

Aug. 27, 1946.

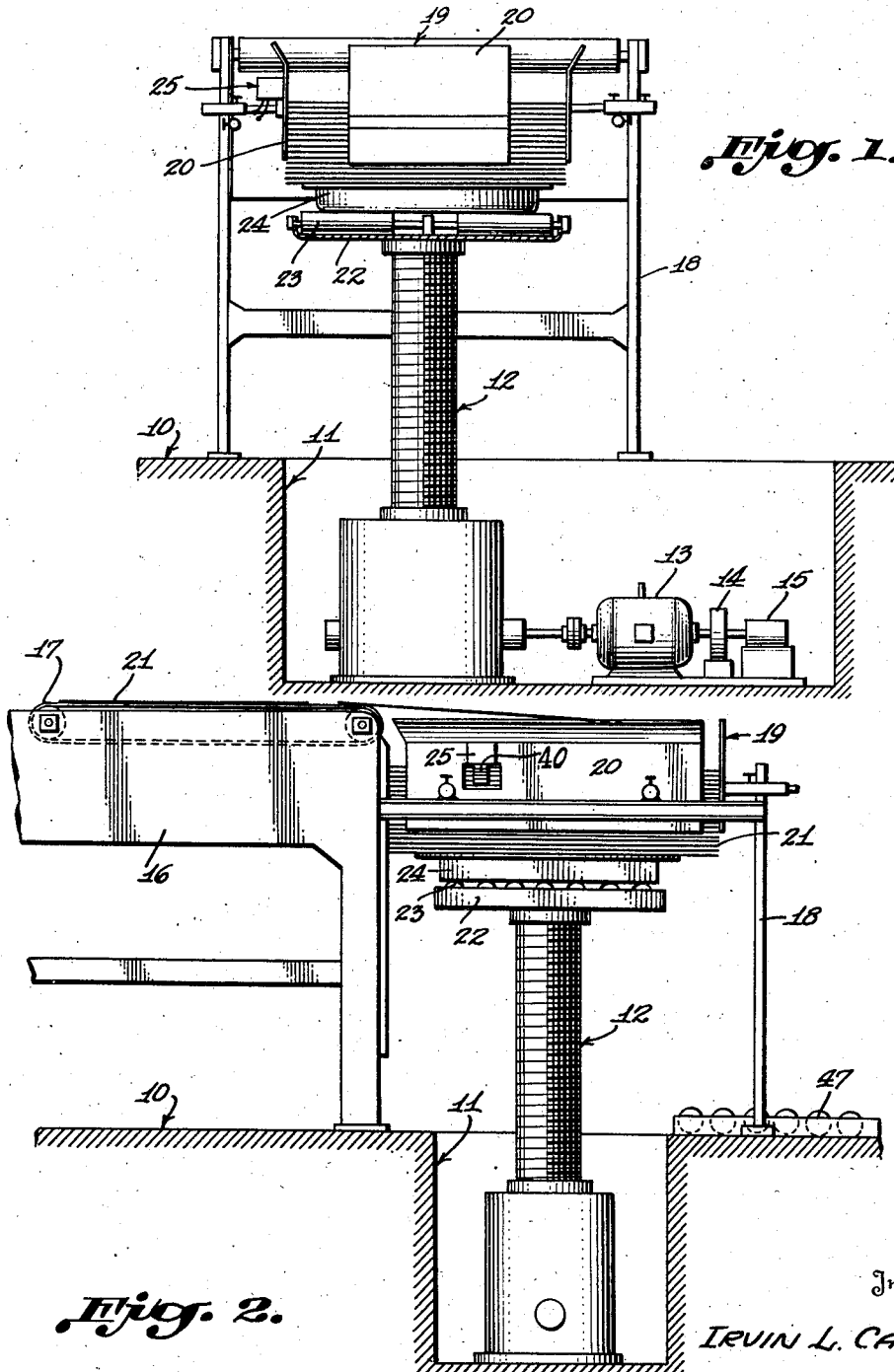
I. L. CASE

2,406,489

MAGNETIC CONTROL

Filed Sept. 30, 1942

2 Sheets-Sheet 1



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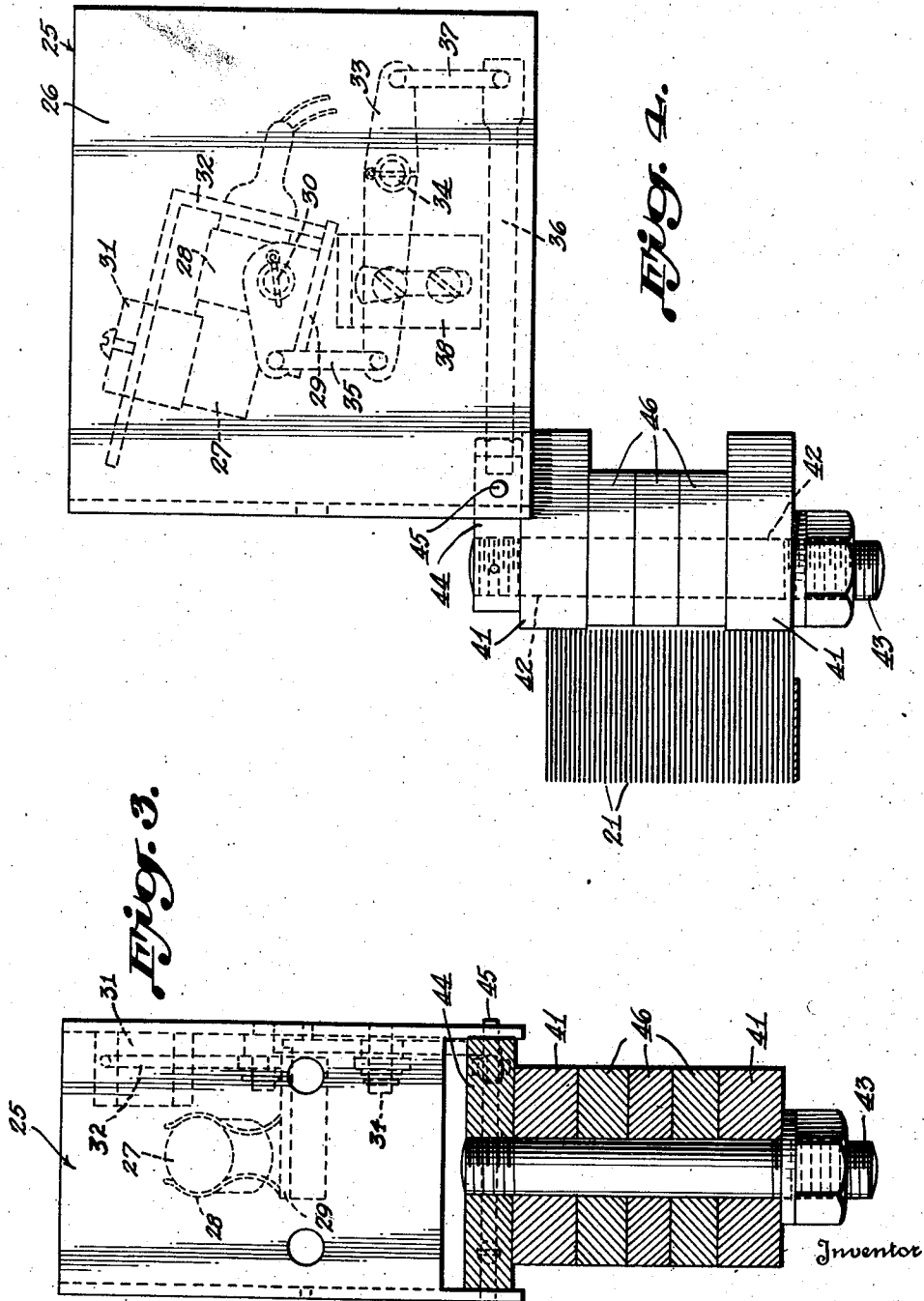
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UNITED STATES PATENT OFFICE

2,406,489

MAGNETIC CONTROL

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10 Claims. (Cl. 271—88)

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This invention relates to a magnetic control device and has particular reference to a device for controlling piling of relatively thin flat products of a magnetic character without scratching or marring their surfaces.

