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B. C. McFADDEN

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METHOD OF TREATING STRIP MATERIAL

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Fig. 1.

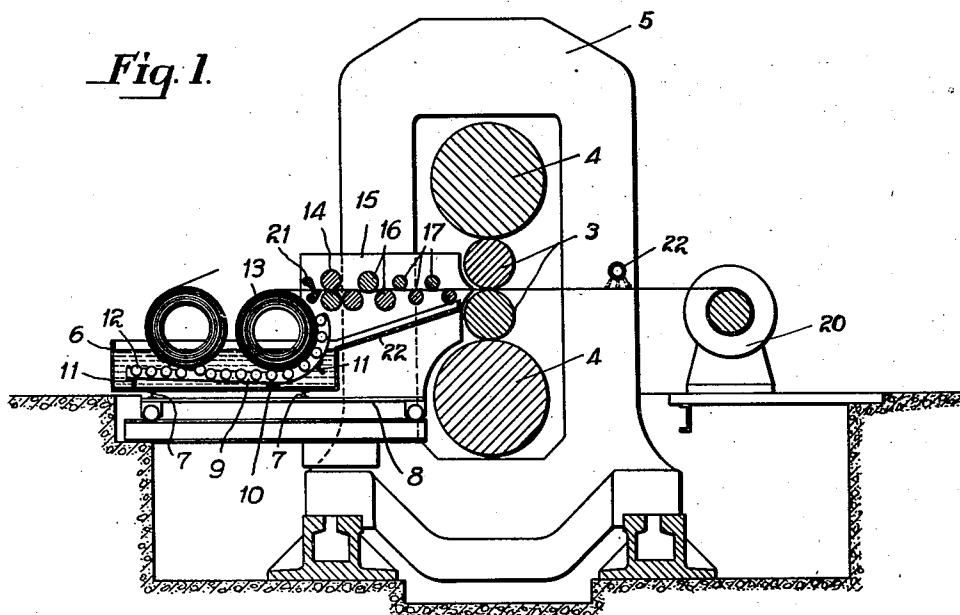
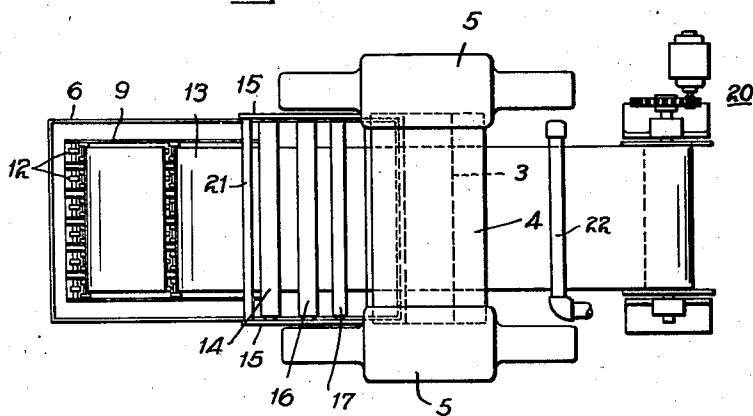


Fig. 2.



INVENTOR
Benjamin C. McFadden
BY
S. Ernest Low
ATTORNEY

UNITED STATES PATENT OFFICE

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METHOD OF TREATING STRIP MATERIAL

Benjamin C. McFadden, Pittsburgh, Pa., assign-
or to Aluminum Company of America, Pitts-
burgh, Pa., a corporation of Pennsylvania

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3 Claims. (Cl. 242—1)

This invention relates to a method of treating coils of sheet metal to eliminate surface marring or scratching between adjacent convolutions of a coil of sheet metal particularly during unwinding thereof.

It is the present practice to handle sheet metal strip in coils at various stages in the manufacture of metal sheets because of the economy of manufacture effected by coiling and the facility with which such coils can be handled during subsequent treatment of the metal or storage of the coils. Uncoiling or unwinding of the coils is usually accomplished by loosely supporting a coil in a coil box or cradle, or on a mandrel, and pulling on the tail or free end of the strip. As unwinding progresses, the convolutions or turns of the coil tend to slide or rub on adjacent turns because of the changing shape of the coil caused by the pulling force, the weight of the coil, the non-circular form of the coil, etc., thereby tending to cause surface scratching of the metal. Such scratching or otherwise marring of the surfaces of the metal is particularly undesirable when the metal is to be given a bright rolled or mirror-like finish, and materially adds to the cost of production of finishing sheets since obliteration or removal of surface blemishes entails additional operations that are laborious and expensive. This tendency to scratch during unwinding is aggravated as larger and heavier coils of metal of increased width are utilized. Certain materials are more easily disfigured or scratched than others, the softer materials, such as non-ferrous metals and their alloys, being particularly susceptible to excessive scratching during unwinding.

