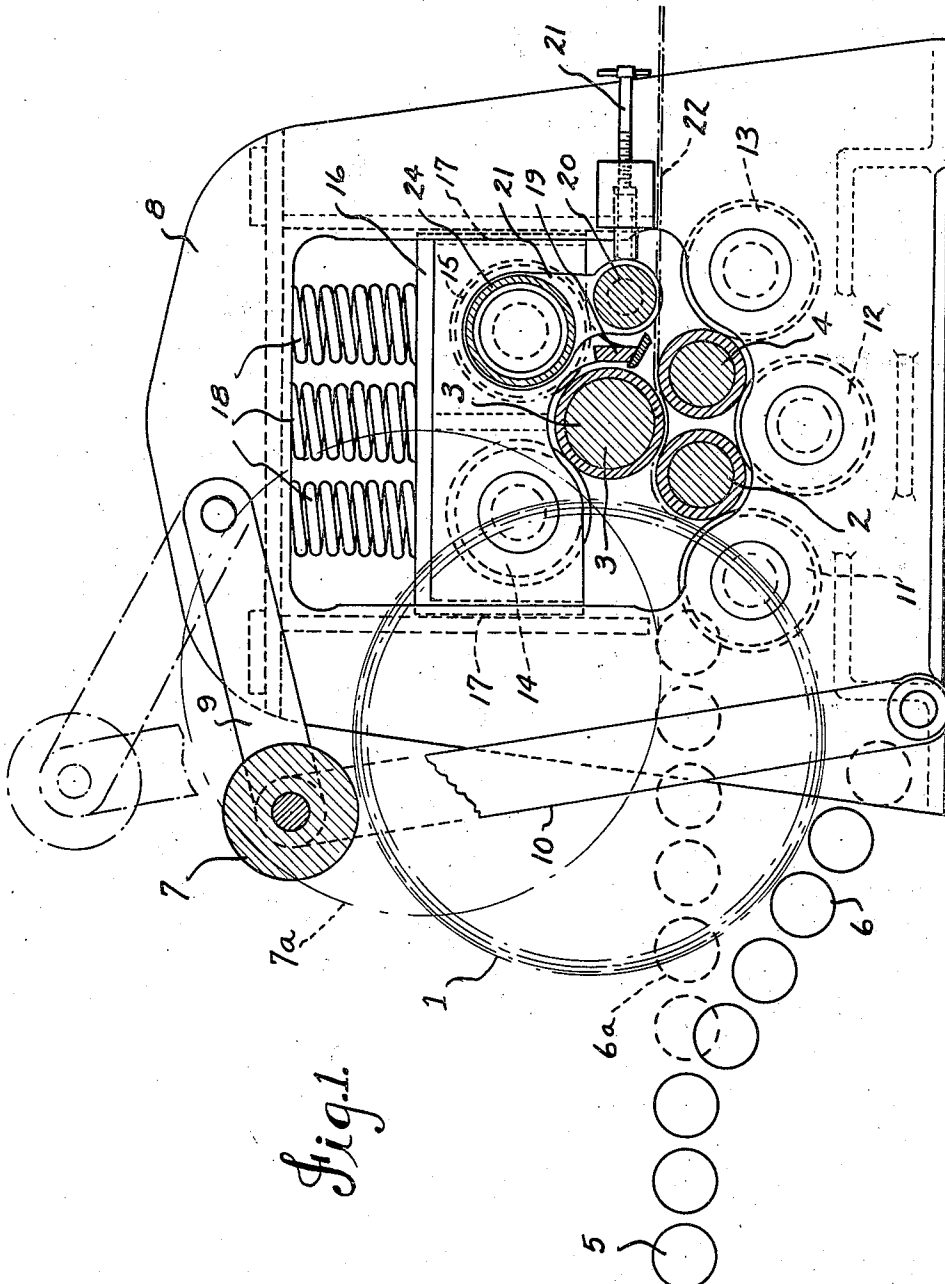
J. R. FREEZE

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DEVICE FOR AND PROCESS OF UNCOILING METAL COILS

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2 Sheets-Sheet 1



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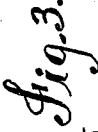
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DEVICE FOR AND PROCESS OF UNCOILING METAL COILS

