Aug. 4, 1959 D. BUCCICONE 2,897,952

METAL SHEET HANDLING APPARATUS

Filed June 18, 1957 4 Sheets-Sheet 1

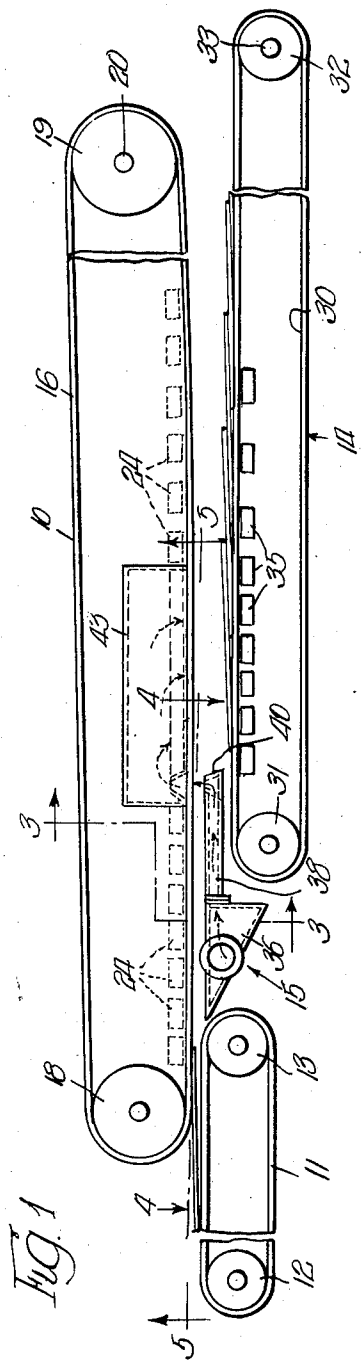


Fig. 1

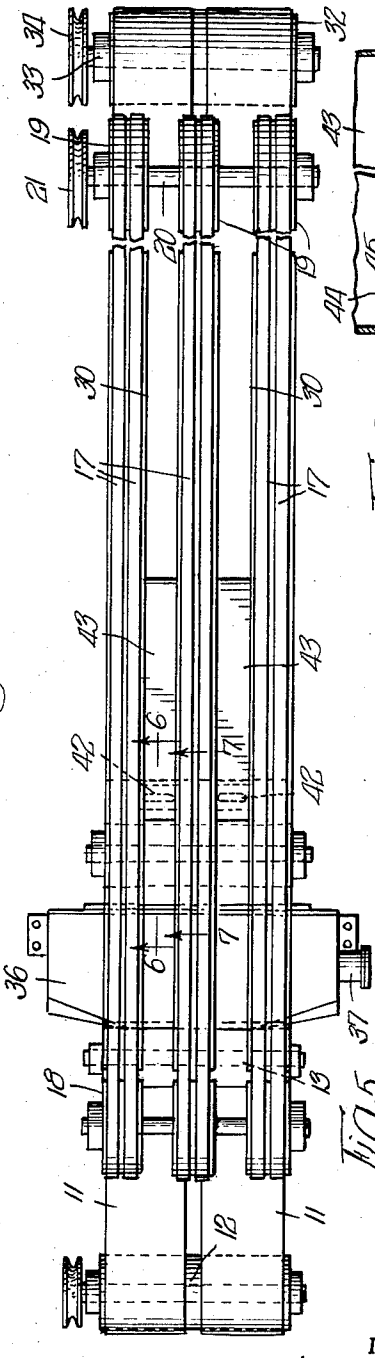


Fig. 2

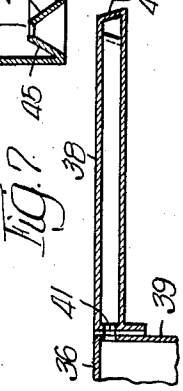


Fig. 7

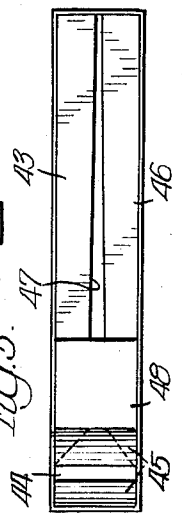


Fig. 5

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METAL SHEET HANDLING APPARATUS

