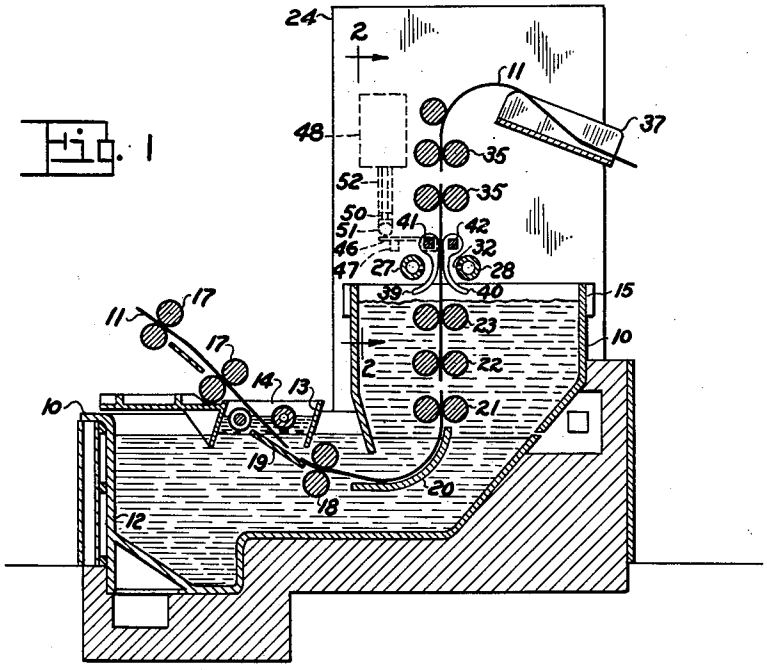
Dec. 13, 1949 H. C. KIRK 2,491,316

SAFETY DEVICE FOR METAL SHEET CONVEYERS IN TINPLATING APPARATUS

Filed May 12, 1947

Fig. 1



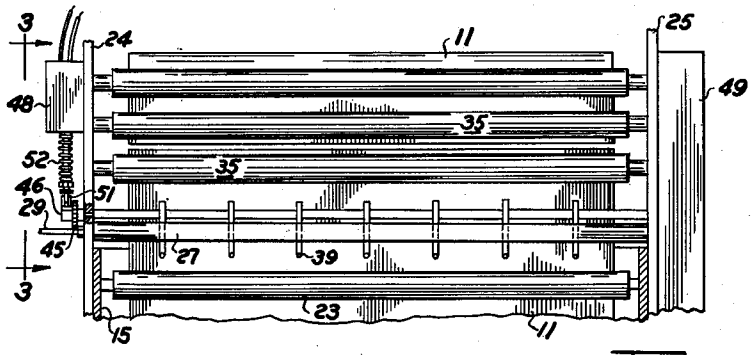


Fig. 2

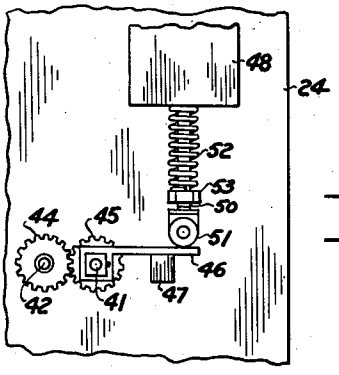


Fig. 3

INVENTOR.
HARRY C. KIRK.

BY James J. Shanley

ATTORNEY.

Patented Dec. 13, 1949

2,491,316

UNITED STATES PATENT OFFICE

2,491,316

SAFETY DEVICE FOR METAL SHEET CONVEYERS IN TIN-PLATING APPARATUS

Harry C. Kirk, Weirton, W. Va., assignor to National Steel Corporation, a corporation of Delaware

Application May 12, 1947, Serial No. 747,429

5 Claims. (Cl. 91—12.7)

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The present invention relates to improvements in apparatus for conveying sheet material along a path and more particularly relates to such apparatus including a safety device for stopping the passage only of deformed or irregular sheets through the apparatus.

The present invention will be described more particularly in connection with hot dip, tinplating apparatus for producing tinplate although its principles may be applied to other types of apparatus in which sheets are propelled along a path by power-actuated rolls or other means.

In mills where tinplate is produced by the hot dip process, the flat sheets of base metal, ordinarily sheets of black plate, are successively, rapidly and continuously moved through the tin-applying apparatus by means of series of guides and power-actuated feed rolls. The tinned sheets, as they emerge from the plating apparatus, are engaged by the first pair of a series of catcher rolls. The catcher rolls propel the sheets of tinplate to the branning machines and/or other processing apparatus. Occasionally, as a sheet is moved through the tinplating apparatus, it will be bent, wrinkled or deformed so as to have a shape different from the normal flat shape. These deformed sheets are called "cobbles." A cobble may occur in the tin pot by the sheet being improperly fed into the tinning apparatus in a biased or canted position. Most cobbles, however, are formed at the catcher due to the fact that the sheets must pass through an open space at this point so that cooling air can be impinged upon them. A cobble at the catcher causes cobbling in the tin pot due to jamming of the succeeding sheets one on the other. As a result, it is necessary to remove the entire machine from the line and replace it with another while the tinning machine containing the cobbles is repaired and the cobbles removed.