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DEVICE FOR AND PROCESS OF UNCOILING
METAL COILSJonathan R. Freeze, Middletown, Ohio, assignor
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14 Claims. (Cl. 153—54)

Certain of the modern methods of rolling sheet metal produce as the result of a continuous hot mill operation, strip material of great length. Some of this strip material is of sheet width, and is known as strip sheet material. At the end of the hot mill operation the strip sheets are coiled while still hot. My invention relates to devices for uncoiling coils of metal, and while it is by no means limited thereto, I shall describe it in connection with the uncoiling of coiled strip sheets produced on a hot mill. The result of the hot mill process as just referred to is that the strip sheet material in the coils after cooling is in a very soft condition. This produces a serious problem in decoiling; and present day processes and apparatus for decoiling are productive of what is known as "coiler breaks." A coiler break occurs wherever the metal is bent so suddenly in any given operation as to exceed the elastic limit along a relatively sharp line. Coiler breaks produce a structure in the metal at isolated and sporadic points, which cannot be wholly eliminated by the usual after treatments, such as cold rolling and the like; and coiler breaks represent one very great source of loss in rejections.

The usual practice hitherto has been to draw the metal from the coil tangentially. The coil is supported in such a way that it may rotate, and the metal is simply pulled away from it by a set of pinch rolls, or the like. Obviously this results in great unevenness of action and the sporadic bending of the metal back upon itself with the result above indicated.

It is an object of my invention to provide a decoiler which prevents any jerky or uneven withdrawal of the metal, and has a decoiling action which is even and uniform. It is another object of my invention to take the metal away from the coil and to control it after it has been taken from the coil, to the end of eliminating coiler breaks. It is an object of my invention to remove the metal from the coil otherwise than tangentially. In my preferred procedure I remove the metal at an angle to the tangent, bending the metal around a knee which is preferably a roller.

While coils may be decoiled for other treatments upon the metal, they are usually decoiled for shearing, after which the metal may be further reduced by hot or cold rolling in the single sheet or in packs. The material in the coil as it comes from the hot mill is likely to be cambered. The camber is not usually apparent when the material is in the coil, but becomes imme-

diately apparent when the material is decoiled. The camber of the strip has hitherto necessitated the use of long leveling and pulling rolls, and an interspacing of the housings which is far greater than the width of the strip sheet. This is a matter of serious consideration because the longer the rolls the more they tend to spring. Hence due to the necessary separation of the housings, devices of this character have had to be very much heavier as machines than the amount of work being done would seem to warrant.

It is an object of my invention to provide means whereby relatively light rolls and housings interspaced not much more than the expected width of the strip sheets may be employed in decoiling and leveling operations.

It is still another object of my invention to provide a device in which the conditions prevailing during coiling may be simulated in decoiling as nearly as is possible with cold metal. Since the stock is to be re-worked into flat form, both the finish and the surface beneath will necessarily be disturbed; and it is an object of my invention to accomplish this in a uniform manner with the forces evenly distributed, and to prevent the concentration of forces at localized areas in the material. These and other objects of my invention which will be pointed out hereinafter or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain construction and arrangement of parts of which I shall now describe an exemplary embodiment, reference being had to the accompanying drawings, wherein:

Figure 1 is a side elevation of my exemplary machine with certain of the rolls shown in section.

Fig. 2 is a plan view thereof.

Fig. 3 is a front elevation, with one of the housings shown in section.

Briefly, in the practice of my invention, I support the coil in such a way that it may be rotated, and I prefer to support the coil in such a way that a tangential withdrawal of the strip sheet would occur from the bottom of the coil rather than from the top thereof, as is the usual practice. Having thus positioned the coil, I remove the metal therefrom over a knee roll so that the metal is not withdrawn tangentially, but is withdrawn at an angle, usually an angle of considerable value, to the tangent. The knee roll aforesaid may be part of a pinch roll system or part of a leveling system, or both, the latter form being illustrated in Fig. 1. In order

to facilitate leading the end of the strip into the pinch roll system I usually bend out the end of the strip sheet from the coil slightly and then support the coil practically on a level with or even higher than the pinch roll system until the end of the strip sheet is engaged therein. Afterward I may increase and/or control the angle of withdrawal to the tangent by lowering the coil. I provide mechanism for this purpose also.