Filed June 18, 1957 4 Sheets-Sheet 2

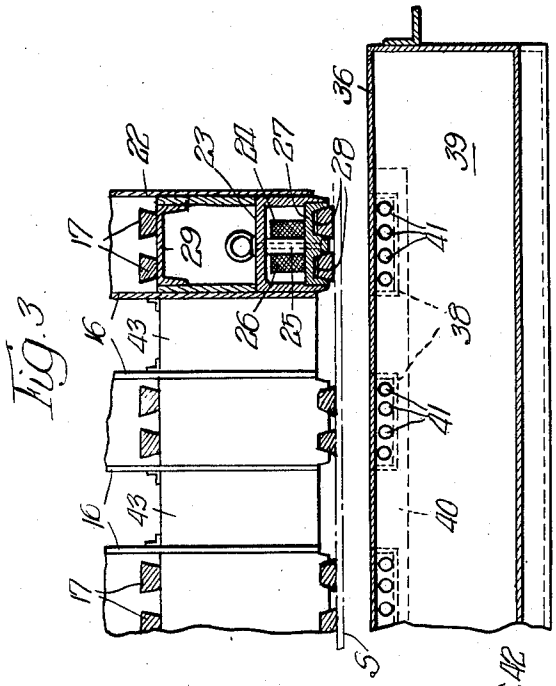


Fig. 3

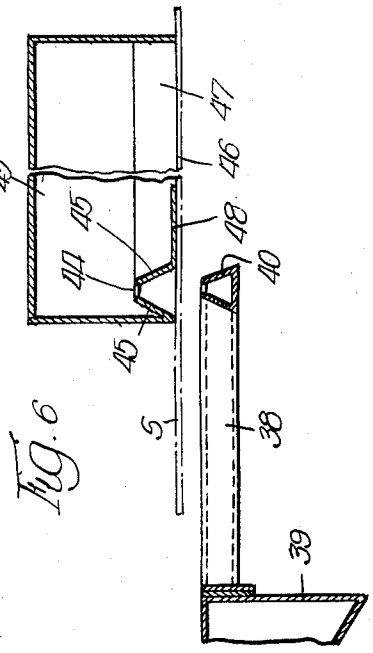


Fig. 6

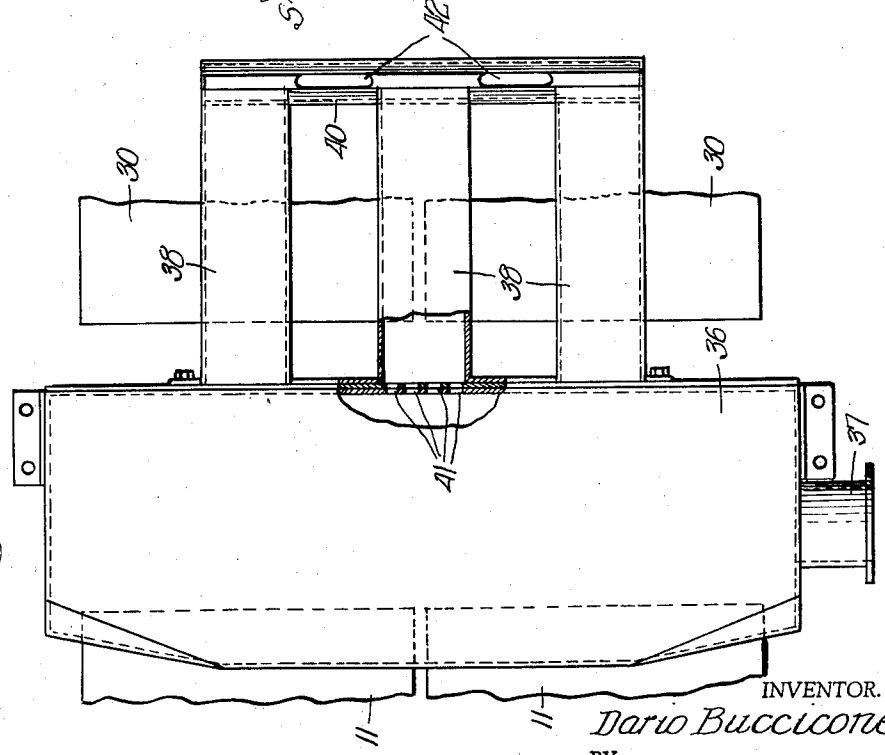


Fig. 4

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METAL SHEET HANDLING APPARATUS

Filed June 18, 1957

4 Sheets-Sheet 3

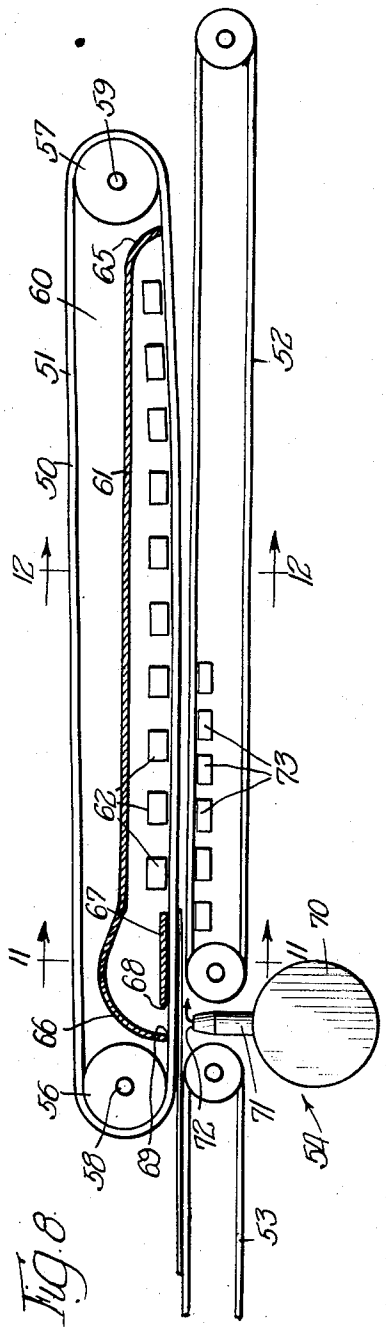


Fig. 8.

