Nov. 1, 1949 D. BUCCICONE 2,486,733

MAGNETIC CONVEYER FOR SHEET PILERS

Filed April 21, 1945 4 Sheets-Sheet 1

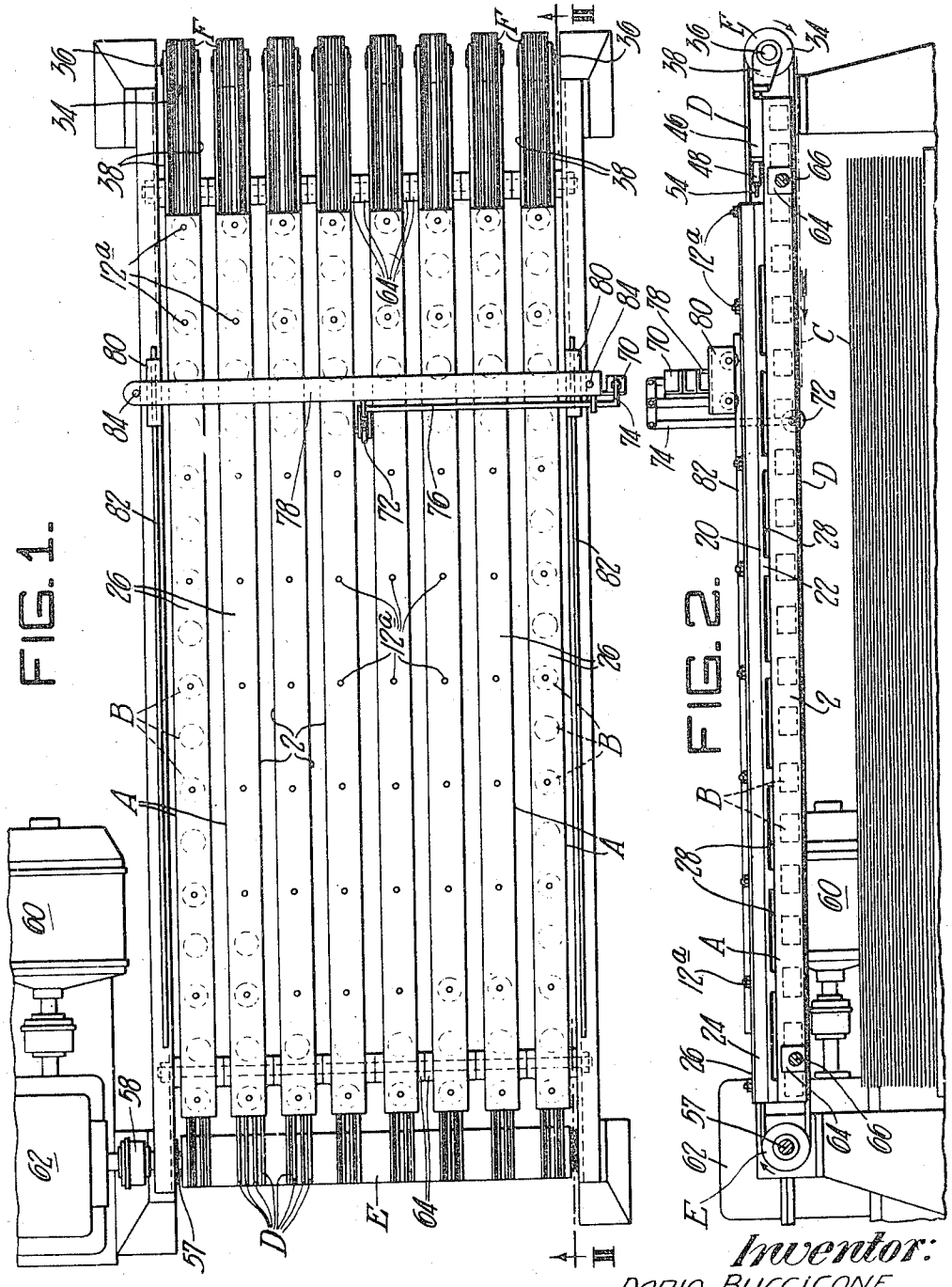

FIG. 1.

FIG. 2.

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Nov. 1, 1949 D. BUCCICONE 2,486,733

MAGNETIC CONVEYER FOR SHEET PILERS

Filed April 21, 1945 4 Sheets-Sheet 2

FIG. 3.

