Oct. 13, 1953 D. E. FEICK 2,655,249

APPARATUS FOR DETECTING COBBLES IN SHEET HANDLING EQUIPMENT

Filed March 30, 1950 2 Sheets-Sheet 1

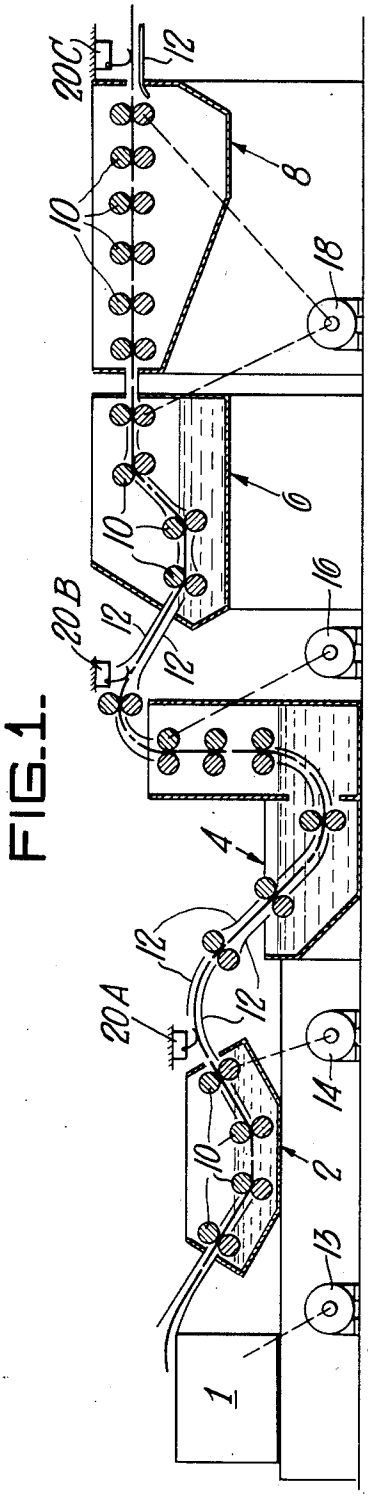


FIG. 1.

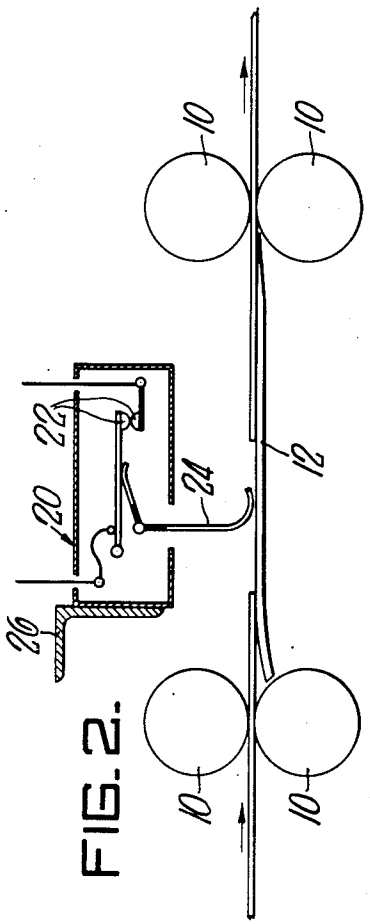


FIG. 2.

