United States Patent [19]

Yazawa et al.

[11] **3,721,114**

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[54] **APPARATUS FOR CONTINUOUS COLD ROLLING**

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[52] **U.S. Cl.** **72/231,** 72/250, 226/197

[51] **Int. Cl.** **B21b 41/06**

[58] **Field of Search** 72/226, 227–231, 72/234; 226/197

[56] **References Cited**

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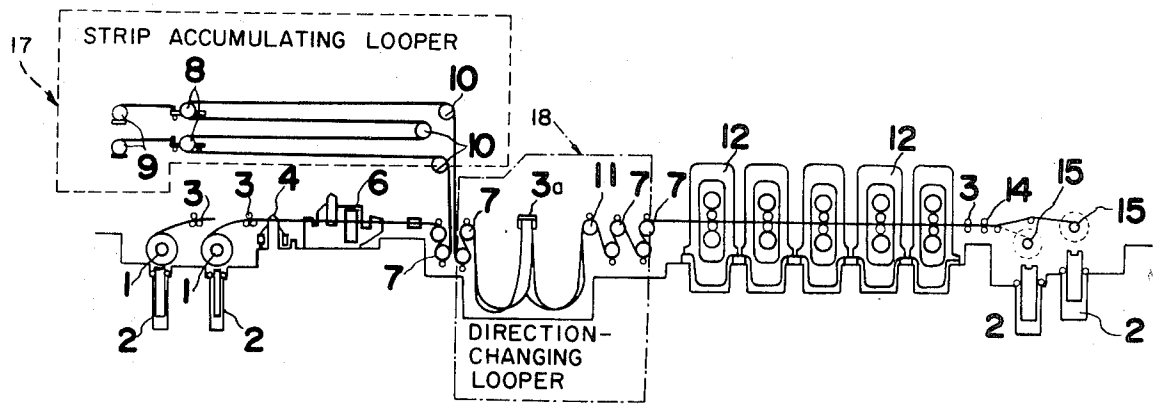
[57] **ABSTRACT**

In a continuous cold rolling apparatus, the strip feeding out of the entry facilities is fed to a looper for changing the direction of the strip. The changed - direction strip is then fed to the rolling stands which may be arbitrarily located, such as in parallel or at right angles with the entry facilities.