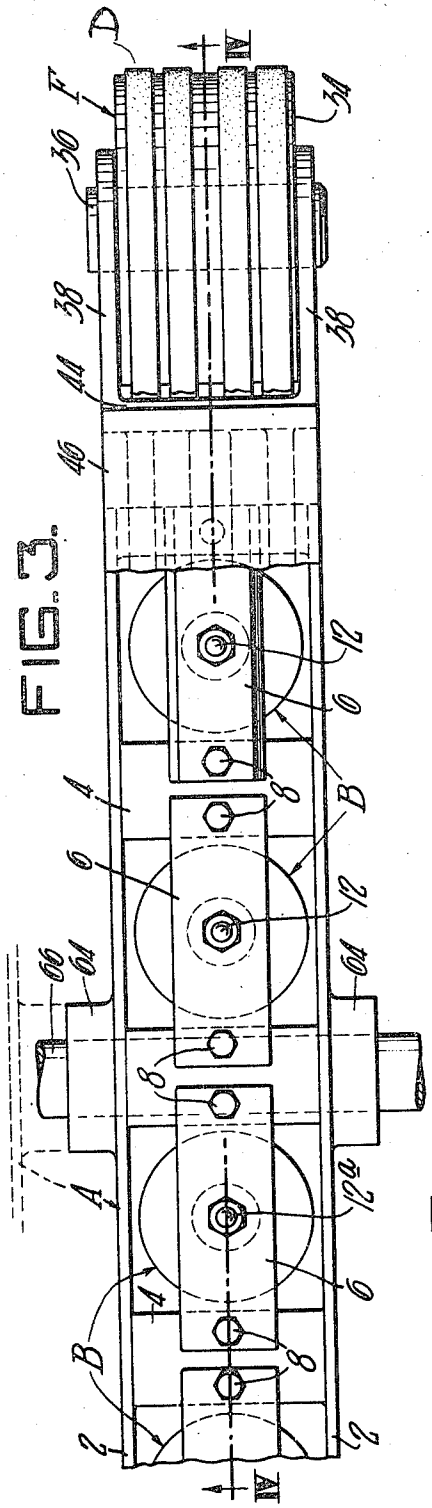
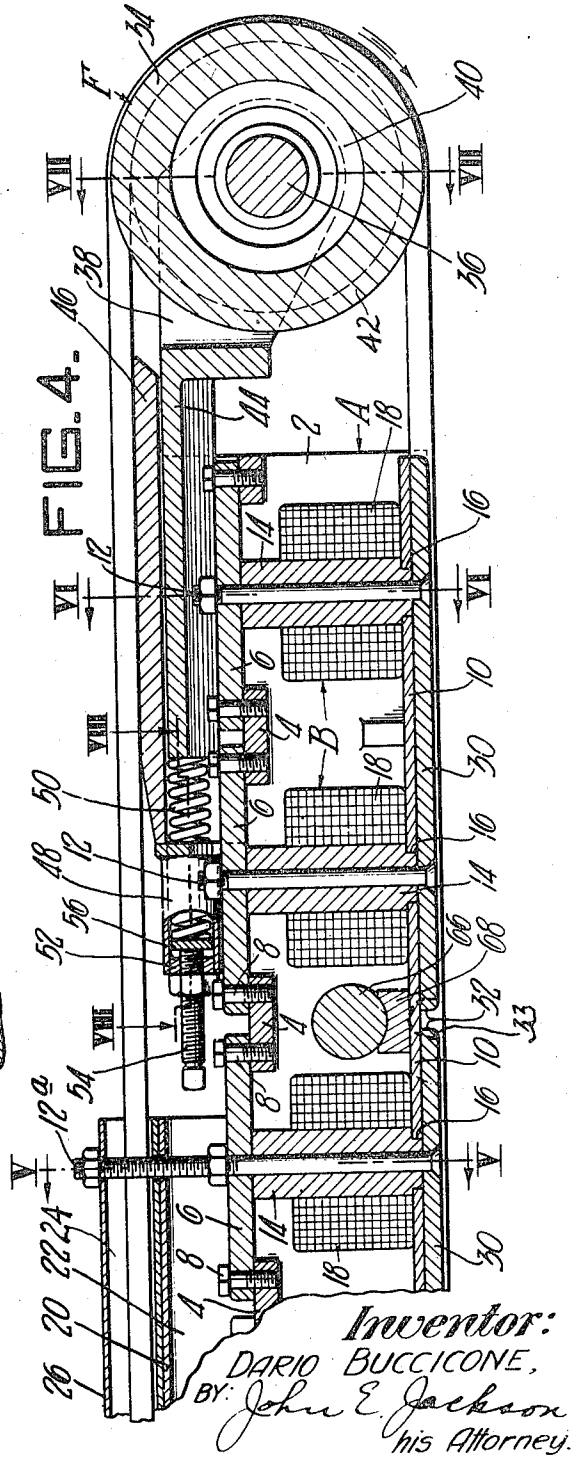


FIG. 4.



