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3,351,299

COIL CAR

Filed Aug. 10, 1966

2 Sheets-Sheet 1

FIG. 1.

<i>Coil Loading Position</i>	<i>Coil Holding Position</i>	<i>Coil Running Position</i>
		

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FIG. 2.

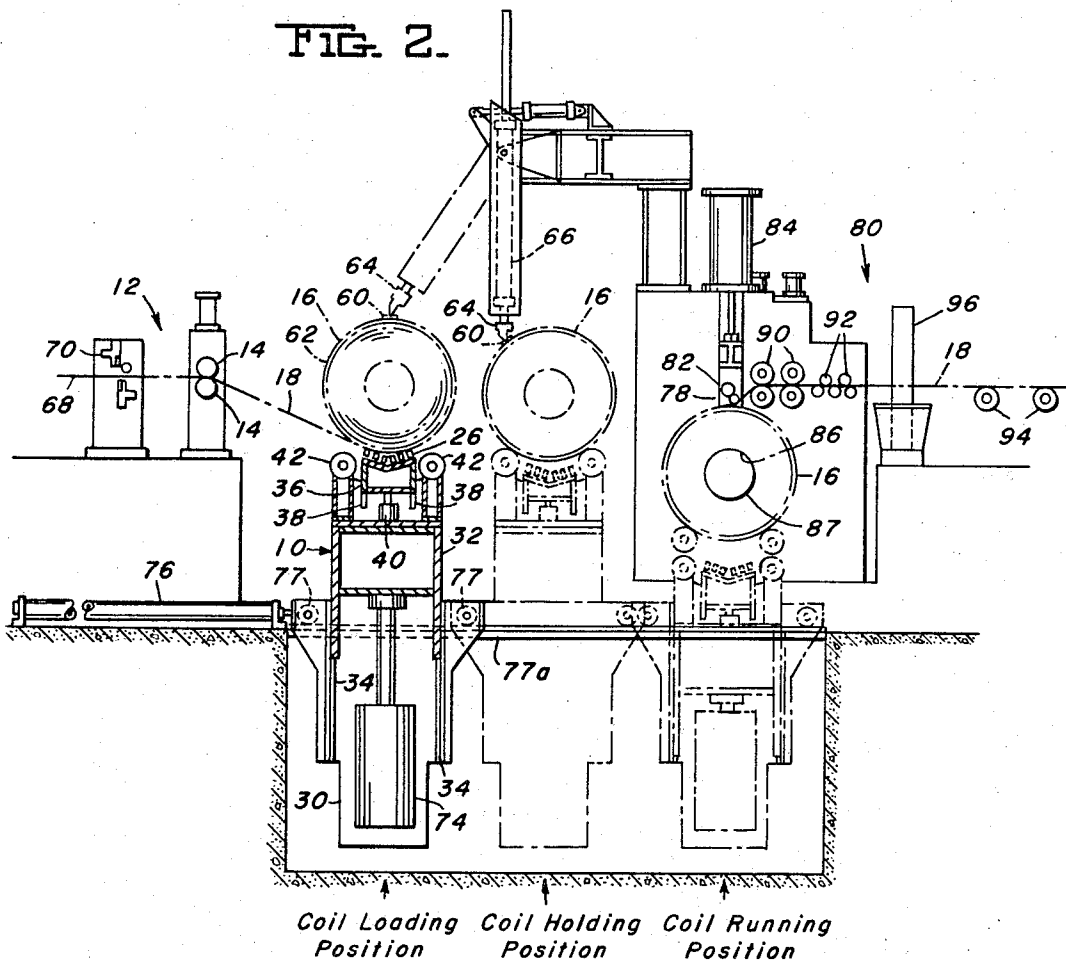
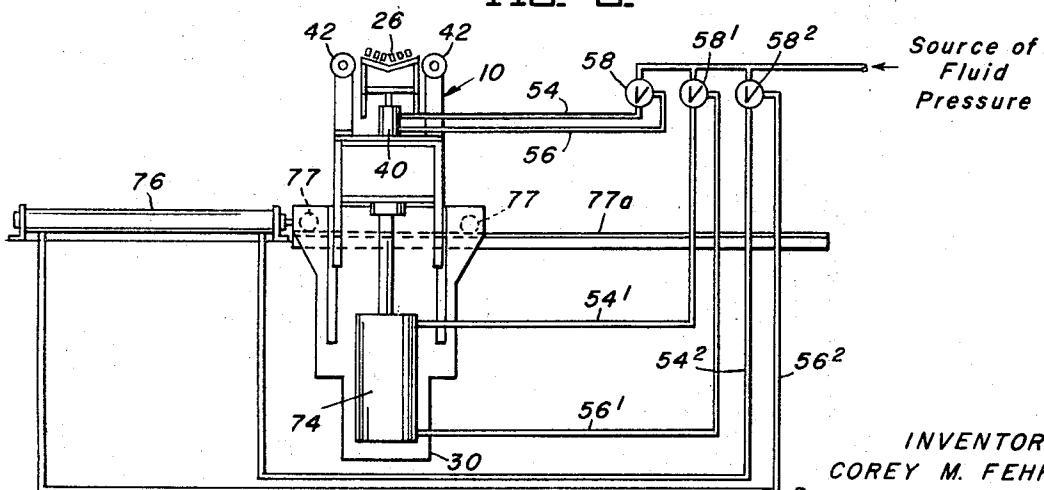


