July 28, 1936. W. B. SNYDER 2,049,332

ROLLING MILL

Filed Dec. 31, 1932

Fig. 1.

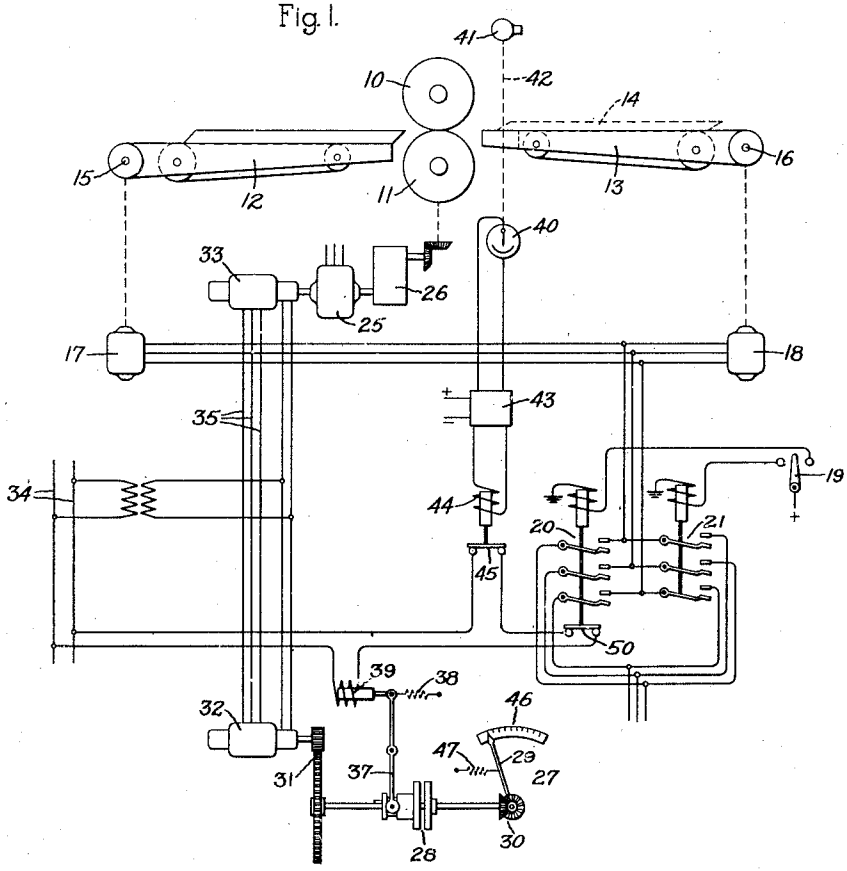
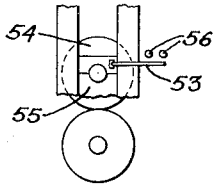


Fig. 2.



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ROLLING MILL

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2 Claims. (Cl. 33—141)

My invention relates to rolling mills and has for its object means for automatically indicating a condition of the material after each rolling operation.

Although not limited thereto, my invention has particular application in the rolling of sheet steel in packs, each pack consisting of a plurailty of sheets. In the rolling of the packs, the pack is repeatedly passed through the mill to effect the gradual reduction in thickness of the sheet. As the pack is rolled down and the thickness of the material decreased the pack itself increases in width and length. It is an object of my invention to provide an indicating device for automatically indicating the thickness of the material as a function of the length of the pack so that the operator can obtain a reliable indication of the thickness of the material without shutting down the mill.

In carrying out my invention in one form I provide an indicator which may be driven by the mill together with clutching means operated by the passage of the pack through the mill to connect the indicator to the mill each time it enters the mill and to disconnect it as the pack leaves the mill together with means for returning the indicator to a zero position when it is disconnected. The range of movement of the indicator thus gives a reliable indication of the length of the pack and hence the thickness of the material.

For a more complete understanding of my invention reference should be had to the accompanying drawing Fig. 1 of which shows in diagrammatic form a steel mill provided with indicating means embodying my invention while Fig. 2 is a fragmentary view showing a modified form of my invention.

Referring to the drawing, while the mill may be of any conventional type for performing a rolling or other operation on material passed through it, I have shown it as a conventional form of steel mill for the rolling of sheet metal in packs. As shown diagrammatically the mill comprises rolls 10 and 11 with tables 12 and 13 on opposite sides to convey the material to and from the rolls. The material, shown as a pack 14 of sheet material, may be fed to the rolls from the table 12 and received upon the table 13. After thus being received upon the table 13 the material is passed back over the rolls to the table 12 by elevating the tables about their pivot supports 15 and 16 by suitable means (not shown). The pack is conveyed on the tables on suitable endless conveyors carried by the tables and driven respectively by electric motors 17 and 18. When the pack has thus been transferred back to the table 12 the tables are lowered again to the positions shown in the drawing for a repetition of the rolling operation.

The motors 17 and 18 are suitably controlled by a manually operated switch 19 which in turn controls the reversing contactors 20 and 21 to control the starting and stopping of the motors 17 and 18 for each direction of rotation. The switch 21 when closed causes the motors to move the pack from the left to the right, whereas the pack is returned when the switch 20 is closed. Obviously the switch 19 may be operated automatically with the lifting and lowering of the tables to produce a plurality of passes of the material through the rolls, which may be of course screwed down for each pass to produce a predetermined reduction in the pack. The rolls are driven through a suitable driving motor 25 connected to the lowermost roll 11 through a speed reduction gearing 26.