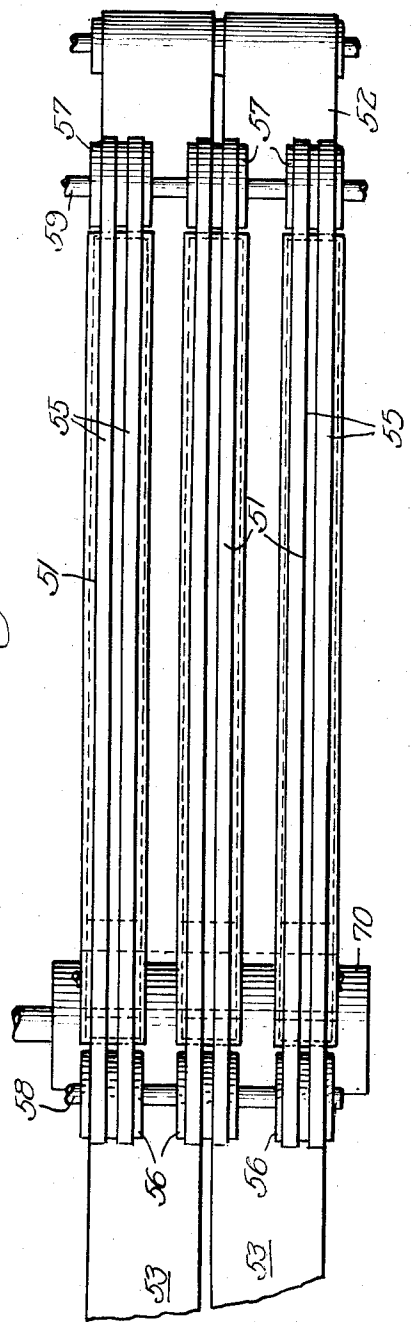


Fig. 9

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METAL SHEET HANDLING APPARATUS

Filed June 18, 1957 4 Sheets-Sheet 4

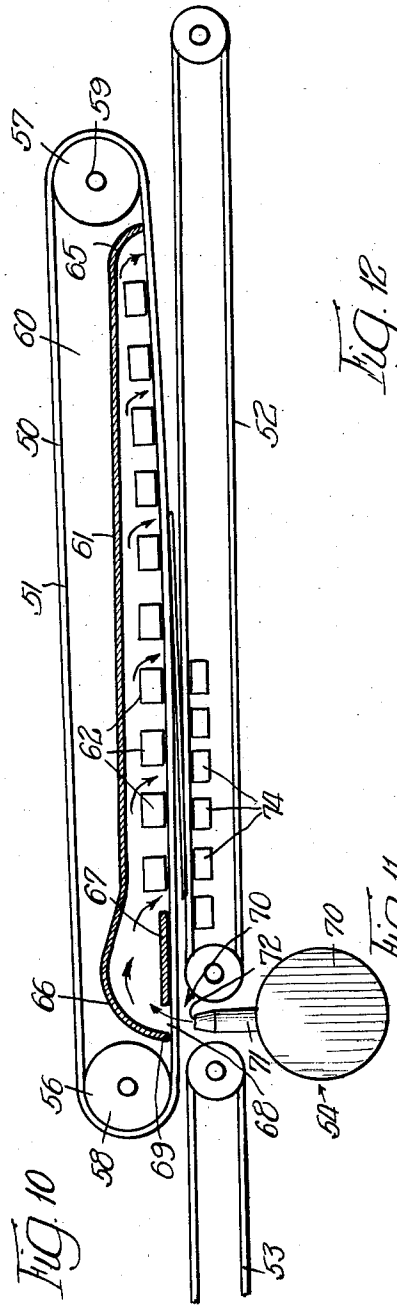


Fig. 10

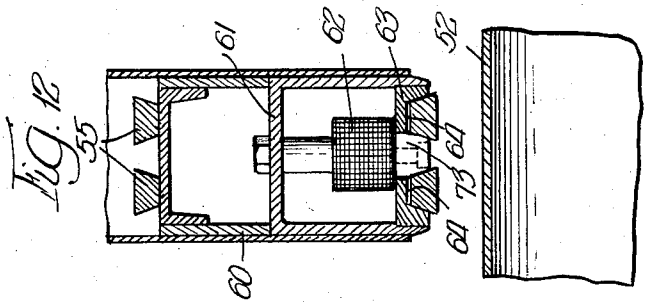


Fig. 12

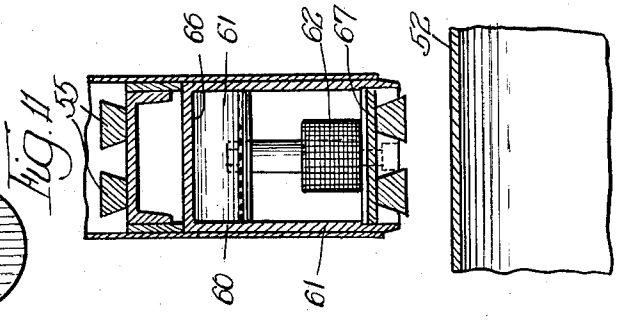


Fig. 11

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METAL SHEET HANDLING APPARATUS

Dario Buccicone, Gary, Ind., assignor to Bucciconi Engineering Company, Inc., Gary, Ind., a corporation of Indiana

Application June 18, 1957, Serial No. 666,385

18 Claims. (Cl. 198—41)

This invention relates to the handling of metal sheets and is more particularly concerned with improvements in a method and mechanism for controlling the transfer of sheets from an overhead magnetic conveyor to a bottom conveyor in a high speed processing line.