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MAGNETIC CONVEYER FOR SHEET PILERS

Filed April 21, 1945 4 Sheets-Sheet 3

FIG. 5.

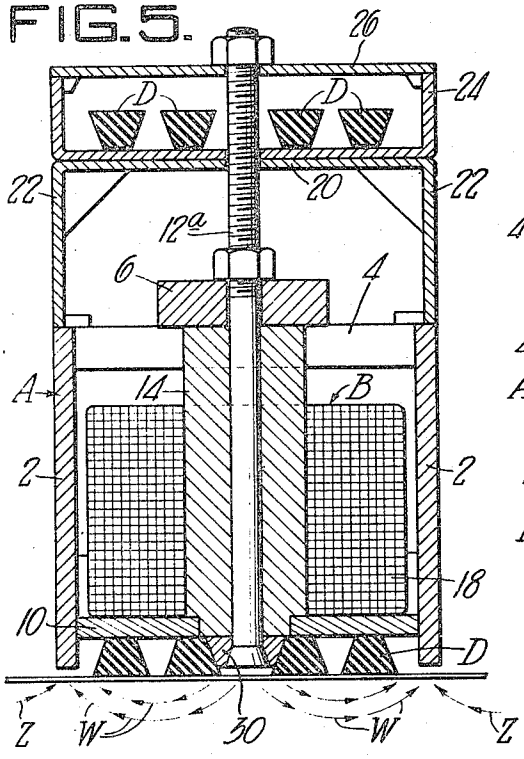


FIG. 6.

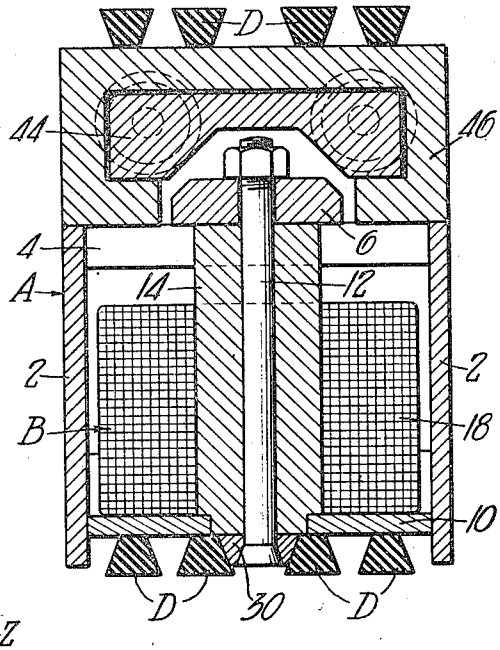


FIG. 7.

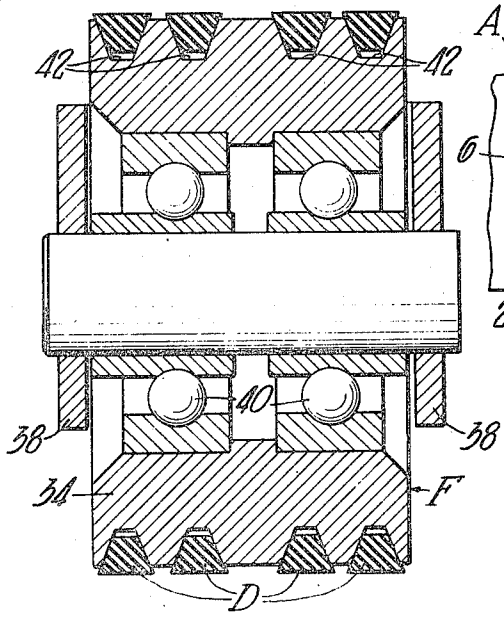
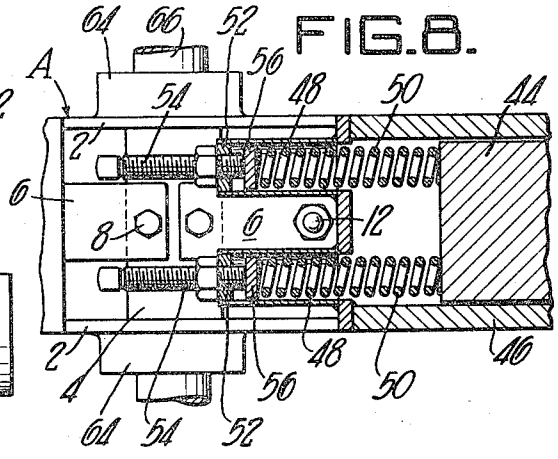


FIG. 8.