In accordance with my invention I provide an indicating device 27 which may be connected through a clutch 28 in driving relation with the rolls for the period that the material is passing through the rolls and thus give an indication of the length of the pack and hence of the thickness of the sheets. As shown, the indicator comprises an index hand 29 which is driven from the motor 25 through a bevel gearing 30, clutch 28, gearing 31 and an electrical driving connection formed by motion transmitting devices 32 and 33 the latter of which is connected to the motor 25. The motion transmitting devices 32 and 33 may be of any suitable type and are shown of a well known alternating current type, each device being provided with a single circuit field winding supplied from a suitable source of alternating current 34, and a three circuit armature winding. The two armature windings are electrically connected together through the conductors 35.

As thus arranged it will be observed that the rotation of the motor 25 is continuously repeated by the receiving device 32 which transmits this motion through the reduction gearing 31 to one member of the clutch 28. The movable member of the clutch is normally biased to the left as shown in the drawing to its disengaged position by means of a pivoted lever 37 and a spring 38. By means of an operating coil 39 the lever 37 may be pulled over in a counterclockwise direction about its pivot to engage the clutch 28 whereupon the index hand 29 is driven from the motor 25.

In order that the index hand will be driven only while the pack is passing through the rolls

so that its maximum indication will be a measure of the length of the pack I provide means responsive to the position of the pack for controlling the energization of the coil 39. As shown in Fig. 1 this means comprises a light sensitive control device or photo-electric cell 40 mounted below the table 13 adjacent the rolls and arranged to receive light from a source of light 41 mounted above the table. The photo-electric cell and the light source are so arranged that the beam of light is interrupted by the pack as it enters the rolls. In other words, the pack 14 as it moves from the table 12 toward the right to the table 13 interrupts the beam of light 42 with its right-hand end as this end emerges from the rolls. This interruption of the beam of light renders the photo-electric cell inactive and consequently its output circuit, or the output circuit of a suitable amplifier 43 controlled by it, is deenergized whereupon a relay winding 44 connected in this output circuit is deenergized to allow the switch 45 to close thus closing the circuit from the supply source 34 to the clutch operating coil 39. The clutch is thus moved to establish a connection between the index hand and the driving motor 25 of the mill and thus the index hand is moved over toward the right on the scale 46 as the pack passes through the rolls until the beam of light 42 is again reestablished to the photo-electric cell 40 by movement of the left-hand end of the pack 14 to a position to the right of the beam. The photo-electric cell is thereupon activated again to cause energization of the coil 44 to open the relay switch 45 whereupon the clutch coil 39 is deenergized and the clutch released by the spring 38. The index hand 29 is thereupon returned to its zero position as shown in the drawing by the spring 47 connected to it. Thus the mill operator by observing the maximum travel of the index hand has a reliable indication of the length of the pack, i. e., of the thickness of the sheets of material comprising the pack.

For the purpose of preventing operation of the index hand 29 while the material in the pack 14 is being passed to the left over the rolls from the table 13 to the table 12, I provided an interlock switch 50 in the circuit of the operating coil 39, this switch being connected to the contactor 20 so as to be opened when the contactor 20 is closed to return the material to the table 12. Consequently since the switch 50 is opened when this switch is closed the clutch operating coil 39 cannot be energized and the clutch will not be engaged to drive the index hand at that time.

In the modified form of my invention shown in Fig. 2, a switch arm 53 is provided which is attached to the upper roll 54 of the mill, preferably to the bearing 55 of the upper roll which, it will be understood, is slidably mounted in a vertical direction in suitable guides to permit adjustment of the roll. It will be understood that as the material leaves the mill the upper roll drops down temporarily into engagement with the lower roll and that as the material enters the roll the upper roll is raised to its limit of adjustment. Therefore as the material enters the rolls the upper roll is raised carrying with it the contact arm 53 into engagement with the contacts 56 to close the circuit through them. This switch formed by the contact arm 53 and the contacts 56 is connected in the circuit of the clutch coil 39 in place of the switch 45. The photo electric cell 40 and associated elements are therefore not used, this modified system otherwise being as shown in Fig. 1 with the modifications previously described.

While I have shown a particular embodiment of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I therefore contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. A material thickness indicating system for a mill for rolling material wherein the material is repeatedly passed through said mill in a predetermined direction and returned in an opposite direction to the other side of the mill between consecutive passes in said predetermined direction, comprising an indicating device, driving means for the mill, means for connecting said indicating device to said driving means, a switch for controlling said connecting means, a light-responsive device for controlling said switch, a source of light arranged to throw a beam of light to said light-responsive device across the path of the material as it moves through the mill in said predetermined direction whereby said beam of light is interrupted by the material to cause operation of said switch and thereby connect said indicating device to said driving means, and means biasing said indicating device to a predetermined position for returning said indicating device to said predetermined position when it is disconnected from said driving means by the passage of the material through the beam of light in said predetermined direction whereby the amount of movement of said indicating device is a measure of the length of the material after each passage through said mill, and means responsive to the movement of the material in the opposite direction for disabling said connecting means.

2. A material thickness indicating system for a mill for rolling packs of sheet material provided with material conveying means for repeatedly passing the pack through the mill in a predetermined direction and returning the pack in the opposite direction to the other side of the mill between consecutive passes in said predetermined direction, comprising an indicating device, a clutch for connecting said indicating device to said mill, operating means for said clutch, a switch for controlling said operating means, means responsive to movement of the pack in said predetermined direction for operating said switch to engage said clutch at the beginning of the passage of the pack through the mill in said predetermined direction and for disengaging said clutch upon the completion of said passage, means for returning said indicating device to a predetermined position when said clutch is disengaged, means for driving the material conveying means, means for reversing said driving means to control the movements of the pack and means responsive to operation of said reversing means for disabling said clutch operating means during return of the pack after each passage in said predetermined direction.

WILLIAM B. SNYDER.