7 Claims, 4 Drawing Figures



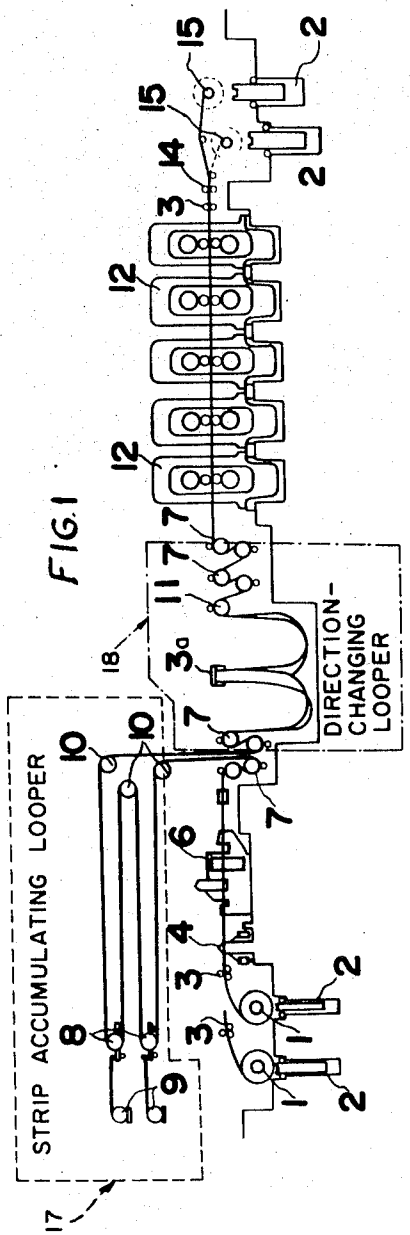

STRIP ACCUMULATING LOOPER
DIRECTION-CHANGING LOOPER
17
18

FIG. 1

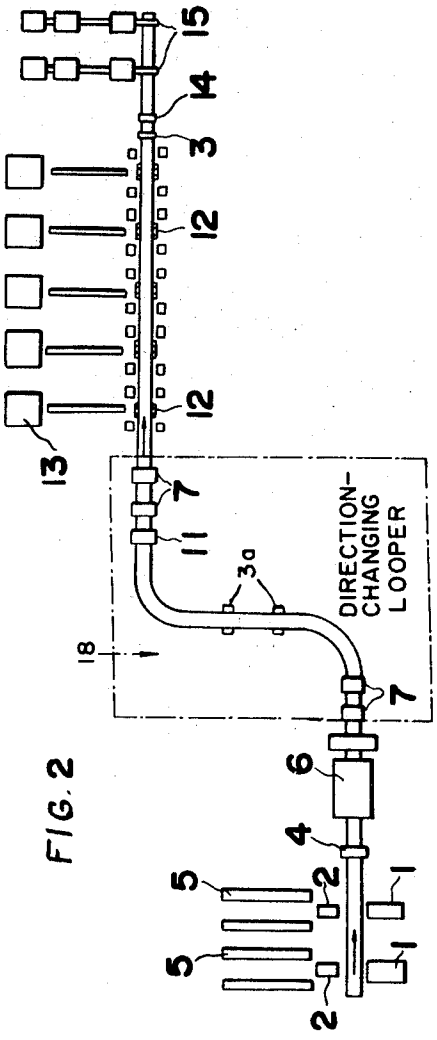

DIRECTION-CHANGING LOOPER
18

FIG. 2

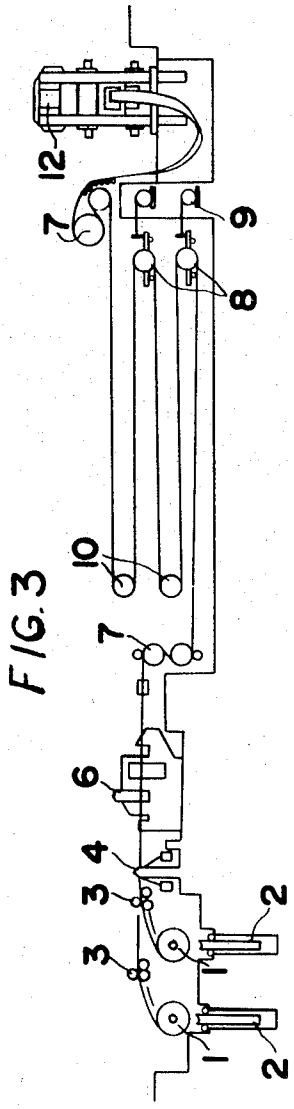


FIG. 3

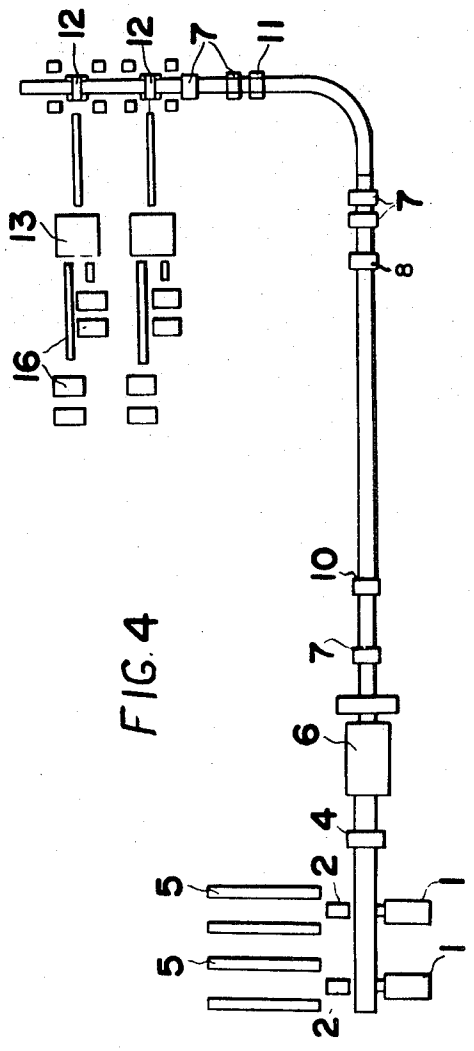


FIG. 4

APPARATUS FOR CONTINUOUS COLD ROLLING

The present invention is related to an improvement in continuous cold rolling apparatus wherein continuous endless rolling is enabled regardless of the relative locations of entry facilities and rolling mills, which relation may vary dependent on the layout of a plant.

In the prior art, coils were cold rolled one at a time which often gave rise to defective products in finished gauge and required slowing down of the rolling speed when the sheets passed through and when they are tailed off. Simultaneously, marks were liable to be caused on the rolls. This resulted in various defects such as increased wear on the rolls and an increase in the number of roll-changes which necessarily accompanied a rise in the manufacturing cost per unit. Apparatus for continuous cold rolling connecting entry facilities with rolling mills with a view to improve work efficiency was accordingly proposed. However, the entry facilities and the rolling mill in this proposed apparatus are aligned in one straight line so that the layout of the plant was often limited.

The present invention has been contrived in order to obviate the above-mentioned defects by providing a direction-changing looper between the entry facilities and rolling mill for changing the direction of the strip. Such an arrangement is useful for connecting the entry facility to the rolling mill when they meet at a right angle or are in parallel to each other. Thus, a continuous and endless rolling in any type of layout of the plant is facilitated.