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MAGNETIC CONVEYER FOR SHEET PILERS

Filed April 21, 1945 4 Sheets-Sheet 4

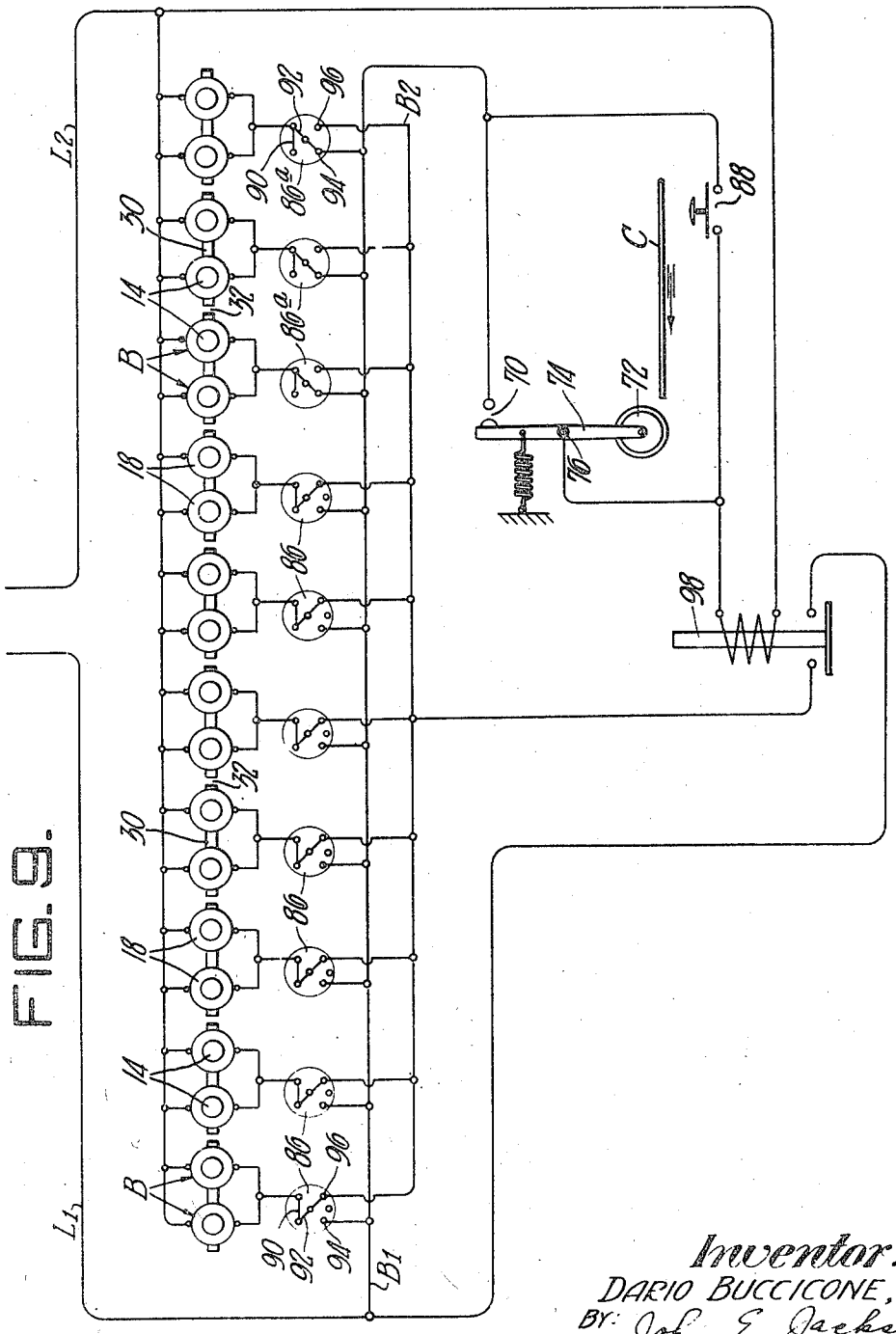

FIG. 9.