A camber in the strip sheet will obviously tend to cause the strip sheet to travel longitudinally of the rolls, which is the reason for the necessarily great space between the housings in former structures. In my structure I provide relatively light rolls and relatively closely spaced housings, but I compensate for the movement of the strip sheet with reference to the rolls by providing very long rolls and permitting them to move longitudinally with respect both to the strip sheet and to the housings. This is another novel feature of my invention, and is the thing which permits me to secure an adequate working of the metal without the use of unduly heavy equipment.

Through analysis and experiment I have learned that if a coil of strip stock is decoiled from its underside, is kept in intimate contact with the knee roll, and is maintained at such an elevation that an abrupt reverse bend is made, coiler breaks will not occur in the first stage of decoiling. Interposed looseness, or the formation of a tangential-land must be avoided. Successive bends or reversals must likewise be made abruptly as the strip passes through the decoiler. The bending requirements described indicate the advantages of a pyramid arrangement of leveling rolls running in pinch relationship. It is therefore convenient to supply the traction for driving the strip by the leveling rolls themselves. An adjustable fending roll may be employed to direct the stock into the correct plane of delivery.

The general organization of my machine will be clear from Fig. 1, wherein I have indicated at 1 a coil of strip sheet material with the leading edge of the strip sheet coming off the bottom of the coil and bending sharply around a knee roll 2. An upper leveling roll 3 and lower leveling rolls 2 and 4 form a pyramid. The rolls operating in pinch relationship not only serve a leveling function, but also serve to draw the strip sheet out of the coil. The coil may be brought up to the decoiler upon a conveyor 5, or otherwise, as desired. If a conveyor is employed as shown, it is convenient to pivot the forward end thereof as indicated at 6. The conveyor end may initially be in the position 6a when a coil is being brought into position for the engagement of its end in the pyramid roll formation aforesaid. The coil may then be in the position 1a. After the end of the coil has been engaged in the pinch rolls, the portion 6 of the conveyor may be dropped as shown, lowering the coil to the position 1, or such other position as may be desired, and controlling the angularity of withdrawal over the roll 2 to the tangent of the coil. As the conveyor portion 6 is dropped, it is convenient to provide something which will push the coil down with it, and to this end I have provided an idler roller 7 held to the housings 8 of my device by links 9. The roller may also, if desired, be connected by links 10 to the end of my conveyor so that the coil will be forced downwardly as the conveyor end is lowered. It will be obvious that these mechanisms may be controlled in any way desired, and that modifications may be made therein without departing from the spirit of my invention.

A series of short rolls or wheels 11, 12 and 13 support the rolls 2 and 4 as shown, and are mounted in the housing 8. A pair of short rolls 14 and 15 bear against the roll 3, and are mounted in a block 16 slidable in ways 17 in the housing member. The block 16 is urged downwardly by springs 18. A guide bar 19 may be located upon the blocks 16 in the position shown, and has for its purpose preventing the strip sheet from following an undesired course after it leaves the pinch between rolls 3 and 4. More specifically it prevents the strip from riding over a fending roll 20, which is mounted upon arms 21 pivoted to a member 24, shown as a cylinder, which spans the blocks 16. A suitable screw 21 or other appropriate device is provided to control the position of the arms 21, and hence the position of roll 20 so that the strip sheet 22 is fed from my device with the desired direction of travel.