Accordingly, a primary object of the present invention is to provide an improved sheet conveying apparatus which includes means for guiding normal sheets along the path of sheet movement and for stopping automatically the feeding apparatus upon receiving a cobbled sheet whereby damage to the apparatus and the formation of additional cobbles is prevented.

It is also an object of the present invention to provide a safety device for hot dip, tinplating apparatus which includes means for guiding flat, normal sheets from the grease pot rolls to the catcher rolls and for stopping the grease pot rolls when a sheet is deformed in the plating apparatus

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to prevent feeding the deformed sheet to the catcher rolls.

These and other objects and advantages will become more readily apparent from the following detailed description taken in connection with the accompanying drawings in which:

Figure 1 is a sectional view taken longitudinally of apparatus embodying the present invention in which the front portion of the apparatus has been removed to more clearly show the internal structure;

Figure 2 is a transverse, fragmentary sectional view taken along line 2—2 of Figure 1; and,

Figure 3 is an enlarged, fragmentary view of the switch and its operating mechanism taken as indicated by line 3—3 on Figure 2.

Referring more particularly to the drawings showing a preferred embodiment of the present invention, the hot dip tinplating apparatus includes a tank 10 through which sheets 11 are successively passed and coated with molten tin. Sheets 11 are flat sheets of ferrous metal ordinarily containing a low percentage of carbon and commonly referred to as "black plate."

The tank 10 includes a lower compartment or tin pot 12 in which there is maintained a molten pool of tin. A pair of upper plate members 13 extend across the tank 10 to form a flux pot 14 in which there is maintained a body of liquid flux. A grease pot 15 confines a pool of grease, such as palm oil, on top of the pool of molten tin. Power-actuated, rotatable feed rolls 17 are provided for feeding sheets 11 one by one into the tank 10. Power-actuated feed rolls 18 are rotatably mounted in the tin pot 12 and rolls 18 and the two guide members 19 and 20 guide sheets 11 through the pool of molten tin. Three pairs of power-actuated feed rolls 21, 22 and 23 are rotatably mounted in grease pot 15 for feeding the sheets up through the palm oil. These feed rolls 21, 22 and 23 are also wiping rolls and, at least to a certain extent, control the thickness of the tin allowed to remain on the sheet 11 by removing the tin which is in excess of the predetermined amount desired.

The tinplating apparatus includes a pair of upwardly extending side frame members 24 and 25 in which are mounted a pair of horizontal pipes 27, 28, each connected through a hose 29 to a source of air or other fluid under pressure. The pipes extend transversely of the opposite surfaces of the strip and each pipe is provided with a plurality of outlet passages 32 for directing streams of air against the corresponding surface of the hot, plated sheet as it emerges from the grease

pot 15 to cool and solidify the tin coating. A plurality of power-actuated catcher rolls 35 are rotatably mounted in the frame members 24 and 25 for propelling the sheets 11 further along the path of sheet movement to the guide member 37.

Sheets of pretreated black plate are either manually or mechanically fed successively to the tinplating apparatus. Any suitable sheet feeding apparatus may be used. The rotating feed rolls 17 pass the sheet down through the flux pot 14 and into the tin pot 12 where the rotating rolls 18 move the sheet through the pool of molten tin. The guide 20 bends the leading edge of the sheet upwardly so that it enters the nip of the first pair of grease pot rolls 21. The grease pot rolls 21, 22 and 23 remove the excess molten tin and pass the sheet upwardly between the cooling pipes 27 and 28 until the leading edge of the sheet is gripped between the catcher rolls. The catcher rolls 35 move the sheet further along its path of movement through the mill.

As the leading edge of the flexible sheet 11 is pushed upwardly by the grease pot rolls toward the catcher rolls, the uppermost portion of the sheet needs to be supported and guided toward the catcher rolls 35. A guide means is provided for guiding the sheet 11 from the grease pot rolls to the catcher rolls. Opposed, divergent, depending guide members or fingers 39 and 40 are mounted on and connected to corresponding square shafts 41, 42. The shafts 41 and 42 are pivotally supported in the side frame members 24 and 25 so that each shaft and the depending guide fingers are pivotally movable about an axis parallel to the sheet and normal to the direction of sheet travel. A spur gear 45 is connected to the shaft 41 and a meshing spur gear 44 is connected to the shaft 42 so that the shafts 41 and 42 turn in unison. An outwardly extending lever 46 is connected to the shaft 41 and a stop 47 is mounted on the side frame member 24. Stop 47 stops rotation of the shafts 41 and 42 in a direction to move the opposed fingers 39 and 40 toward each other so that the fingers are maintained in position to guide and allow the passage therebetween of normal, flat sheets.