In the handling of metal sheets in a processing line conveyor employing electromagnets for holding the sheets against a traveling belt are frequently employed. Conveyors of this type are shown in my Patents Nos. 2,642,174, dated June 16, 1953, and 2,527,911, dated October 31, 1950.

It is the usual practice to control the current delivered to the electromagnets in such conveyors by suitable switching arrangements so that the magnetic force acting on the sheets may be reduced or cut off in order to permit discharge of the sheets from the conveyor. Due to the high speed with which the sheets are delivered by the shear to the processing line, one common conveying arrangement involves delivering the sheets from a fast moving overhead conveyor in the processing line to a slower moving lapping conveyor so that the sheets may be advanced at a lesser rate of speed for deposit in a piling box or for other processing operations. In this arrangement magnet switching problems arise which are difficult to solve satisfactorily. It is a general object of the invention, therefore, to provide an improved method and means for automatically releasing the sheets from an overhead magnetic conveyor for transfer to a bottom conveyor which makes switching control of the electromagnets unnecessary.

It is a more specific object of the invention to provide a sheet handling apparatus wherein the successive sheets are advanced by an overhead magnetic conveyor for delivery to a bottom lapping conveyor aligned beneath the same and wherein provision is made for releasing the sheets from the overhead conveyor and for dropping the sheets onto the lapping conveyor in overlapped relation without permitting any appreciable lateral shifting of the sheets which would result in scratching or otherwise damaging overlapped portions of the sheets.

It is another object of the invention to provide a sheet handling method and apparatus wherein the sheets are transferred from an overhead rail type magnetic conveyor to a bottom lapping conveyor without any need for switching of the magnets in the overhead conveyor, with the sheets being released from the holding influence of the magnets by the pressure of air delivered to the top surface of the successive sheets.

It is a further object of the invention to provide an apparatus for transferring metal sheets from an overhead rail type magnetic conveyor to a bottom lapping conveyor wherein a device is arranged for cooperation with the overhead conveyor which delivers a stream of air upwardly across the path of movement of the sheet so that it is effective to support the sheet until the sheet passes the air stream and thereafter the air is directed onto the top of the sheet with sufficient force to release

the sheet from the influence of the magnets and allow the same to drop onto the bottom lapping conveyor.

These and other objects and advantages of the invention will be apparent from a consideration of the method and apparatus which is shown by way of illustration in the accompanying drawings wherein:

Figure 1 is a side elevation, partially schematic, of a sheet handling apparatus having incorporated therein the principal features of the invention;

Figure 2 is a plan view, with portions broken away, of the apparatus shown in Figure 1;

Figure 3 is a cross section, on an enlarged scale, taken on the line 3—3 of Figure 1, with portions broken away;

Figure 4 is a horizontal section, on an enlarged scale, taken on line 4—4 of Figure 1;

Figure 5 is a horizontal cross section, on an enlarged scale, taken on the line 5—5 of Figure 1;

Figure 6 is a cross section, on an enlarged scale, taken on the line 6—6 of Figure 2;

Figure 7 is a cross section, on an enlarged scale, taken on the line 7—7 of Figure 2;

Figure 8 is a side elevation, partly in section and partly schematic, of a modified form of the apparatus;

Figure 9 is a plan view of the apparatus in Figure 8;

Figure 10 is a view similar to Figure 8;

Figure 11 is a cross section, on an enlarged scale, taken on line 11—11 of Figure 8; and

Figure 12 is a cross section, on an enlarged scale, taken on line 12—12 of Figure 8.

Referring to Figures 1 and 2 of the drawings, there is illustrated an apparatus for handling metal sheets which embodies the principal features of the present invention. In the apparatus shown the sheets S are delivered from a high speed processing line to an overhead magnetic conveyor 10 on a feeding conveyor 11, the latter being positioned at the entrance or receiving end of the conveyor 10 and comprising endless belts supported on the driven pulley 12 and the idler pulley 13. The sheets S are advanced by the overhead conveyor 10 above a bottom lapping conveyor 14 which is arranged with its receiving end spaced somewhat from the delivery end of the feed conveyor 11. The sheets are freed in succession from the overhead conveyor 10 and deposited on the upper run of the bottom lapping conveyor 14 in lapped relation by operation of an air apparatus indicated at 15 which cooperates with the overhead conveyor 10 in the delivery of the sheets S to the lapping conveyor 14.