It will be noticed in Fig. 1 that the pyramid rolls 2, 3 and 4 are supported entirely by the short rolls 11 to 15, inclusive. The exact manner of mounting these rolls in the housing, and the exact form of the housings is a matter of selection. I have shown in Figure 3 a housing in section, comprising side plates 8a and 8b and a top abutment member 23 against which the spring 18 presses. The rollers 11 and 14, etc. are preferably mounted on ball or roller bearings, and are rounded at their edges so as not to inhibit the longitudinal movement of the rolls 2, 3 and 4 with respect thereto. It will thus be clear that the rolls 2, 3 and 4 are maintained under sufficient backing pressure exerted by the short rolls referred to at points no greater than the interspacing of the housings, irrespective of the movement of the said rolls 2, 3 and 4; and it will likewise be clear from Figs. 2 and 3, that these rolls are of considerably greater length than the distance between the housings and are mounted for longitudinal motion with respect thereto, the housings being cut away as shown for this purpose. While this construction may be varied as desired, I prefer to mount thrust bearing members 25 and 26 upon the end of the roll 3, and to interpose between these members and the rolls 2 and 4, thrust members 27 so that the rolls 2, 3 and 4 must move together. A member 28 may also provide a bearing surface for the end of roll 3. This member is a shoe member adapted to ride along tracks or ways in a member 29. A purpose of this construction is to keep the driven end of roll 3 in alignment, irrespective of its longitudinal motion, so that it may be driven. To this end I fasten a gear 30 non-rotatably upon the end of the roll 3, or upon the end of a shaft attached thereto; and this gear meshes with the teeth of a long jack pinion 31, which is mounted in bearings 32 and 33. The jack pinion may be provided with a gear 34 meshing with another gear 35 upon the driving shaft of an electric motor 36, or other prime mover.

By the construction which I have just described the rolls 2, 3 and 4 may creep with reference to the housing members as demanded by the camber of the strip, while at all times these rolls retain their relationship, and while at all times the gear 30 meshes with the jack pinion 31 so that these rolls may be driven.

It is contemplated in my invention that means will be provided automatically to center the rolls 2, 3 and 4 with reference to the housings at the end of any decoiling operation. I have not illustrated such means; but they may comprise a suitable system of cables and counter

weights, suitable springs or suitable pressure cylinders. The housings themselves, or appropriate guide means attached thereto, or to some external support, may be employed to enforce the longitudinal movement of the rolls 2, 3 and 4 by preventing transverse movement of the strip. The coil 1 will normally enter as shown somewhat between the housings, and this will serve the same function. It will be obvious that I may provide, if desired, one or more rolls to absorb the longitudinal thrust of the coil 1 as it is being decoiled; but ordinarily this will not be necessary since, if the coil is held down, as by the roller 7, the thrust will be absorbed partly by this roller and partly by the knee roll 2. It is desirable, however, to hold down the coil 1 and control it by some such means as the roller 7 or an equivalent structure, so that the decoiling movement is smooth and not jerky. It is a characteristic of my invention that the decoiling movement is smooth and continuous. No loops are formed in the metal and therefore no coiler breaks occur. The bending and working of the metal about the knee roll 2 and between this roll and the leveling rolls 3 and 4, while relatively strenuous, is smooth and continuous so that it does not bring about an uneven structure in the decoiled metal.

Modifications may be made in my invention without departing from the spirit thereof.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a decoiling device, pinch rolls, means for supporting a coil initially so that the leading end of the metal withdrawn from beneath may be engaged in said pinch rolls, and means for subsequently lowering said coil to the extent of producing a substantial reverse bend of said metal about one of said pinch rolls as it is being withdrawn.

2. In a decoiling device, a conveyor table, a set of pinch rolls adapted to receive the leading end of a metal strip leaving a coil from beneath said coil, means for lowering said table so as to bend said metal about one of said rolls by lowering said coil, and means for maintaining said coil in lowered position.

3. In a decoiling device, a conveyor table, a set of pinch rolls adapted to receive the leading end of a metal strip leaving a coil from beneath said coil, means for lowering said table so as to bend said metal about one of said rolls by lowering said coil, means for maintaining said coil in lowered position, and at least one additional roll adapted to produce a second bending of said metal to level the same.

4. In a leveling device, the combination of interspaced housings and leveling rolls, means for supporting and backing said rolls in said housing, said means being slidable with reference to said rolls and said rolls being of substantially greater length than the interspacing of said housings, whereby said rolls may move longitudinally in response to curvature in material being leveled therein, one of said rolls having a slidable driving connection with a source of power.

5. In a leveling device, the combination of interspaced housings and leveling rolls, means for supporting and backing said rolls in said housing, said means being slidable with reference to said rolls and said rolls being of substantially greater length than the interspacing of said housings, whereby said rolls may move longitudinally in response to curvature in material be-

ing leveled therein, one of said leveling rolls having a driving connection with a source of power, and means enforcing the longitudinal movement of the others of said rolls in accordance with the longitudinal movement of said driven roll.