An important object of the present invention is to provide a method of protecting the contiguous surfaces of sheet metal strip in coiled form during unwinding of the coil so as to obviate the formation of surface blemishes on said surfaces through changes in the shape of the coil.

Another object of this invention is to provide a method of insulating adjacent convolutions of a coil of sheet metal, whereby to eliminate scratching between contiguous surfaces thereof during uncoiling.

A further object of the invention is to provide a method of uncoiling sheet metal and simultaneously forming a protecting and lubricating coating on the surfaces of the metal so as to prevent metal-to-metal contact between adjacent turns of the coils and thereby prevent scratching of the metal surfaces through relative movement of the adjacent turns during uncoiling.

A further object is to provide means for effecting the formation of a film of lubricant between the turns of a coil of sheet metal as the coil is being unwound.

In the accompanying drawing, I show one form of apparatus particularly adapted for practicing the method of my invention, wherein Fig. 1 is a longitudinal, vertical, sectional view of the coil unwinding apparatus, the structure being illustrated somewhat schematically, and Fig. 2 is a plan view thereof.

As heretofore pointed out, during unwinding of a coil of sheet metal, the surfaces of the sheet are liable to become disfigured and the value of the metal consequently impaired. However, I propose to cover the surfaces of the metal with a film of lubricant whereby the contiguous surfaces of the metal of adjacent convolutions of a coil will be protected by the lubricant film, such lubricant forming an insulating layer of lubricant between the turns of the coil which is effective to prevent metal-to-metal contact between adjacent turns during unwinding of the coil.

Liquid lubricant may be introduced between the turns of a coil of sheet material by immersing the coil in a hydrocarbon oil bath for a period sufficient to permit the oil to seep between the turns of the coil and completely coat the surfaces of the metal. The oil bath may be heated if desired in order to expedite seepage of the oil into the spaces between the turns of the coil and thereby reduce the soaking period required to treat the coil. An alternative to filling the spaces between adjacent turns of the coil by immersion in an oil bath, oil may be applied by spraying it against the ends of the coil. In either case the lubricated coil is moved into unwinding position where it is supported for uncoiling in substantially the manner hereinafter described. As the coils are being unwound, the presence of the film of oil on the surfaces of the metal of each turn of the coil eliminates or greatly minimizes the danger of scratching.

However, in the case of relatively loose or open coils, I prefer to treat each coil of metal with a liquid lubricant as it is being unwound and so I have devised a coil unwinding apparatus which finds particular adaptation in conjunction with a metal working device such as a rolling mill, wherein the coils are not only effectively treated to eliminate the danger of scratching but extraneous handling of the coil is unnecessary. Such open coils are regularly produced by well known methods and are characterized by the loose embracing condition of the convolutions

thereof, in some cases, the coils being so wound that all the convolutions of each coil are spaced from each other. Where the coil wraps are not completely spaced from each other, but may have some areas thereof in direct contact, its loose condition enables free and rapid inflow of a lubricant into the interstitial spaces nominally present between the coil wraps, so that all the surfaces of the metal may be effectively covered with the lubricant during a concurrent unwinding operation in the manner hereinafter described. It will be understood, however, that my invention has a wide range of use and is not to be considered as limited to its association with a rolling mill.

Referring now to the drawing, a pair of working rolls 3 and backing rolls 4 are mounted in the usual way in housings 5 and constitute a four-high rolling mill stand, well known in the art. At the front side of the mill, I provide a coil unwinding device that is adapted to straighten or flatten and, if desired, feed coiled metal strip into the mill and concurrently therewith apply a protecting coating of lubricant to the strip. This device comprises a tank 6 that is supported on cross beams 7 carried by a platform 8. Within the tank is disposed a coil supporting cradle 9 which is supported in raised position relative to the bottom of the tank by blocks 10 and members 11. The cradle 9 is provided with rollers 12 for rotatably supporting a coil of strip metal 13 for free rotary movement, the rollers 12 being arranged in transverse rows with alternate rows staggered relative to adjacent rows, as shown in Fig. 2, so as to form a roller bed for adequately supporting the coil without marking the metal strip. The end of the cradle 9, adjacent to the mill rolls is turned upwardly into arcuate form to embrace the coil 13 and prevent it from being drawn toward the mill. However, the coil 13 may be supported in other ways as by means of a mandrel extending transversely of the tank and axially through the coil.