The overhead conveyor 10 is formed of a plurality of magnetic rail units 16 which are arranged in laterally spaced parallel relation, three of the units being illustrated in the particular arrangement provided. The number of the rail units 16 will depend upon the width of sheet which is to be handled by the machine. The rail units 16 are of the type disclosed in my Patents Nos. 2,527,911 and 2,642,174. Each rail unit 16 comprises a pair of belt members 17 (Figures 1, 2 and 3) arranged on the end pulleys 18 and 19, the former being an idler pulley and the latter being a driven pulley which is mounted on a cross shaft 20 having a drive pulley 21 at the one end thereof for connection with a suitable source of power. The belt carrying pulleys 18 and 19 are supported at opposite ends of the frame 22 of the unit, the latter being of generally rectangular cross section and extending vertically and longitudinally above the bottom conveyor 14. The frame 22 carries a downwardly opening bottom channel 23 which forms a box for the electromagnets 24, each of which comprises a pole piece 25 and a coil 26. A belt guide 27 spans the bottom side of the magnet box 23 and has parallel longitudinally extending recesses 28 in its bottom face for receiving

the belts 17. A top channel 29 supports the return run of the belts. The electromagnets 24 are spaced lengthwise of the box 23 and the coils are connected to a suitable source of current with switch controls being provided for controlling the operation of the electromagnets 24, if desired.

The lower or bottom lapping conveyor 14 is preferably of the broad belt type such as disclosed in my copending application Serial No. 650,180, filed April 2, 1957. It comprises a pair of sheet supporting belts 30 carried on end pulleys 31 and 32 which are suitably mounted on a supporting framework. The pulley 31 at the receiving end is an idler pulley while the pulley 32 at the discharge end is supported on a cross shaft 33 which has a drive pulley 34 mounted at one end for connection to a suitable source of power for driving the conveyor. The conveyor 14 includes a series of longitudinally spaced magnet units indicated at 35 which are supplied with current from a suitable source. The magnets 35 which are adjacent the receiving end of the conveyor 14 are of greater strength and are more closely spaced than the magnets at the discharge end of the conveyor so that the magnetic force acting on the sheets is greatest at the point where they are first dropped onto the conveyor 14 and any shifting of the sheets is avoided.

The air apparatus 15 comprises an air tank 36 which extends transversely of the apparatus between the discharge end of the feed conveyor 11 and the receiving end of the bottom lapping conveyor 14. The tank 36 has an inlet connection at 37 for receiving a pipe or other conduit to connect the same to an air supply (not shown). The tank 36 is provided with conduit forming sections 38 which are of generally rectangular cross section and which extend forwardly from the forward wall 39 of the tank. The tank sections 38 are positioned between the lower run of the belts 17 on the overhead conveyor 10 and the upper run of the bottom lapping conveyor 14 and extend forwardly to a point somewhat beyond the idler roller 31 of the latter. The tubular sections 38 each extend beneath a rail unit 16 of the overhead conveyor 10 and the outer ends of all the sections connect with a hollow cross member 40, the latter having a generally truncated triangular cross section and extending transversely of the apparatus. The forward side wall 39 of the air tank 36 is apertured at 41 (Figure 4) to provide passage for the air from the tank 36 through the sections 38 to the cross member 40. The cross member 40 is provided with two elongate air discharge openings 42 which are located in the space between the center rail unit 16 and the two outside rail units.

The air is delivered across the path of movement of the sheets S and into deflector boxes 43 which are generally rectangular in cross section and which are arranged in the space between the rail units 16 with the one end extending over the cross member 40 as shown in Figure 1. Each deflector box 43 has an air inlet opening 44 in the bottom face which is formed at the end thereof by transversely extending upwardly converging plates 45. The plates 45 have their upper edges spaced to form the air slot or opening 44 through which the air is introduced into the deflector box 43. The deflector box 43 also has a longitudinally extending air discharge opening or slot 46 in the bottom face formed by downwardly inclined or converging plates 47 which are spaced at their lower edges to give the slot 46 a tapered formation in the longitudinal direction. The air outlet slot 46 is closed at the end adjacent the air inlet slot 44 by a bottom apron 48 on the innermost cross plate 45. The air outlet slot 46 is tapered towards the other end of the box 43 so that air delivered into the box through the inlet or end slot 44 is passed out of the box 43 and against the uppermost surface of the sheets S through the outlet or longitudinal slot 46 with the air passage being narrowed down towards the leading end of the sheets so that the air pressure is distributed to apply pressure to the plates S, forcing the same downwardly and releasing them from the influence of the electromagnets 24, less air pressure being needed at the discharge end of the conveyor because of the spacing of the electromagnets.

In operating the apparatus the electromagnets 24 are supplied with current sufficient to produce an electromagnetic force which will attract the sheets S and hold them against the lower run of the belts 17 for advance by the upper conveyor 10 above the bottom lapping conveyor 14. The sheets S are advanced by conveyor 11 to the entrance end of conveyor 10 where they are gripped by the first electromagnets 24. As the leading end of each sheet S passes the slots or openings 42 it interrupts the stream of air delivered from the tank 36 with the result that the air blows against the lowermost face of the sheet and aids in holding the same against the belts 17 on the conveyor 10. As the sheet advances and the trailing edge passes the openings 42, the air is delivered through the inlet openings 44 into the deflector boxes 43 and out through the bottom openings 46 where it impinges on the uppermost surface of the sheet S and applies sufficient pressure on the sheet to force it downward so that it drops onto the bottom conveyor 14. The electromagnets 35 in the bottom conveyor 14 are arranged so that the greatest force is exerted at the receiving end of the conveyor which results in the sheets being instantly pulled by the electromagnets against the belts 30 and held on the upper run of the conveyor without any shifting so as to avoid scratching or otherwise damaging the bottom surface of the sheets as they are deposited in lapped relation on the conveyor 14.