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UNITED STATES PATENT OFFICE

2,486,733

MAGNETIC CONVEYER FOR SHEET PILERS

Dario Buccicone, Gary, Ind.

Application April 21, 1945, Serial No. 589,572

14 Claims. (Cl. 198—41)

1

This invention relates to improvements in apparatus for conveying and piling metallic sheets and more particularly to sheet pilers or conveyors employing magnetic attraction.

In my copending application, Serial No. 462,997, issued as Patent No. 2,374,174, I have shown a magnetic piler comprising movable belts arranged below two rows of magnets with a non-magnetic shoe interposed between the belts and the magnets. This arrangement is satisfactory for light sheets but it is not suitable for piling thick gauge, heavy sheets and the construction thereof is not readily adaptable to sheets of various widths and gauges. In the present invention, I have provided a piler composed of unitary rail sections which is adaptable to a wide variety of shapes and sheet widths. Also the piler of this invention embodies an arrangement having magnetic side pieces or poles which provide transverse sharply defined zones of flux that permit more efficient and rapid piling of heavy sheets.

It is an object of the present invention to provide a magnetic sheet piler or conveyor which will satisfactorily pile large heavy steel sheets.

It is another object to provide a magnetic sheet piler or conveyor which will pile large heavy steel sheets without scratching or marring the same.

It is a further object to provide a magnetic piler or conveyor which will pile steel sheets rapidly and efficiently.

It is a still further object to provide a magnetic piler or conveyor which is flexible in operation and can be used for handling a wide variety of shapes and sizes.

It is another further object to provide an improved manner of constructing and assembling the magnets and the mountings therefor.

The foregoing and further objects will be apparent from the specification and drawings, wherein:

Figure 1 is a plan of my improved magnetic conveyor;

Figure 2 is a longitudinal section on line II—II of Figure 1;

Figure 3 is a top view of a portion of the conveyor with the cover portion removed therefrom;

Figure 4 is an enlarged partial longitudinal section on line IV—IV of Figure 3;

Figure 5 is a vertical section on line V—V of Figure 4;

Figure 6 is a sectional view on line VI—VI of Figure 4;

Figure 7 is a section on line VII—VII of Figure 4;

2

Figure 8 is a part sectional plan on line VIII—VIII of Figure 4; and

Figure 9 is a wiring diagram.

Referring more particularly to the drawings, the improved magnetic piler of my invention comprises a suitable number of longitudinally extending rails A having a plurality of vertically disposed electro-magnets B therein for attracting and holding steel sheets C against narrow V-belts D which are carried by driven sheaves E and idler sheaves F. Each of rails A has vertically disposed side plates 2 which extend substantially the full length of the rail and are spaced apart the desired distance by transversely spaced tie plates 4, as is shown in Figure 3. Bridge plates 6 span the gaps between tie plates 4 and are secured thereto by cap screws 8. The primary purpose of bridge plates 6 is to provide means for retaining the assembled parts of the magnets B in position, as described in detail hereinafter.

A brass support plate 10 extending substantially the full length of the rails A is suspended from bridge plate 6 by bolts 12 so as to be disposed between the lower ends of sides 2. Mounted around the bolts 12 are circular cores 14, the lower ends of which are turned down to provide a tight fit with holes in plate 10 as at 16. The cores 14 are shown as solid, but it is of course understood that laminated cores may be used if desired. Magnet wire windings 18 surround the cores 14 within the rail assembly and rest upon the upper surface of plate 10. Thus the cores 14 and bolts 12 maintain the windings 18 loosely but concentrically between the side plates 2. Certain of the bolts 12, designated 12^a, extend upwardly above the bridge plate 6 to hold a cover 20 thereon. The cover 20 is composed of a lower inverted U-shaped section 22, an upper U-shaped section 24 and a cover plate 26. Suitably spaced apertures 28 may be provided in the cover member 20 to provide space for connecting suitable wiring to the magnet windings. The upper section 24 provides a support for the upper strand of the belts D.