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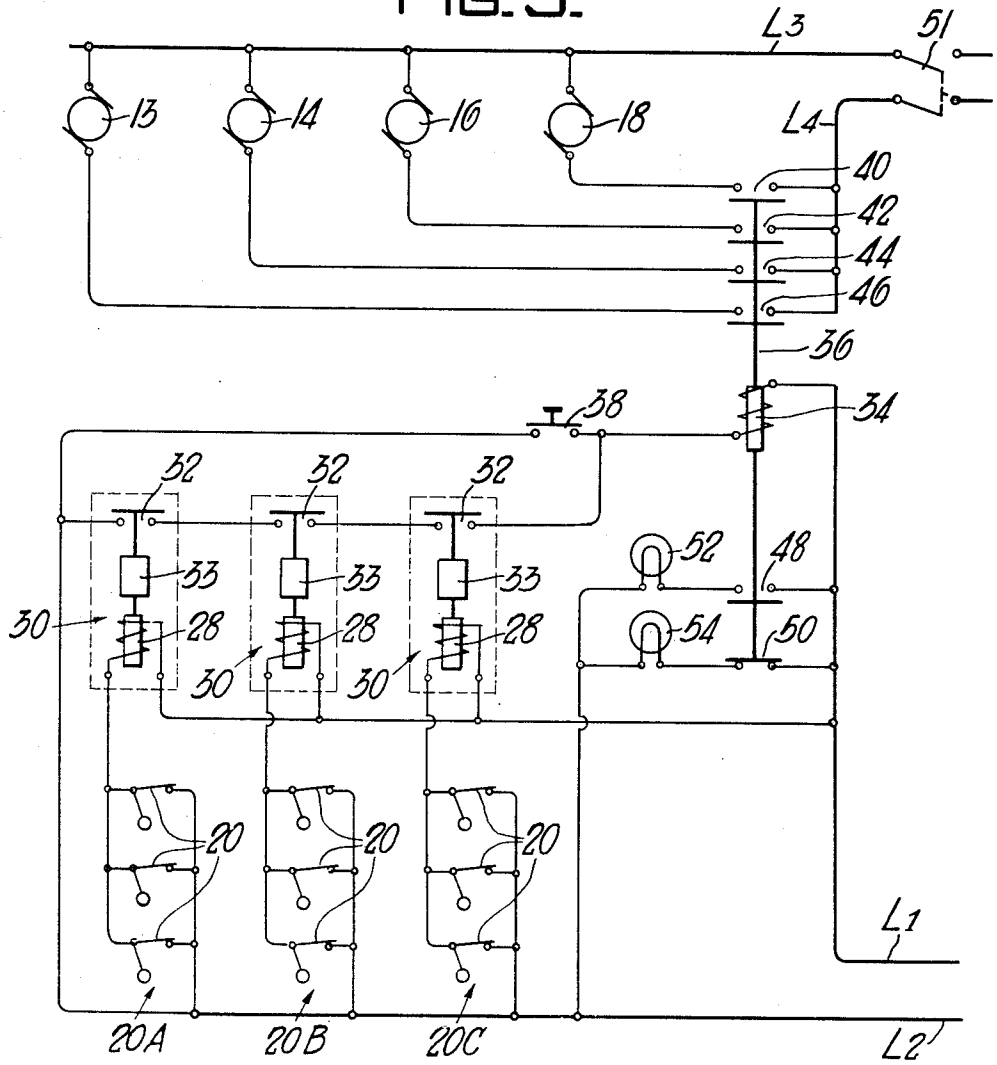
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2 Sheets-Sheet 2

FIG. 3.



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Patented Oct. 13, 1953

2,655,249

UNITED STATES PATENT OFFICE

2,655,249

APPARATUS FOR DETECTING COBBLES IN SHEET HANDLING EQUIPMENT

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Application March 30, 1950, Serial No. 152,942

4 Claims. (Cl. 198—37)

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This invention relates to control equipment for sheet handling apparatus and in particular to electrical control equipment for automatically stopping the apparatus in the event a sheet cobbles therein.

When processing material in sheet form, such as in the manufacture of hot-dip tin plate, a defective sheet will occasionally be fed into the equipment or the guides between conveyor rolls will get out of alignment with the result that a sheet becomes lodged in the equipment interrupting the orderly progress of the material therethrough. Sheets which become lodged are termed "cobbles" and are the source of considerable damaged product and lost time. If the cobble is not immediately detected and the equipment shut down, the jamming of succeeding sheets at the point of obstruction can seriously damage the equipment.

Accordingly it is an object of the present invention to provide an electrical control system for sheet handling equipment which will stop the equipment in response to any interruption in the orderly progress of material therethrough.

Another object is to provide a control system which will detect any interruption in the orderly movement of the sheet material and signal the operator of the condition.

These and other objects will be made apparent in the following specification when read in conjunction with the attached drawings wherein:

Figure 1 is a schematic view of equipment for hot-tinning steel sheets and shows the location of the cobble-detecting stations of my control system;

Figure 2 is an enlarged view of the cobble-detecting means; and

Figure 3 is a wiring diagram showing an operable arrangement of the various parts of my control system.

With particular reference to the drawings, Figure 1 shows an arrangement of conventional processing units for the hot tinning of steel sheets. Only those details necessary to the explanation of the present invention have been shown. It will be assumed that the drawing represents a "three-way" tinning machine, i. e., one which processes three parallel rows of sheets simultaneously. In such apparatus a feeding mechanism 1 is arranged to deliver sets of three sheets abreast which are moved through a pre-treating unit 2, a tinning stack 4, a washer 6 and a branner 8. The finished sheets are received in three separate piles by a piler mechanism, not shown. The rate of feeding is adjusted so that an interval

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of from two to six inches is maintained between consecutive sheets in each row. Each of the units 2, 4, 6 and 8 includes several sets of driven pinch rolls 10 for conveying the sheet material; some of the rolls also performing special functions in connection with the processing steps. Guides 12 of appropriate shape, support and direct the sheets between adjacent sets of rolls. The feeder 1 is driven by a motor 13. The rolls of unit 2 are driven by a motor 14; those of the tinning stack 4 by a motor 16. Motor 18 serves to drive the rolls of both the washer 6 and the branner 8.

In accordance with my invention cobble-detecting means 20 are located adjacent the discharge ends of any of the processing units in which a cobble is likely to occur, e. g., at locations 20A, 20B and 20C of Figure 1. The detecting means 20 may comprise a trigger type limit switch having a pair of contacts 22 operated by a trigger or wand 24. As shown in Figure 2, switch 20 is mounted on a support member 26 which extends transversely of the machine and is positioned so that its trigger 24 is deflected by a moving sheet and returns to its normal position when the sheet passes.