A modified form of apparatus embodying the invention is illustrated in Figures 8 to 12 which is particularly designed to handle the sheets S where it is necessary to arrange the rail units in the overhead conveyor in relatively close proximity. In this form of the apparatus, the upper or overhead conveyor 50 comprises three rail units 51 arranged in parallel laterally spaced relation while the bottom lapping conveyor 52 may be substantially identical with the lapping conveyor 14 in the form of the invention previously described. A feed conveyor 53 is positioned at the receiving end of the conveyors 50 and 52 with the ends of the two conveyors 52 and 53 being spaced a distance sufficient to accommodate an air apparatus 54.

In this form of the apparatus each of the rail units 51 of the upper conveyor 50 is modified to incorporate therein an air deflector means, thereby eliminating the need for separate air deflector boxes. Each of the rail units 51 comprises a pair of belts 55 which are carried on the end pulleys 56 and 57, the latter being supported on cross shafts 58 and 59 which are in turn supported on the main frames 60 of the units. The frame 60 of each conveyor unit 51 carries a downwardly opening magnet box or channel 61 (Figures 8, 10, 11 and 12) in which a series of electromagnets 62 are mounted in longitudinally spaced relation. A belt guide 63 forms the lower face of the frame 60 and is provided with longitudinally extending parallel recesses 64 to receive the belts 55.

The magnet box 61 of each conveyor unit 51 is closed at the discharge end of the conveyor by a curved end portion 65 and at the receiving end of the conveyor by the curved end portion 66. The first electromagnet 62 in the box 61 is spaced from the leading end of the unit a sufficient distance to accommodate a horizontally extending deflector plate 67 which is arranged so that it provides an air inlet slot or opening 68 between its trailing or rearmost edge and the rear bottom edge 69 of the end portion 66 of the magnet box 61 for receiving air delivered by the air apparatus 54 into the box 61. The air apparatus 54 comprises a tank 70 and upwardly extending conduits 71 which are aligned with the conveyor rail units 51 and which have to top nozzle or discharge opening 72 positioned below the air inlet slot 63 in the bottom

face of the box 61 in each of the rail units 51 of the conveyor 50. The box 61 has openings 73 in its bottom face between the electromagnets 62 for discharge of the air downwardly toward the conveyor 52. Preferably these openings decrease in size toward the leading end of the conveyor 52.

The bottom lapping conveyor 52 is provided with the electromagnet units 74 which are arranged in the same manner as in the bottom lapping conveyor 14 previously described with the greater magnet power being provided at the entrance end of the conveyor to insure that there is sufficient magnetic force exerted on the sheets as they are dropped onto the top run of the conveyor 52 to hold the same against shifting.

In operation, the sheets S are delivered to the overhead conveyor 50 by the feed conveyor 53 and the passage of the leading edge of each successive sheet over the nozzles 72 cuts off the stream of air into the magnet boxes 61 in the conveyor rail units 51 and the air blows against the lowermost surface of the sheet (Figure 8) which holds the sheet against the belts 55 until it reaches the first of the magnets 62. As the sheet advances the air aids the electromagnets 62 in holding the sheets in contact with the belts 55. As the trailing end of each successive sheet passes the nozzles 72 (Figure 10) the air is delivered into the magnet boxes 61 at the ends 66 of the rail units 51 and the pressure of the air is exerted downwardly against the uppermost face of the sheet S which has passed the air apparatus 54. This results in the sheet being pulled downwardly away from the influence of the electromagnets 62 for deposit on the lapping conveyor 52.

In both forms of the apparatus which are disclosed, the electromagnets in the overhead conveyor are provided with sufficient current to produce a magnetic force which is operative on the sheets to hold the sheets to the conveyor belts but which is not strong enough to hold the sheets against the force of the air when the trailing end of the sheet is moved past the air delivery apparatus and the stream of air is directed into the deflector boxes and caused to impinge upon the uppermost surface of the sheet. If desired, a switching arrangement may be employed with the electromagnets in the overhead conveyor to shut off the magnetic force and release the sheets and the air may be employed as a supplemental force operating on the top surfaces of the sheets. Ordinarily, the use of the air will eliminate the necessity for any switching control on the electromagnets. The air apparatus may be incorporated in other electromagnetic conveying arrangements which do not involve the use of a lapping conveyor.

While particular materials and specific details of construction have been referred to in describing the illustrated forms of the invention, it will be understood that other materials and variations in the details of the apparatus employed may be resorted to.

I claim:

1. A method of handling sheets of magnetic material in a continuous processing line, which comprises delivering successive sheets in a generally horizontal path to a horizontally disposed overhead magnetic conveyor, delivering a stream of air upwardly across the path of movement of the sheets and deflecting the stream of air downwardly against the top surface of each successive sheet as the trailing end of the sheet passes the stream of air and reaches a position in advance thereof for depositing the same on a surface beneath the magnetic conveyor whereby to force the sheet downwardly for release by the magnetic conveyor.