A pair of pinch rolls 14 are journaled in end plates 15 that are suitably supported in upright position adjacent to the housings 5. The pinch rolls 14 are preferably, positively driven by any suitable source of power to withdraw the strip from the coil 13. After passing the pinch rolls 14 the sheet preferably passes between a group of upper and lower flattening or straightening rolls 16 and then passes between upper and lower sets of leveling rolls 17. The two groups of rolls 16-17 serve to straighten and level the sheet by reversely bending the same during its passage therebetween, and the sheet enters between the rolls 3 substantially flat. The rolls 16-17 are also journaled in the end plates 15 and it is desirable that the straightening rolls 16 be positively driven at the same peripheral speed as the pinch rolls 14 until the sheet enters between the rolls 3. Driving power is then preferably discontinued so that the rolls 16-17 serve to tension the sheet as the rolls 3 operate thereon. After passing the work rolls 3, the sheet may be coiled over a power-driven coiler indicated generally by the numeral 20, or may be passed to successive roll stands, slitters, flying shears, or the like, and have additional work performed thereon, as desired. It will be apparent to one versed in this art that the mill rolls 3 may be the only means provided for drawing the metal from the coil 13, the invention being equally applicable to such an installation.

The tank 6 is filled with oil, soap solution, or

other suitable lubricating liquid to a level above the inside wrap or convolution of the coil 13, and the coil is rotated through the bath by unwinding the outermost turn and passing it to the mill rolls 3. Thus, due to the loose or open condition of the coil, the oil not only seeps and flows into the spaces nominally present between the turns of the coil, but the relative movements occurring as heretofore described between adjacent turns or coil wraps because of the changing shape of the coil as unwinding progresses facilitate entry and spread of the lubricant over the metal surfaces. This spreading of the lubricant results in coating with lubricant any portion of the adjacent coil wraps that may be in surface contact. In addition, under the pull on the strip, the coil is compressed or flattened somewhat against the upturned portion of the cradle 9 with accompanying expansion or bulging of the coil at points near the top and bottom thereof to accommodate such compression. As the coil rotates, all parts thereof are moved through the points of compression and expansion. Flattening of the coil may bring adjacent coil wraps into contact, but at the points of bulging, the coil wraps spread or separate from each other and form slit-like openings into which the lubricant enters and spreads over the metal surfaces. By reason of the initially loose condition of the coil and the spreading action that takes place between contacting portions of the coil wraps, a heavier bodied oil or coil treating liquid may be employed advantageously. Such a heavier bodied liquid forms a thicker coating on the surfaces of the metal than will a lighter liquid, and in effect forms a filler between the adjacent turns of the coil which filler is effective to prevent metal-to-metal contact between the turns of the coil and thereby prevents scratching of the metal surfaces through repeated occurrences of the relative movement of adjacent turns during unwinding. A further advantage of applying liquid to the coil concurrently with rotation of the coil resides in the flushing action of the liquid, wherein foreign matter trapped in the coil is flushed out through surging and slushing of the liquid through the slits opened up between the turns of the coil.

From the foregoing, it will be apparent that, although the coil is only partially immersed in the liquid bath, the loosely wound condition thereof affords rapid entry of the lubricant between all the coil wraps so that practically the entire surface area of the metal will be coated with lubricant when the entire circumference of the coil has been moved through the bath. An excess amount of lubricant enters the coil, and it tends to flow circumferentially between the coil wraps due to rotation of the coil, and thus the lubricant can seep between and coat any surfaces that may be in direct contact. In case the contacting portions do not entirely separate, the pressure therebetween is relieved whereupon spreading of the lubricant over the contacting surfaces of the metal will be effected by sliding movement therebetween. Hence, the entire surface of the metal will quickly become covered with a protective film of lubricant. Thereafter, repetitions of such movements in the body of the coil, which ordinarily accumulatively cause surface scratching or marking, take place on a film of oil and are practically rendered harmless. The inner coil wraps which are most likely to become marked because they are exposed to a greater number of such movements are adequately protected

throughout the uncoiling operation. The continuous infiltration and spreading of lubricant serves to maintain the protective film of lubricant on the metal surfaces as unwinding progresses; and hence, any coils that require prelubrication and have been so lubricated by any of the other described modes of treatment additionally may be beneficially partially immersed and unwound in the foregoing manner, since replenishment of lubricant to the coiled metal surfaces thus affected assures continuous protection for the unwound portion of the coil. The prelubrication of the coils eliminates any possibility of the metal being marked or scratched during the initial stage of unwinding movement as such a prelubricated coil is rotated through the liquid.