FIG. 3.



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COIL CAR

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This invention relates to coil processing lines, and more particularly to an improved coil transfer car for such a coil processing line.

Heretofore a coil processing line, such as a shear line, pickle line, cold and temper mill line and the like, have utilized a gravity-type conveyor inclined slightly to the horizontal for transferring banded coils from a source, such as a strip mill warehouse, into position against a mechanical stop at the end of the gravity conveyor. Release of the mechanical stop permits the leading coil to gravitate downwardly from the end of the gravity conveyor onto the continuation rolls of a tilting car. While the coil is positioned on the tilting car against an adjustable stop utilized to centralize a coil with respect to an adjacent coil processor, the operator cuts the steel band around the coil preparatory to the dumping of the unbanded coil onto a coil transfer car. At the suitable moment the tilting car and the unbanded coil are rotated through a predetermined angle to cause the unbanded coil to roll off the steel side plate of the tilting car and to fall into the adjacent coil transfer car. This transfer of the unbanded coil causes the heavy coil to land with great force and shock upon the blocker rolls of the coil transfer car, thereby jarring the entire transfer car and causing excessive shock to the gear box and drive associated with the blocker rolls on the top of the coil transfer car. The operator then opens the guides on the processor, withdraws the processor mandrel and elevates the breaker rolls of the processor preparatory for entry of the unbanded coil into the processor. The elevator mechanism of the coil transfer car lowers the unbanded coil to the same elevation as the processor. The coil transfer car then moves the positioned coil into the processor in alignment with the mandrel so that the eye of the unbanded coil registers with the path of movement of the retractable processor mandrel. The mandrel is then positioned within the eye of the coil, the breaker rolls are moved downwardly into position to receive the free end of the coil. At this point the side guides of the processor are also moved into position against the side of the unbanded positioned coil. The blocker rolls are rotated by the blocker roll rotary mechanism on the coil transfer car to move the free end of the coil into position with respect to the breaker rolls of the processor. Thereafter the coil transfer car is lowered to clear the coil positioned on the mandrel and such transfer car is retracted backwardly to the coil receiving position adjacent the tilting car. The free or scrap end of the coil is fed by the pinch rolls through the straightening rolls and open shear onto a table. Thereafter the shear closes and cuts off the free or scrap end.

The disadvantages and defects of such conventional conveying apparatus are utilization of an expensive complicated tilting mechanism and excessive shock load on the coil transfer car itself and the gears and drive for the blocker rolls on the coil transfer car. The scrap and removal operation is performed in the first stage of the coil processing line and the full utilization is not made of strip running time during operation of the particular coil processing line. The operator of the entry portion of the processing line is idle between coil charging operations, and the tilting-dropping transfer of the unbanded coil from the tilting car to the coil transfer car causes shock damage and scratches to the coil itself.

I am aware of the following prior art:

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U.S. Patent Nos. 2,121,388, E. N. Millan, June 21, 1938; 2,267,036, D. A. McArthur, Dec. 23, 1941; 2,388,283, J. A. Porter, Nov. 6, 1945; 2,848,124, D. S. Angell et al., Aug. 19, 1958; 3,218,001, A. M. Gombos, Nov. 16, 1965.