2. A method of handling sheets of magnetic material in a continuous processing line, which comprises advancing successive sheets in a generally horizontal path to a horizontally disposed overhead magnetic conveyor, directing a stream of air upwardly toward the overhead conveyor, advancing successive sheets across the upward stream of air and to a position beyond the stream of air for depositing the same on a surface beneath the magnetic conveyor and deflecting the stream of air when the sheet has passed the same onto predetermined portions of the top surface of the sheet to force the same downwardly for release by the magnetic conveyor at the position for depositing the same on said surface.

3. In apparatus for handling metal sheets, a bottom sheet receiving conveyor, an overhead magnetic conveyor extending in aligned relation above the bottom conveyor for delivering sheets to a position above the bottom conveyor for release thereon, an air device at the entrance end of the bottom conveyor having means for delivering a stream of air upwardly across the path of travel of the sheets, and means associated with the overhead conveyor for deflecting the air downwardly against the top surface of the sheet when the sheet has passed through the stream of air whereby to exert downward pressure on the sheet and thereby release the same from the overhead conveyor.

4. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor extending above the bottom conveyor for delivering sheets to the bottom conveyor, an air tank at the entrance end of the bottom conveyor having an upwardly opening discharge aperture for delivering a stream of air across the path of travel of the sheets, and means forming air deflector compartments associated with the overhead conveyor and having downwardly opening receiving and discharge apertures, said air receiving aperture being positioned above the discharge aperture in the air tank and said discharge apertures extending along the overhead conveyor whereby to permit the air to exert downward pressure on the sheet to release the same from the overhead conveyor when the trailing end of the sheet has advanced beyond the discharge opening in said air tank.

5. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor extending above the bottom conveyor for advancing successive sheets to a position for deposit on the latter, an air supply device at the entrance end of the bottom conveyor having an upwardly opening discharge aperture for delivering a stream of air across the path of travel of the sheets, and means forming air deflector compartments positioned adjacent said overhead conveyor and having downwardly opening receiving and discharge apertures, said air receiving aperture being positioned above the discharge aperture of the air supply device and said discharge apertures extending along the overhead conveyor whereby to cause the air to strike the top surfaces of the sheets and exert downward pressure on the sheets when the trailing ends thereof have advanced beyond the discharge opening of said air supply device.

6. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor comprising a plurality of laterally spaced rail units extending above the bottom conveyor for advancing successive sheets to a position for release on the bottom conveyor, an air device between the opposed runs of the conveyors having an upwardly opening discharge aperture for delivering a stream of air across the path of travel of the sheets, and means forming air deflector compartments positioned between the rail units of the overhead conveyor and having downwardly opening receiving and discharge apertures, said air receiving apertures being positioned to receive air from the discharge aperture in the air device and said discharge apertures extending along the overhead conveyor units whereby to cause the air to strike the top surfaces of successive sheets and exert downward pressure on the sheets for releasing the same from the overhead conveyor when the trailing ends of the sheets have advanced beyond the discharge opening in said air device.

7. In apparatus for handling metal sheets, a bottom lapping conveyor, an overhead magnetic conveyor extending in vertically aligned relation above the lapping conveyor for delivering sheets to a position above the

lapping conveyor for release thereon, an air tank at the entrance end of the lapping conveyor having an upwardly directed air discharge means for delivering a stream of air across the path of travel of the sheets, and means forming air deflector compartments associated with the overhead conveyor and having downwardly opening air receiving and discharge apertures, said air receiving apertures being positioned to receive air from the air tank and said discharge apertures extending along the overhead conveyor whereby to cause the air to exert downward pressure on the sheet to release the same from the overhead conveyor when the trailing end of the sheet has advanced beyond the discharge means in said air tank.

8. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor comprising a plurality of relatively narrow laterally spaced elongate conveyor units extending above the bottom conveyor for advancing successive sheets to a position for release on the bottom conveyor, an air device between the opposed runs of the bottom and overhead conveyors having an upwardly opening discharge aperture for delivering a stream of air across the path of travel of the sheets, and means forming air deflector compartments associated with the overhead conveyor units and having openings forming air receiving and discharge apertures, said air receiving apertures being positioned to receive air from the discharge aperture in the air device and said air discharge apertures extending along the overhead conveyor units whereby to direct the air against the top surfaces of successive sheets and exert downward pressure on the sheets for releasing the same from the overhead conveyor when the trailing ends of the sheets have advanced beyond the discharge opening in said air device.

9. In apparatus as recited in claim 8 and said air discharge apertures decreasing in size toward the leading end of the overhead conveyor.

10. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor having a series of laterally spaced relatively narrow elongate conveyor units extending above the bottom conveyor for delivering sheets to a position for deposit on the bottom conveyor, an air supply device adjacent the entrance end of the bottom conveyor having means for delivering a stream of air upwardly across the path of travel of the sheets, and means forming air deflector compartments in the overhead conveyor units, said means having air receiving and discharge apertures, said air receiving aperture being positioned to receive the air from the supply device and said discharge apertures extending along the overhead conveyor units whereby the air is deflected downwardly from said compartments against the top of the sheet to force the same downwardly from the overhead conveyor when the trailing end of the sheet has advanced beyond the stream of air from said supply device.

11. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor extending above the said bottom conveyor for delivering sheets to a position for release on said bottom conveyor, said overhead conveyor comprising an elongate downwardly opening box for receiving therein longitudinally spaced magnets and a traveling belt having the lower sheet engaging run traveling below the magnets, means covering the lower face of said box and having air receiving and discharge openings therein, an air supply device adjacent the entrance end of the bottom conveyor having an opening for delivering a stream of air upwardly across the path of travel of the sheets, said overhead conveyor being positioned with its air receiving opening above the opening in the air supply device and with the air discharge openings extending along said bottom conveyor whereby to cause the air to exert downward pressure on the sheet to release the same from the overhead conveyor magnets when the trailing end of the sheet has advanced beyond the opening in said air supply device.

12. In apparatus for handling metal sheets, a bottom conveyor, an overhead magnetic conveyor extending in vertically aligned relation above the bottom conveyor for delivering sheets to a position for deposit on the bottom conveyor, said overhead conveyor comprising a series of relatively narrow elongate conveyor units arranged in parallel laterally spaced relation, an air supply device adjacent the entrance end of the bottom conveyor having a discharge aperture for delivering a stream of air upwardly across the path of travel of the sheets, and compartment forming boxes arranged between the units of said overhead conveyor and having air receiving and discharge apertures, said air receiving aperture being positioned for receiving the air from the supply device and said discharge apertures extending along the bottom faces of said boxes whereby to cause the air to strike the top surfaces of the sheets and force the same from the overhead conveyor when the trailing ends of the sheets have advanced beyond the discharge aperture of said air supply device.

13. In apparatus for handling metal sheets, an overhead magnetic conveyor unit comprising an elongate downwardly opening compartment forming magnet box having a series of electromagnets mounted in longitudinally spaced relation therein, a sheet carrying belt and a guide shoe for said belt closing the bottom face of said magnet box, an air receiving aperture at the trailing end of said magnet box and a series of air discharge apertures spaced along said guide shoe, an air supply device adjacent the entrance end of said conveyor unit having an aperture for delivering a stream of air across the path of travel of the sheets and into the air receiving opening in said magnet box whereby to direct the air onto the upper surface of the sheet to release the same from the influence of the magnets when the trailing end of the sheet has advanced beyond the opening in said air supply device.

14. In apparatus for handling sheets of magnetic material wherein the sheets are advanced in a generally horizontal plane while held against the lower run of a traveling belt by electromagnetic force, a magnetic rail type conveyor unit which comprises a magnet box having its ends closed and a belt guiding shoe in the lower face thereof, a belt traveling in said guide shoe, a series of electromagnets in said box for exerting electromagnetic force on a sheet engaged with the lower face of said belt, said belt guide having an air receiving opening at the entrance end of said unit and air discharge openings spaced therefrom in the direction of advance of said belt.

15. A sheet handling apparatus comprising an overhead conveyor having sheet engaging traveling belts and electromagnets arranged to hold the sheets against the belts, one or more air deflector boxes associated with the conveyor and having openings for receiving air adjacent the trailing end thereof and for discharging the air downwardly against the sheets in areas in advance of the same, and an air supply device for delivering air across the path of travel of the sheets and into an air receiving opening in each deflector box.

16. A sheet handling apparatus comprising an overhead conveyor having laterally spaced endless belts and electromagnets arranged to hold the sheets against the lower faces of the belts, means forming air deflector boxes arranged between the belts with air discharge apertures opening downwardly along the same, the air discharge apertures being arranged to deflect the air against the uppermost surfaces of the sheets for forcing them downwardly away from the pull of the electromagnets and means to deliver air to the deflector boxes in timed relation to the movement of the sheets.

17. A sheet handling apparatus comprising an overhead conveyor having a sheet engaging traveling belt and electromagnets arranged to hold a sheet against the belt, an air deflector box associated with the conveyor and having an opening for receiving air adjacent the trail-

ing end thereof and for discharging the air downwardly against the top surface of the sheet thereby forcing the sheet downwardly away from the pull of the electromagnets, and an air supply device for delivering air upwardly across the path of travel of the sheet as it advances beneath said traveling belt and into the air receiving opening at the trailing end of the deflector box.

18. A sheet handling apparatus comprising an overhead conveyor having a sheet engaging traveling belt and electromagnets arranged to hold a sheet against the belt, means to direct a stream of air upwardly toward the belt at the receiving end thereof so as to strike against the bottom surface of a sheet as it advances beneath the electromagnets thereby to hold the sheet against the belt, and means to deflect the stream of air downwardly against the top surface of the sheet when the trailing end of the sheet advances beyond the upwardly directed stream of air thereby to force the sheet downwardly away from the pull of the electromagnets.

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2,312,357	Odquist	Mar. 2, 1943
2,642,174	Buccicone	June 16, 1953

FOREIGN PATENTS

750,824	Great Britain	June 20, 1956