Although the present invention is adapted to use with any magnetic sheet material it is especially adapted for handling tin plate which has a highly polished surface, marring of which depreciates its marketability. Normally in piling tin plate, the tinned sheet comes out of the branner onto a conveyor which delivers the sheets to a point where they are piled onto skids in even stacks and then removed. When a pile is being started, the bottom of the pile is in the neighborhood of the floor and as each sheet is fed onto the pile, the drop from the conveyor belt to the bottom of the pile is so great that the resulting velocity of the sheet often mars the surface of the sheet as it contacts the preceding piled sheet. The present invention contemplates a piler having a lift mechanism so controlled as to keep the top of the stack adjacent the exit side of the conveyor belt whereby the sheets drop a relatively short distance. The present invention further contemplates the provision of means to automatically control the operation of the lift mechanism.

Thus, the principal object of the present invention is to provide a mechanism for controlling movement of a magnetic object.

A further object of the present invention is to control the piling of magnetic sheets.

A further object is to provide a lift mechanism that can be lowered step by step by the deposit of metal sheets thereon.

A still further object of the invention is to provide novel means for automatically controlling the lowering of the lift mechanism.

Other objects of the invention will become apparent to those skilled in the art from the following detailed description of the accompanying drawings which disclose a preferred embodiment of the invention.

In the drawings:

Figure 1 is an end elevational view of a piling apparatus embodying the present invention.

Figure 2 is a side elevational view thereof.

Figure 3 is an end view taken partly in section of the lift control means.

Figure 4 is a side view thereof.

As best shown in Figures 1 and 2, the reference numeral 10 designates generally the floor and 11 the pit for housing the lift mechanism and operating means therefor. The lift mechanism may

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comprise any suitably operated lift and is shown in the present case as comprising a motor operated lift designated by numeral 12. As seen in Figure 1, the operating means comprises motor 13, brake 14 and limit switch 15.

A conveyor table 16 having a conveyor belt 17 suitably mounted thereon is supported on the floor adjacent the pit 11. A frame 18 supporting a piler box 19 straddles the pit 11 and is suitably supported by the table 16 and floor 10. The piler box 19 comprises adjustable walls 20 acting as abutment members for stacking the sheets 21 as they are fed into the piler box from the conveyor belt. The upper end of lift 12 comprises a dished plate member 22 having conveyor rollers 23 suitably mounted therein. A skid member 24 is supported on rollers 23 and receives the stack of plates as they are dropped into the piler box. In the specific embodiment herein described an automatic piler control in the form of a relay is shown at 25, mounted on a wall of the piler box for automatically controlling the operation of the lift mechanism.

The piler control comprises the important part of the present invention and the specific embodiment thereof shown will be described in detail as follows: Referring to Figures 3 and 4 in detail, there is shown a housing 26 suitably secured to a wall of the piler box and having mounted therein a tilting mercury switch 27 connected by suitable wires to motor 13 to operate the motor which in turn operates the lift mechanism. The switch 27 is carried in a holder 28 supported on a tilting arm 29 pivotally secured to a wall of the housing by means of a pivot pin 30. A counterweight 31 is secured to tilting arm 29 through the medium of an arm 32. A lever arm 33 is pivotally secured to a wall of housing 26 by means of a pivot pin 34 and has one end connected to an end of the tilting arm 29 through a link 35. The opposite end of lever arm 33 is connected to a travel arm 36 through link member 37. An adjustable stop 38 is provided to limit the tilting movement of tilting arm 29. Secured to the other end of travel arm 36 is a relay armature generally designated by numeral 40 which makes engagement along its length with the edges of the sheets in the stack through an opening in the wall 20.