It is the general object of the present invention to avoid and overcome the foregoing and other difficulties of and objections to prior art practices by the provision of an improved coil transfer car which:

- (1) Eliminates the expensive complicated conveyor tilting mechanism;
- (2) Prevents shock damage to the coil transfer car itself and more particularly to the gearing for the rotatable blocker rolls on such coil transfer car;
- (3) Eliminates the scrap end removal operation in the coil processing line, thereby increasing prime strip running time of such coil processing line;
- (4) Utilizes the operators down time to shear the strip and the unbanded coil; and
- (5) Eliminates shock damage and more particularly scratches in the coil itself.

The aforesaid objects of the present invention, and other objects which will become apparent as the description proceeds, are achieved by providing a coil transfer car for a coil processing line having an entry portion for receiving a coil having a free end from a conveyor having a first conveying means and for presenting the free end to the coil processing line. The coil transfer car comprises a main frame, a first frame reciprocable with respect to the main frame, a second conveyor means on the first frame adapted to receive the coil from the first conveying means, and coil rotating means rotatable on the main frame. The second conveying means is operable to move the coil so that the coil rotating means supports the coil and the coil rotating means is operable to rotate the free end into position with respect to the entry portion.

For a better understanding of the present invention reference should be had to the accompanying drawings, wherein like numerals of reference indicate similar parts throughout the several views and wherein:

FIGURE 1 is a plan view of a conveyor, the improved coil transfer car of the present invention, a first coil processing line and a second coil processing line, and showing a coil receiving position, coil holding position and coil running position of the coil transfer car;

FIGURE 2 is a side elevational view of the apparatus shown in FIGURE 1;

FIGURE 3 is a diagrammatic view of the fluid system for operating the second elevator means for reciprocating the second conveyor means; and

FIGURE 4 is a fragmentary enlarged side elevational view of the second frame portion and rollers of the coil transfer car.

Although the principles of the present invention are broadly applicable to the transfer of a coil of rods, wires, sheet or strip both in metallic and non-metallic form, the present invention is particularly adapted for use in conjunction with a coil of metal sheet or strip and hence it has been so illustrated and will be so described.

With specific reference to the form of the present invention illustrated in the drawings and referring particularly to FIGURES 1 and 2, a coil transfer car is indicated generally by the reference numeral 10.

This coil transfer car 10 is utilized in conjunction with a coil processing line 12 indicated in the left hand portions of FIGURES 1 and 2 and having an entry portion, such as the pinch rolls 14. The coil transfer car 10 is adapted to receive a coil 16 (FIGURES 1, 2) of steel sheet 18 (FIGURE 2) from a conveyor, such as the gravity-type conveyor 20 (FIGURE 1). This gravity-type conveyor 20 is provided with a first conveying means,

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such as inclined banks of rollers 22 (FIGURE 1) adapted to move the coils 16 down the rollers 22 and against a pivotable mechanical stop 24 (FIGURE 1).

Movement of the mechanical stop 24 from a vertical position shown in FIGURE 1 to a horizontal position not shown in FIGURE 1 permits the leading coil 16 to roll down the inclined rollers 22 and onto a second conveying means, such as inclined banks of rollers 25 (FIGURES 1, 2, 4) on the coil transfer car 10 and against an adjustable stop 28 mounted on the floor and shown in retracted position in FIGURE 1, which adjustable stop 28 aligns the leading coil 16 with respect to the coil processing line 12.

Referring now to the coil transfer car 10 in detail (FIGURES 1, 2, 4), such coil transfer car 10 is provided with a main frame 30 (FIGURES 1, 3). A first frame 32 (FIGURES 2, 4) is reciprocable with respect to such main frame 30 on guides 34 (FIGURE 2) in the main frame 30. In turn, a second frame 36 (FIGURES 2, 4) is reciprocable with respect to such first frame 32 on guides 38 on the first frame 32. The above-mentioned second conveying means, such as the inclined banks of rollers 26 are mounted on the second frame 36 and are adapted to receive the coil 16 from the inclined banks of rollers 22 of the gravity-type conveyor 20 when such coil transfer car 10 is in the coil loading position shown in FIGURES 1 and 2.

A first elevator means, such as a fluid cylinder 40, (FIGURES 2, 3, 4) is mounted on the first frame 32 and is connected to the second frame 36 which second frame 36 supports the rollers 26. Such fluid cylinder 40 is utilized to reciprocate the second frame 36 and the rollers 26 in a vertical path of movement. A coil rotating means, such as the blocker rolls 42 (FIGURES 2, 3, 4), are rotatably mounted on the first frame 32. Rotating means, such as a coupling 44 (FIGURE 1), speed reducer 46 (FIGURES 1, 4) and reversible motor 48, drive the right hand blocker roll 42 in a rotary direction such that the blocker rolls rotate the coil 16 in either a clockwise or counterclockwise direction as desired when viewed in FIGURE 2.