The present invention will now be described in detail with reference to the accompanying drawings in which:

FIG. 1 shows a diagram depicting one embodiment of the present invention wherein entry facilities and the rolling mill are placed in parallel to each other;

FIG. 2 shows a plan view of the embodiment of FIG. 1;

FIG. 3 illustrates another embodiment wherein entry facilities and the rolling mill are placed at right angles to each other; and

FIG. 4 shows a plan view of the embodiment of FIG. 3.

In the embodiment depicted in FIGS. 1 and 2, the entry facilities (including a looper 17) and the rolling mill are placed in parallel to each other and 1 is a pay-out reel, 2 a coil loading car, 3 a pinch roll, 3*a* a looper pinch roll, 4 a shear, 5 a coil loading skid, 6 a welder, 7 a bridle roll, 8 a loop car, 9 a torque motor, 10 a steering roll, 11 a deflector roll, 12 a roll stand for rolling mills, 13 a speed reducer for rolling mills, 14 a flying shear and 15 a tension reel, respectively.

The entry looper 17 may be a horizontal looper as shown in drawings, a free hanging looper or a looper tower. The direction of the strip movement is changed by a second looper (18) provided between the rolling mill and the entry facilities which includes a pay-out reel 1, a welder 6, and the first looper 17 which is used for strip accumulation, as is well known.

The direction of the strip movement may be changed by a free-hanging looper 18 as shown in drawings. The strip which has come out of the entry facilities is directed toward the rolling mill by the direction-changing looper 18 and is then continuously rolled.

Another embodiment of the present invention is shown in FIGS. 3 and 4, wherein the entry facilities and the rolling mill meet at a right angle to each other. The main driving motor 16 is shown in FIG. 4. The same reference numerals denote corresponding parts in the two embodiments. The horizontal strip accumulating looper of the entry facilities is provided on top of the welder in the embodiment of FIGS. 1 and 2, but on the floor adjacent to the welder in the embodiment of FIGS. 3 and 4. Any type of strip accumulating looper may be used in the entry facility to connect the coils with a welder and the position of the entry strip accumulating looper may also be arbitrary.

As has been described hereinabove, the entry facilities including the pay-out reel, the welder and the strip accumulating looper may be positioned arbitrarily with respect to the rolling equipment, i.e. aligned in a straight line, positioned in parallel, or meet at a right angle, and the direction of the strip is changed freely by the direction-changing looper and fed into the rolling mill so that an improved and effective continuous, endless rolling is facilitated without being limited in any way by the layout of the plant.

What we claim:

1. In a continuous cold rolling apparatus comprising:
entry facilities including means for paying out a metal strip; and
a plurality of tandem rolling stands for continuously rolling said strip;
the improvement comprising:
a free-hanging looper interposed between said entry facilities and said rolling stands and including means for receiving a strip from said entry facilities, means for forming a free hanging loop of said strip and for then changing the direction of said received strip, and means for then feeding said strip to said rolling stands.

2. Apparatus according to claim 1 wherein said entry facilities and said rolling stands are located at right angles to each other.

3. Apparatus according to claim 1 wherein said entry facilities and said rolling stands are located in parallel to each other and are spaced from each other in the longitudinal directions thereof.

4. Apparatus according to claim 1 wherein said free-hanging looper includes a bridle roll receiving the metal strip from said entry facilities and for paying out said strip in the direction in which it was received; and a pinch roll angularly oriented with respect to said bridle roll and receiving said strip from a direction different from that in which said bridle roll pays out said strip, and for feeding said strip in said different direction, a free-hanging loop of said strip being formed between said bridle roll and said pinch roll.

5. Apparatus according to claim 1 wherein said free-hanging looper includes a bridle roll receiving the metal strip from said entry facilities and for paying out said strip in the direction in which it was received; and a deflector roll receiving said strip from a direction difference from the direction in which said bridle roll pays out said strip, and for feeding said strip in said different direction, a free-hanging loop of said strip being formed between said bridle roll and said deflector roll.

6. Apparatus according to payout 3 wherein said free-hanging looper includes a bridle roll receiving the strip from said entry facility and for feeding out said strip in the direction from which it was received; a pinch roll spaced from said bridle roll and oriented in a

direction different from that of said bridle roll, said pinch roll receiving said strip from said bridle roll in a direction different from the payout direction of said bridle roll and feeding out said strip in said different direction, a free-hanging loop of said strip being formed between said bridle roll and said pinch roll; and a further roll spaced from said pinch roll and oriented in a direction different from the direction of said pinch roll for receiving the strip fed out from said pinch roll and for feeding same in a direction different from the direction in which said strip is fed out from said pinch roll, a free-hanging looper strip being formed between said pinch roll and said further roll.

7. Apparatus according to claim 6 wherein said pinch roll is oriented to feed strip in a direction substantially perpendicular to the feed direction of said bridle roll, and said further roll is oriented to feed strip in a direction substantially perpendicular to the direction of strip feed of said pinch roll.

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