6. In a leveling device, a plurality of leveling rolls, interspaced housings, means in said housings to support and back said leveling rolls and slidable with reference thereto, said leveling rolls being of a length substantially greater than the interspacing of said housings, whereby said rolls may move longitudinally in response to curvature of material being leveled, means for enforcing concurrent longitudinal motion of said rolls, means for preventing transverse movement of the end of one of said rolls, driven means on said end of said roll, and externally located driving means having a slidable connection with said driven means.

7. In a leveling device, a plurality of leveling rolls, interspaced housings, means in said housings to support and back said leveling rolls and slidable with reference thereto, said leveling rolls being of a length substantially greater than the interspacing of said housings whereby said rolls may move longitudinally in response to curvature of material being leveled, means for enforcing concurrent longitudinal motion of said rolls, means for preventing transverse movement of the end of one of said rolls, driven means on said end of said roll, externally located driving means having a slidable connection with said driven means, and said supporting and backing means comprising backing rollers having rounded edges rotatably mounted in said housings, and means for exerting pressure upon some at least of said rollers.

8. In a decoiling device, the combination of a pair of interspaced housings, a pair of pinch rolls journaled therein, means for supporting a coil rotatably, with an end of the material in said coil, leaving said coil from beneath, entering the pinch between said rolls, and bending sharply about one of said rolls, at least one other roll adapted to produce another bend in said metal, said pinch and said other roll being of substantially greater length than the interspacing between said housings, and adapted to move longitudinally with respect thereto to compensate for curvature of the material in said coil.

9. In a decoiling device, the combination of a pair of interspaced housings, a pair of pinch rolls journaled therein, means for supporting a coil rotatably with an end of the material in said coil, leaving said coil from beneath, entering the pinch between said rolls, and bending sharply about one of said rolls, at least one other roll adapted to produce another bend in said metal, said pinch and said other roll being of substantially greater length than the interspacing between said housings, and adapted to move longitudinally with respect thereto to compensate for curvature of the material in said coil, and driving means for at least one of said rolls.

10. In a decoiling device for heavy metal coils, means for supporting a coil in an initial position for the substantially tangential withdrawal of the metal therefrom, power means for withdrawing the metal from the coil, a breaking means over which said metal is withdrawn located close to said coil but beyond said metal as it leaves said coil, and means to place said coil in a different position subsequently with respect to said breaking means, whereby the metal is with-

drawn over said breaking means at a substantial angle to the tangent of the coil.

11. In a decoiling device for heavy metal coils, rolls in pyramid formation between which rolls the leading end of metal from a coil in an initial position may be introduced substantially in a tangential direction, means for supporting a coil in said initial position, and means for bodily shifting said coil to a secondary position in which said coil is rotatably held close to said rolls and in which the position of withdrawal of said metal from said coil has changed relatively to the position of said coil so that said metal is withdrawn in substantially a radial direction by being bent over one of said rolls.

12. A process of decoiling metal which comprises supporting a coil in a position for withdrawal of the metal therebeneath, engaging said metal by withdrawal means having an arcuate portion, lowering said coil with respect to said means so as to bend said metal sharply away from the tangent of said coil, around an arc of said arcuate portion of the withdrawal means, and withdrawing the metal from said coil while continuously bending it as aforesaid.

13. A process of decoiling metal which comprises supporting the coil in a position for substantially tangential withdrawal of the metal therefrom, engaging said metal by withdrawal means having an arcuate portion, changing the position of said coil with respect to said means so as to bend said metal sharply away from the tangent of said coil, around an arc of said arcuate portion of the withdrawal means, and withdrawing the metal from said coil while continuously bending it as aforesaid.

14. Apparatus of the character described comprising means for supporting a coil of hot rolled sheet metal, a transversely curved metal working member engageable against the coil along the line at which the sheet leaves the coil, a second transversely curved member engageable against said first member, and means for transmitting a pull to the free end of the sheet passing from said coil in a reverse direction about an arc of said first member, and then immediately in another reverse direction about an arc of said second member.

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