Referring to FIGURE 3 and the fluid system for actuating the fluid cylinder 40, cylinder 40 is connected by inlet line 54 and outlet line 56 to a manual control valve 58 which in turn is connected to a source of fluid pressure (not shown), such as compressed air or a liquid, such as oil. Operation of the control valve 58 lowers the rollers 26 and the coil 16 carried thereby downwardly, as viewed in FIGURE 2, so that the coil 16 rests on the blocker rolls 42. Thereafter the blocker rolls 42 are operable to rotate the coil 16 so that a buckle 60 (FIGURE 2) on a strap 62 is positioned adjacent the operative path of movement of a coil 16. Preparatory means, such as a chisel 64 (FIGURE 2), is operated by a fluid cylinder 66. Operation of the fluid cylinder 66 by a hydraulic system similar to the hydraulic system shown in FIGURE 3 moves the chisel 64 downwardly, as viewed in FIGURE 2, to sever the buckle 60 from the strap 62 and releases the free scrap end 68 (FIGURE 2) of the coil 16. Thereafter the rollers 42 rotate the free scrap end 68 of the coil 16 in a clockwise direction to position such free scrap end 68 adjacent the pinch rolls 14 of the coil processing line 12 to enable the operator to position such free scrap end 68 between the pinch rolls 14. The pinch rolls 14 drive the free scrap end 68 between and beyond the now open shears 70 until such free scrap end 68 passes beyond the shears 70 (FIGURES 1, 2), whereupon the shears 70, operated by fluid cylinder (not shown), sever the free scrap end 68 from the coil 16. The blocker rollers 42 then retract the free end 68 of the coil 16 preparatory for the next operation.

Alternative embodiments

It will be understood by those skilled in the art that alternatively, as shown in FIGURES 1 and 2, the coil transfer car 10 may be provided with a second elevator

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means, such as the main fluid cylinders 74 (FIGURES 2, 3) mounted on the main frame 30 and connected to the first frame 32 for reciprocating the blocker rollers 42 with respect to such main frame 30. Drive means, such as the fluid cylinder 76 shown in FIGURES 1, 2, 3, is connected to the main frame 30 for moving the coil transfer car 10 having wheels 77 on rails 77a (FIGURES 1, 2, 3) between a coil loading position, a coil holding position and coil running position adjacent to a second coil processing line 80 shown in the right hand portions of FIGURES 1 and 2.

The fluid cylinder 76 is then operable to move the coil transfer car 10 and the coil 16 to the coil holding position. The main fluid cylinders 74 (FIGURES 2, 3) lower the blocker rolls 42 and the coil 16 into vertical alignment with an entry portion 78 (FIGURE 2) of the second coil processing line 80. The blocker rolls 42 rotate the coil 16 and the free end 68 thereof into position with respect to the normal operating position of the now raised breaker rolls 82 (FIGURE 2) of the second coil processing line 80. These breaker rolls 82 are reciprocable in a vertical path of movement, as shown in FIGURE 2, by means of a fluid cylinder 84 adjacent control (not shown).

The horizontal fluid cylinder 76 then moves the coil transfer car 10 and the positioned coil 16 from the coil holding position into the coil running position so that an eye 86 (FIGURE 2) of the coil 16 lines up or registers with a mandrel 87, shown in the running position in FIGURES 1, 2. Such mandrel 87 is operated by motor 88 and is positioned in a reciprocable hydraulic path of movement by a fluid cylinder 89 (FIGURE 1) similar to the fluid cylinders 84, etc. Thereafter the mandrel 87 is moved into the eye 86 of the coil 16 and the fluid cylinder 74 is operable to lower the blocker rolls 42 downwardly away from the coil 16 positioned on the mandrel 87, so that the blocker rolls 42 clear such coil 16 positioned on the mandrel 87. Thereafter the hydraulic fluid cylinder 76 moves the coil transfer car 10 to the left, as viewed in FIGURES 1 and 2, through the coil holding position to the coil loading position. There the fluid cylinder 74 raises the first frame 32 and the blocker rolls 42 carried thereby to the position shown in FIGURE 2, and the fluid cylinder 40 elevates the second frame 36 and the rollers 26 carried thereby above the blocker rolls 42 in line with the inclined banks of rollers 22 on the gravity-type conveyor 20 preparatory for receipt of the next coil 16.