A normally closed switch 48 is mounted on the side frame member 24 and is operably connected to the drive means for driving all of the feed rolls. A common drive means of the type customarily used in hot dip, tinplating machines rotates all of the feed rolls 17, 18, 21, 22 and 23 and the catcher rolls 35 at the same peripheral speed, a portion of this drive means is beneath cover 49, Figure 2. A downwardly extending, vertically movable plunger 50 of switch 48 is provided at its lower end with a roller 51 engaging lever 46. A compressed spring 52 extends about plunger 50 between the switch 48 and an adjustable nut 53 threadedly engaging the plunger 50. The spring 52 presses the plunger 50 and the lever 46 downwardly to maintain the switch 48 in the normally closed position and to urge the divergent guides 39 and 40 toward each other as far as stop 47 will permit. The spring 52 resiliently urges the guides 39 and 40 into the normal position for guiding flat sheets from the grease pot rolls to the catcher rolls. The force urging the guides 39 and 40 toward each other to the sheet-guiding position can be changed by adjusting nut 53 to vary the pressure exerted by spring 50 and by varying the effective length of lever 46.

As a flat sheet is moved up between the guides 39 and 40, the guides guide the sheet into the nip of the lower pair of catcher rolls. The stop 47 may be positioned so that the guides are spaced apart a distance equal to or greater than the thickness of a sheet or, the stop 47 may be positioned so that the guides are spaced apart a distance slightly less than the thickness of a sheet. In any one of these positions, the guides 39 and 40 provide some support for and act as guides for the flat sheets and the passing of a flat sheet between the guides while so positioned does not move the guides 39 and 40 sufficiently to actuate the switch 48.

As an enlarged deformed portion of a deformed sheet enters the convergent throat between the guide members 39 and 40 and starts to pass between the divergent guide members 39 and 40, these members are spread apart which in turn raises lever 46 and plunger 50 to open the switch 48 and stop all of the feed rolls. The deformed sheet is removed and the apparatus then restarted. Thus, the guides 39 and 40, when in the normal or sheet guiding position, are arranged to guide the normal sheets 11 being fed upwardly by the grease pot rolls and are movably supported for movement to a different position upon receiving a deformed sheet from the feed rolls. The guides and the switch constitute a safety device for stopping the feed rolls when a deformed sheet is received by the guides to prevent damage to the catcher rolls and other equipment and to prevent the feeding of additional sheets through the apparatus until the deformed sheet has been removed. Further, without this safety device, the presence of a cobble in the catcher rolls causes cobbles in the feed rolls and as it is impossible to remove these cobbles, it has in the past been necessary to remove the entire machine from the line and replace it with another while the tinning machine containing the cobbles was repaired and the cobbles removed. The guides also reduce or eliminate the number of cobbles formed at the catcher rolls as a result of improper positioning of the leading edge of the sheet so that the leading edge does not properly enter the catcher rolls.

I claim:

1. In hot dip tinplating apparatus, the combination comprising, means for successively hot dip plating a series of sheets, power-actuated feed rolls for propelling the plated sheets upwardly from the plating means along a path, power-actuated catcher rolls disposed above the feed rolls for advancing the sheets further along the path, opposed guide members, a pair of shafts supporting the guide members on opposite sides of the path of sheets between the feed rolls and the catcher rolls in a normal position in which the guide members are arranged to guide a normal sheet therebetween along the path to the catcher rolls, each shaft being rotatable about an axis extending parallel to the sheets and transversely of the direction of sheet travel and the shafts movably supporting the guide members for movement through an arc away from the path and each other to a different position upon receiving a deformed sheet from the feed rolls, means resiliently urging the guide members toward the normal position to support and guide the normal sheets and providing restrained movement of the guide members to said different position, and control means mechanically engaging and operable by movement of the guide members all the way to said different position to stop the feed rolls whereby the feed rolls are stopped

upon feeding a deformed sheet to the guide members.