A pair of wiper blades 21 of rubber, felted fabric or other suitable material is disposed in front of the pinch rolls 14 and engage the opposite sides of the uncoiled or withdrawn portion of the sheet to wipe excess liquid from the surfaces of the sheet. Suitable squeegee rolls or brushes may be substituted for the blades 21. Any entrained foreign matter harmful to the surface finish of the sheet in the subsequent working thereof is carried away by the liquid as it is wiped from the sheet and returned to the tank 6. A drip trough 22 is provided beneath the series of rolls 14, 16, and 17 to catch any oil or liquid which may drip from the rolls and return it to the tank. Any foreign matter in the returned liquid settles at the bottom of the tank and may readily be removed therefrom, or, if desired, the liquid may be filtered and recirculated through the tank 6. It is also possible to definitely control the temperature of the liquid within the tank 6 to suit any desired rolling or operating conditions. The cradle 9 is disposed above the bottom of the tank as heretofore mentioned, so that movement of the coil 13 during unwinding will not materially agitate the sediment in the tank. One of the transverse rows of rollers 12, as indicated in Fig. 1, is adapted to be manually moved vertically into and out of the plane of the cradle so as to form a stop when in raised position against which a succeeding coil may rest and soak up liquid or oil prior to movement thereof to unwinding position. Either before or after transferring the coil to unwinding position, the rotatably supported coil may be manually rotated to afford entry of the liquid lubricant around the entire coil circumference so that the entire surface of the metal may become coated with the lubricant. Such preliminary soaking and rotation of the coils, particularly in the case of wide coils and those that are in a wound condition that inhibits rapid and free infiltration of the liquid between the coil wraps, insures the presence of sufficient lubricant spread over the contiguous surfaces within the coil to overcome surface marking or scratching during unwinding.

The coils may be treated with various com-

pounds or solutions such as the mineral lubricating oil mentioned heretofore, or by vegetable oils, soap solutions, or other detergents.

Although I have described a specific embodiment of my invention and one form of apparatus for practicing the same, it will be understood that numerous modifications and variations may be made in the process and apparatus disclosed without departing from the spirit of the invention or the scope of the appended claims.

What I claim is:

1. The method of treating a coil of sheet metal to protect the surfaces thereof against scratching by relative movement between adjacent convolutions in the body of the coil during unwinding, which comprises bringing the coil into an intermediate position preliminary to moving it into unwinding position, immersing the coil in a liquid lubricant, maintaining the coil immersed until the seepage of the lubricant between the convolutions of the coil completely covers said surfaces thereof, then transferring the lubricated coil to unwinding position, supporting the coil in said position on a rotatable surface for free rotary movement, unwinding the coil, and continuously supplying liquid lubricant to the surfaces of the convolutions remaining in the coil until such convolutions in turn are unwound.

2. The method of treating a loose coil of sheet metal to protect the surfaces of adjacent internal wraps of the coil against scratching by relative movement between said surfaces during unwinding of the coil, which comprises bringing the coil into proximity to an unwinding position, placing the coil on its side in a bath of liquid lubricant at said proximate position to a depth sufficient to cover the inner wrap of the coil with lubricant, to permit seepage of the lubricant between all the coil wraps prior to moving the coil to unwinding position, rotating the coil in said bath to effect spreading of the lubricant circumferentially of the coil, moving the coil to another position in said bath for uncoiling, rotatably supporting the coil in said other position on a rotatable surface for unrestrained rotation, and uncoiling the coil.

3. The method of treating a coil of sheet metal to protect the surfaces thereof against scratching by relative movement between adjacent convolutions in the body of the coil during unwinding, which comprises bringing the coil into an intermediate position preliminary to moving it into unwinding position, inundating the coil with a liquid lubricant for a period sufficient to permit the lubricant to infiltrate into the coil and completely coat said surfaces, then moving the lubricated coil into unwinding position, rotatably supporting the coil in said unwinding position on a rotatable surface for free rotary movement, and unwinding the coil while said surfaces are coated with the lubricant.

BENJAMIN C. McFADDEN.