Referring again to the second coil processing line 80 shown in the right hand portions of FIGURES 1 and 2, the breaker rolls 82 are lowered downwardly adjacent to the coil 16 and the operator pushes the free end 68 of such coil 16 between the breaker rolls 82. Rotation of the breaker rolls 82 by a rotating device (not shown) but similar to the drive for the blocker rolls 42, moves the free end 68 of the coil 16 through pulling or pinch rolls 90 (FIGURE 2) into level or straightening rolls 92 and onto a table 94 disposed above a looping pit (not shown), the table having an auxiliary scrap end shear 96 disposed thereon, as shown in FIGURES 1 and 2.

It will also be understood that the conveyor 20 need not be of the gravity type. The rollers 22 and the rollers 26 of the transfer car 10 may be power driven by motors (not shown) similar to the motor 48 and its associated drive. Further a reinforced belt conveyor (not shown) may be employed in lieu of the rollers 22 and the rollers 26.

It will also be recognized by those skilled in the art that the objects of the present invention have been achieved by providing an improved coil transfer car which eliminates the expensive complicated conveyor tilting mechanism, prevents shock damage to the coil transfer car itself and more particularly to the gearing for the rotatable blocker rolls on such coil transfer car,

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eliminates the scrap end removal operation in the coil processing line, thereby increasing prime strip running time of such coil processing line, utilizes the operator's down time to shear the strip and the unbanded coil, and eliminates shock damage and more particularly scratches in the coil itself.

While in accordance with the patent statutes preferred and alternative embodiments of the present invention have been illustrated and described in detail, it is to be particularly understood that the invention is not limited thereto or thereby.

I claim:

1. A coil transfer car for a coil processing line having an entry portion for receiving a coil having a free end from a conveyor having a first conveying means and for presenting said free end to said coil processing line, said coil transfer car comprising:

- (a) a main frame;
- (b) a first frame reciprocable with respect to said main frame;
- (c) a second conveyor means on said first frame adapted to receive said coil from said first conveying means, and
- (d) coil rotating means rotatable on said first frame;
 - (1) said second conveying means being operable to move said coil so that said coil rotating means supports said coil; and
 - (2) said coil rotating means being operable to rotate said free end into position with respect to said entry portion.

2. A coil transfer car for a coil processing line having an entry portion for receiving a coil having a free end from a conveyor having a first conveying means and for presenting said free end to said coil processing line, said coil transfer car comprising:

- (a) a main frame;
- (b) a first frame reciprocable with respect to said main frame;
- (c) a second frame reciprocable with respect to said first frame;
- (d) a second conveyor means on said second frame adapted to receive said coil from said conveyor; and
- (e) coil rotating means rotatable on said first frame;
 - (1) said second conveying means being operable to move said coil so that said coil rotating means supports said coil;
 - (2) said coil rotating means being operable to move said coil into vertical alignment with respect to said entry portion;

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(3) said coil rotating means being operable to rotate said free end into position with respect to said entry portion.

3. The coil transfer car recited in claim 2 wherein said coil transfer car is movable between a coil loading position and a coil holding position.

4. The coil transfer car recited in claim 2 wherein said coil transfer car is movable between a coil loading position and a coil running position.

5. The coil transfer car recited in claim 2 wherein said coil transfer car is movable between a coil loading position, a coil holding position and a coil running position.

6. The coil transfer car recited in claim 2 wherein said coil processing line has pinch roll means for driving said free end.

7. The coil transfer car recited in claim 6 wherein said coil processing line has shear means for removing a scrap portion of said free end.

8. The transfer car recited in claim 6 wherein said coil transfer car moves said coil to a coil running position adjacent a second coil processing line.

9. The coil transfer car recited in claim 8 wherein said coil rotating means rotates said coil and positions said free end with respect to said second processing line.

10. The coil transfer car recited in claim 2 wherein said coil transfer car moves said coil to a coil holding position.

11. The coil transfer car recited in claim 10 in combination with coil preparation means for removing a band from said coil.

12. The coil transfer car recited in claim 11 wherein said coil rotating means moves said coil into vertical alignment with said second processing line.

13. The coil transfer car recited in claim 12 wherein said coil rotating means rotates said free end into position with respect to said second coil processing line.

14. The coil transfer car recited in claim 13 wherein said coil transfer car moves said coil into a coil running position.

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