The relay armature 40 comprises a pair of permanent magnets 41 having offset openings 42 formed therein to receive a clamping rod 43. The magnets 41 are arranged with the openings 42 reversed with respect to the poles so that there is a magnetic circuit between their ends. The clamping rod 43 is secured to a pivot block 44

which in turn is secured to the travel arm 36. The block 44 is pivotally mounted to housing 25 by means of a pivot pin 45. A plurality of spacer blocks 46 separate the magnets 41 on clamping rod 43. Clamping rod 43, pivot block 44 and spacer blocks 46 are of non-magnetic material. Although the magnets 41 are shown as permanent magnets, obviously any other source for a magnetic circuit could be used.

The operation of the above described apparatus is as follows: At the beginning of the operation, the lift mechanism is brought up to a position adjacent the exit side of the conveyor belt and slightly below the lower magnet of the armature by means of motor 13 which has separate controls (not shown) for raising the lift. Due to the position of pivot 45 with regard to the center of gravity of armature 40, the lower end of armature 40 will swing to the right into inoperative position due to gravity and the magnetic circuit through the ends of the magnets will be through the air. In this position of the armature, the switch 27 will be in its downward position or opposite to the position shown in Figure 4. With the switch in its downward position, the circuit is broken and the lift mechanism remains stationary. As the sheets of tin plate or steel drop into the plier box on plate 24 and piles up to a point adjacent the upper magnet as shown in Figure 4, the presence of this pile of magnetic material furnishes a short path for the magnetic circuit, and due to the tendency of the magnetic lines to contract, the lower magnet is pulled in toward the stack of sheets into operative position. This causes tilting of the mercury switch 27 into its upward position shown in Figure 4, closing the circuit and starting the motor to operate the lift mechanism in a down direction. When the top of the pile has dropped to a point adjacent the lower magnet, the magnetic circuit will again be through the air and the force of gravity will cause the armature to again swing to the right. This operates mercury switch 27 to again break the motor circuit and the brake 14 slows down the lift mechanism at the desired rate to bring the top of the pile to about the height of the bottom of the lower magnet. This procedure is repeated until the piler lift has reached its extreme down position as determined by limit switch 15, in which position the stack of sheets may be slid off rollers 23 onto roller conveyor 47.

Stop 38 defines the two extreme positions of the armature by contact with tilting arm 29 in each extreme position. The armature may or may not, as desired, make engagement with the stack in operative position.

Although the present invention has been specifically described as applied to controlling the stack while piling, it will be apparent that where desired upward movement of the stack itself by the lift may be controlled. Thus when part of the entire stack is removed the lower and remaining part may be raised up to the proper height for continued piling of additional sheets. In such case the armature acts to reverse motor 13 when the stack has passed the proper height and motor 13 then positions the stack properly.

It is to be noted that due to the relative positions and movements of the stack and the armature, the stack intercepts and forms a short path for more magnetic lines of force for a greater part of its downward path than in its effective upward path. This is because the armature in operative position is closer to the stack and having once attained this proximity remains in the same

position until the stack has reached a position in the neighborhood of the lower magnet. On the other hand, once having moved into inoperative position and thus further spaced from the effective path of the stack, the upward path of the stack defined by its increasing height intercepts fewer lines of force and does not present a short path sufficient to pull the armature into operative position until the height of the stack is in the neighborhood of the upper magnet. It is on this phenomenon that the present invention is based.

I claim:

1. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, and magnetic means in magnetic relation with the stack for controlling the operating means in accordance with the height of the stack.

2. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, and magnetic means in magnetic relation coacting with the stack for actuating the operating means to lower the support when the top of the stack reaches a predetermined point.

3. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, and magnetic means in magnetic relation with the stack for actuating the operating means to lower the support a predetermined distance when the top of the stack reaches a predetermined point.

4. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, means for supplying a magnetic circuit including a path through air so positioned that sheets being stacked on the support enter the air path, means associated with the last named means to cause movement of the same toward the stack when a predetermined amount of sheets have entered the air path, and control means actuated by said movement to cause the operating means to lower the support.

5. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, means for supplying a magnetic circuit including a path

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through air so positioned that sheets being stacked on the support enter the air path, means associated with the last named means to cause movement of the same toward the stack when a predetermined amount of sheets have entered the air path, control means actuated by said movement to cause the operating means to lower the support, means for reversing said movement when a predetermined portion of the stack has moved out of the air path, and control means actuated by the reversal of movement to cause the operating means to stop the support.

6. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, an armature movable between inoperative and operative position and normally urged into inoperative position, the armature in operative position being adjacent the top of the stack of sheets, means for maintaining a magnetic circuit carried by the armature, the magnetic circuit acting on the armature to move the same into operative position when the top of the stack of sheets reaches a predetermined point, and control means actuated by the armature in operative position to cause the operating means to lower the support.

7. A piling apparatus for sheets of magnetic material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, an armature movable between inoperative and operative position and normally urged into inoperative position, the armature in operative position being adjacent the top of the stack of sheets, means for maintaining a magnetic circuit carried by the armature, the magnetic circuit acting on the armature to move the same into operative position when the top of the stack of sheets reaches a predetermined point, control means actuated by the armature in operative position to cause the operating means to lower the support, means causing movement of the armature to inoperative position when the stack has been lowered a predetermined distance, and control means actuated by the armature in inoperative position to cause the operating means to stop the support.

8. A piling apparatus for sheets of magnetic

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material comprising sheet feeding means, sheet stacking means positioned to receive sheets from the sheet feeding means, a support for the sheets associated with the stacking means and positioned below the sheet feeding means, a lift mechanism for changing the height of the support, operating means for the lift mechanism, an armature associated with the stacking means and positioned in the neighborhood of the desired height of the stack, the armature including a pair of aligned unlike magnetic poles, vertically spaced and arranged to face in the direction of the stack and be adjacent thereto in operative position, a pivotal support on the armature so located that the lower pole is urged by gravity away from the stack into inoperative position, and control means operative in response to movement of the armature to actuate the lift operating means when the armature is in operative position and deactuate the same when the armature is in inoperative position.

9. A magnetic control comprising an armature including a pair of aligned unlike magnetic poles spaced along a line and presenting a magnetic field, the armature being movable between an operative and an inoperative position, a magnetic object arranged to move along a path, the line and the path being parallel when the armature is in operative position, the line forming an angle with the path when the armature is in inoperative position, supporting means so constructed and arranged as to hold the armature in operative position when more than a predetermined amount of the field is intercepted by the magnetic object and so constructed and arranged as to hold the armature in inoperative position when less than said predetermined amount of field is intercepted by the magnetic object, operating means for moving the magnetic object along the path in a direction to reduce the amount of field intercepted, and control means associated with the armature and the operating means to actuate the operating means when the armature is in operative position and deactuate the operating means when the armature is in inoperative position, the distance between the line and the path when the armature is in inoperative position increasing in the direction of the movement of the magnetic object by the operating means.

10. A magnetic control in accordance with claim 9 in which the magnetic object is a stack of sheets of magnetic material and the operating means is a lift mechanism for changing the height of the top of the stack.

IRVIN L. CASE.

Disclaimer

2,406,489.—*Irvin L. Case*, Steubenville, Ohio. MAGNETIC CONTROL. Patent dated Aug. 27, 1946. Disclaimer filed Nov. 12, 1948, by the assignee, *National Steel Corporation*.

Hereby enters this disclaimer to claims 1 to 7 inclusive.

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