In the present example normally closed switches are used and three switches, one for each row of sheets being processed, are spaced along the support member at each of the detecting stations 20A, 20B and 20C.

As shown in Figure 3, the three switches 20 at each of the detecting stations are connected in parallel to the operating coil 28 of a time relay 30; the resulting circuits being powered from a suitable source L_1 and L_2. The relays 30 each include a pair of normally closed contacts 32 and a timing mechanism 33 which opens the contacts 32 at a predetermined interval after the energization of coil 28. Upon deenergization of this coil, the timing mechanism is immediately reset to zero time and the contacts 32 closed. Such time relays are well known and may take a variety of forms. The time interval is selectable and in the present instance is set to be somewhat longer than the time required for a single sheet to pass a cobble-detecting station. The contacts 32 are connected in series to the operating coil 34 of a control relay 36. A normally open push button type switch 38 is connected in parallel with the contacts 32 and permits relay 36 to be energized independently of relays 30 when needed. Relay 36 includes several sets of normally open contacts 40, 42, 44, 46 and 48, and a pair of normally closed contacts 50. Contacts 40 are connected in cir-

cuit with the motor 18; contacts 42 with the motor 16; contacts 44 with the motor 14 and contacts 46 with the motor 13. The motor circuits are powered from lines L_3—L_4 through a switch 51, and include means, not shown, for synchronizing and regulating motor speeds. Normally open contacts 48 are connected in circuit with a green lamp 52; normally closed contacts 50 with a red lamp 54. The signal lamp circuits are supplied from lines L_1 and L_2.

The control circuit operates in the following fashion: the machine is made ready for operation by closing switch 51. The operator then closes normally open switch 38 which energizes relay 36 to complete the power circuits of the drive motors causing three sheets abreast to be fed into and through the machine at fixed intervals. The switch 38 is maintained closed until sheets are discharged at the end of the machine. During this interval the three lead sheets in each row advance past detecting stations 20A, 20B and 20C, thus initially opening switches 20 to thereby deenergize coils 28, causing contacts 32 to close and timing mechanisms 33 to reset to zero time. As succeeding sheets continue to pass each station the switches 20 are opened and closed at regular intervals, the timing mechanisms 33 of the relays 30 being set in operation with each closing and being reset to zero time with each opening of switches 20. Under these normal conditions of sheet movement, the time during which the switches at any station remain closed is insufficient to cause contacts 32 of the relay 30 associated therewith to open. If, however, a sheet in any row cobbles in any of the units of the machine the switch 20 next in line of travel in that row beyond the cobble will remain closed for more than the preset operating time of its associated relay 30 and the contacts 32 of that relay will open, deenergizing control relay 36 and automatically opening the power circuits of all the drive motors of the machine. Deenergization of relay 36 also opens the circuit to green lamp 52 and closes the circuit to red lamp 54 signalling the operator that a cobbled condition exists.

While I have shown and described a specific embodiment of my invention, I do not wish to be limited exactly thereto except as defined in the appended claims.

I claim:

1. In apparatus for conveying sheet material in orderly succession having conveying means and an electric motor for driving the latter in combination therewith of a control relay having a pair of normally open contacts in circuit with said drive motor, a normally closed limit switch opened and closed by each sheet of said orderly succession in turn, a time relay energized and deenergized by the closing and opening respectively of said switch, said time relay having an adjustable timing mechanism and a pair of contacts in circuit with said motor control relay, said last mentioned contacts being closed upon energization of the time relay and opened by the timing mechanism thereof, said timing mechanism being set in operation by energization of the time relay and reset to zero upon the deenergization thereof, and a manually operated normally open push button switch shunting the contacts of the time relay whereby the motor control relay may be initially operated to establish said orderly succession of sheet material past said limit switch.

2. In apparatus for conveying sheet material in orderly succession having conveying means and an electric motor for driving the latter in combination therewith of a control relay having a pair of normally open contacts in circuit with said drive motor, a normally closed limit switch operable by each sheet of said orderly succession in turn, a time relay controlled by said switch and connected in circuit with said motor control relay, and a manually operated switch shunting said time relay for initially operating said motor control relay.

3. In apparatus for conveying sheet material in orderly succession having conveying means and an electric motor for driving the latter in combination therewith of a control relay having a pair of contacts in circuit with said drive motor, means operable in response to the passage of each sheet in said orderly succession, a time relay controlled by said last mentioned means and in circuit with said motor control relay, and a manually operated switch shunting said time relay for initially operating said motor control relay.

4. In apparatus for conveying sheet material in orderly succession having conveying means and electrically operated means for driving the conveying means in combination therewith of a limit switch operable by each sheet of said orderly succession in turn, a time relay in circuit with the electrically operated driving means to control the latter, and a manually operated switch shunting said time relay for initially operating said driving means.

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