2. In hot dip tinplating apparatus, the combination comprising, means for successively hot dip plating a series of sheets, power-actuated feed rolls for propelling the plated sheets upwardly from the plating means along a path, power-actuated catcher rolls disposed above the feed rolls for advancing the sheets further along the path, opposed guide members, a pair of shafts supporting the guide members on opposite sides of the path of sheets between the feed rolls and the catcher rolls in a normal position in which the guide members are arranged to guide a normal sheet therebetween along the path to the catcher rolls, each shaft being rotatable about an axis extending parallel to the sheets and transversely of the direction of sheet travel and the shafts movably supporting the guide members for movement through an arc away from the path and each other to a different position upon receiving a deformed sheet from the feed rolls, gear means connecting the shafts for rotation in unison in opposite directions, means resiliently urging the guide members toward the normal position to support and guide the normal sheets and providing restrained movement of the guide members to said different position, and control means mechanically engaging and operable by movement of the guide members all the way to said different position to stop the feed rolls whereby the feed rolls are stopped upon feeding a deformed sheet to the guide members.

3. In hot dip tinplating apparatus, the combination comprising, means for successively hot dip plating a series of sheets, power-actuated feed rolls for propelling the plated sheets upwardly from the plating means along a path, power-actuated catcher rolls disposed above the feed rolls for advancing the sheets further along the path, opposed guide members, a pair of shafts supporting the guide members on opposite sides of the path of sheets between the feed rolls and the catcher rolls in a normal position in which the guide members are arranged to guide a normal sheet therebetween along the path to the catcher rolls, each shaft means being rotatable about an axis extending parallel to the sheets and transversely of the direction of sheet travel and the shafts movably supporting the guide members for movement through an arc away from the path and each other to a different position upon receiving a deformed sheet from the feed rolls, gear means connecting the shafts for rotation in unison in opposite directions, an arm connected to one of the shafts and movable therewith, a stop engageable by the arm for limiting the movement of the guide members toward each other, a normally closed switch associated with the feed rolls and operable to an open position to stop the feed rolls, a switch operating member, and resilient means urging the switch operating member into engagement with the arm and the arm into engagement with the stop to urge the guide members to the normal sheet guiding position to support and guide the normal sheets to the catcher rolls and providing restrained movement of the arm away from the stop to open the switch and restrained movement of the guide members to said different position to stop the feed rolls upon receiving a deformed machine between the guide members.

4. In hot dip tinplating apparatus, the combination comprising, means for successively hot dip plating a series of sheets, power-actuated feed rolls for propelling the plated sheets upwardly from the plating means along a path, power-actuated catcher rolls disposed above the feed rolls for advancing the sheets further along the path, opposed guide members, means supporting one of the guide members on one side of the sheet path between the feed rolls and the catcher rolls in a normal position, a shaft supporting the other guide member on the opposite side of the sheet path between the feed rolls and the catcher rolls in a normal position, the guide members in the normal positions being arranged to guide a normal sheet therebetween along the path to the catcher rolls, means rotatably supporting the shaft for rotation about an axis extending in a direction parallel to the sheets and transversely of the direction of sheet travel, the shaft movably supporting the guide member thereon for movement through an arc about said axis away from the sheet path and the opposite guide member to a different position upon receiving a deformed sheet from the feed rolls, means restraining movement of the shaft supported guide member from the normal position to support and guide the normal sheets and providing restrained movement of the shaft supported guide member to said different position, a control operable to stop the feed rolls, and control operating means connected to the shaft supported guide member and movable therewith to a control operating position for operating the control and stopping the feed rolls upon movement of the guide member to said different position whereby the feed rolls are stopped upon the feeding of a deformed sheet to the guide members.

5. In hot dip tinplating apparatus, the combination comprising, means for successively hot dip plating a series of sheets, power-actuated feed rolls for propelling the plated sheets upwardly from the plating means along a path, power-actuated catcher rolls disposed above the feed rolls for advancing the sheets further along the path, opposed guide members, means supporting one of the guide members in a normal depending position on one side of the sheet path between the feed rolls and the catcher rolls, a shaft supporting the other guide member in a normal depending position on the opposite side of the sheet path between the feed rolls and the catcher rolls, the depending guide members diverging outwardly from the sheet path and defining a convergent throat to receive and guide a normal sheet therebetween along the path to the catcher rolls, means rotatably supporting the shaft for rotation about an axis extending in a direction parallel to the sheets moving along the path and transversely of the direction of sheet travel, the shaft rotatably supporting the guide member thereon for movement through an arc about said axis away from the sheet path and the opposite guide member to a different position upon receiving a deformed sheet from the feed rolls, means restraining movement of the shaft supported guide member from the normal position to support and guide normal sheets and providing restrained movement of the shaft supported guide member to said different position, and control means including a control operable to stop the feed rolls and including a movable control operating member movable from a non-operating position to a control operating position to operate the control and stop the feed rolls and including means connecting the control operating member to the shaft supported guide

member arranged so that movement of the shaft supported guide member to said different position moves the control operating member to the operating position whereby the feed rolls are stopped only upon the feeding of a deformed sheet to the guide members.

HARRY C. KIRK.

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