Hollow and inverted truncated retainer guides 30 are carried by the keeper bolts 12 and 12^a below brass support plate 10. The interior of these guides is machined to fit fairly closely the heads and shanks of the bolts 12 and 12^a. The truncated or conical exterior provides a guiding surface for some of the V-belts D. The length of the guides 30 is such that each guide retains or supports only two magnets in position, as is shown more clearly in Figure 4. Since the guides 30 and bolts 12^a are composed of steel they form

a continuation of the cores 14. A space 32 is provided between the ends of adjacent guides 30 to provide a definite and positive air gap therebetween. This is done to establish progressively definite transverse zones of magnetic force along the length of the rail assembly which are definitely limited into prescribed zones as hereinafter described. Moreover they are capable of being collectively adjusted to suit various sizes and types of sheets. To enhance the zoning effect, notches 33 may be placed in the side rails in transverse alignment with the gaps 32.

Each rail A has an idler sheave pulley 34 mounted on shaft 36 carried by bracket 38 secured to the entry end of the rail. Preferably anti-friction bearings 40 are disposed between the shaft 36 and pulley 34. Suitable grooves 42 are provided in the pulleys to receive belts D.

As is shown in Figure 4, the bracket 38 is slidably mounted on rail A to permit adjustment of belts D by properly positioning the bracket and sheave carried thereby. Bracket 38 has a rearwardly extending arm 44 which is reciprocably arranged in an integral shoe 46 in the end of the rail A. Sleeves 48 are provided at the rearward end of shoe 46 for receiving a pair of compression springs 50. Integral end piece 52 of sleeve 48 is tapped to receive an adjusting screw 54 which can be rotated to force follower 56 inwardly and thereby adjust the compression of springs 50, and thereby force the bracket 38 outwardly to properly tension belts D.

At the opposite end of the rails, there is arranged a shaft 57 extending across the assembled rails which has suitably spaced grooves to provide sheaves E. Shaft 57 is connected by a flexible coupling 58 to a variable speed electric motor 60 through a gear reduction unit 62.

The side frame 2 of the rails A are provided with lugs 64 adjacent the ends thereof which are bored transversely of the rail to permit tie rods 66 to be passed therethrough and hold the desired number of rails in assembled position. The lugs 64 serve as spacing elements to maintain equal spacing between the rail sections and parallel relationship therebetween. Rests 68 may be provided under the tie rods to prevent distortion of the rail structures as a result of drawing the same together.

A limit switch 70 for controlling the energization of certain of the magnets is mounted on one side of the rail assembly at a spaced distance from the entry end thereof. The limit switch 70 is actuated by contact of a sheet being transferred with wheel 72 mounted below the rail assembly. A portion of the wheel 72 extends downwardly into the path of sheets being carried by the conveyor and is linked to the switch 70 by linkage 74 and shaft 76. Shaft 76 and wheel 72 are suspended from a cross member 78 mounted on buggy 80 for movement longitudinally of the rail assembly on rails 82 on the upper and outer sides of the rail assembly. Clamp bolts 84 are provided for locking the buggy 80 in the desired position.

As is shown in the wiring diagram, which only shows connections to one rail for the sake of simplicity, each pair of magnets may be individually controlled by hand switches 86. It also appears from the wiring diagram that closing of the switch 70 by a sheet contacting the wheel 72 energizes all of the magnets rearwardly of the wheel. Thus when a sheet moves past the wheel, the switch opens to deenergize the magnets to the rear of the wheel thereby allowing such sheet to drop from the conveyor. There is also provided

a master switch 88, which can be manually or automatically closed to energize all of the magnets even though switch 70 is open so that defective sheets can be conveyed past the regular pile into a reject pile. By reason of the manual switches 86, only sufficient magnets need be used to adequately handle various sizes and weights of sheets. It is noted that the magnets to the right or entry side of the limit switch operating wheel 72 are always energized when the conveyor is in operation.

Referring more particularly to the wiring diagram, it is seen that one terminal of all of the magnet windings in a rail are connected to line L2 connected to a suitable source of power. The other terminals are all connected to joint contacts 90 of switches 86 and 86a and coacting switch arm 92. The other end of switch arm 92 is adapted to contact either of two contacts 94 and 96, contacts 94 being connected to branch B1 of line L1 and contacts 96 to line B2 which is connected to line L1 by operation of switch 70 or master switch 88, either of which operates relay 98 to close its associated contacts. Switches 86 have a neutral or off position so that certain of the magnets may be kept deenergized if desired.

As is indicated in Figure 5 of the drawings, three separate magnetic poles are established by the two side pieces 2, which act as side poles, and the retainer guide member 30, which acts as an inner pole, each of which extends downwardly below the support plate 10 a distance which is slightly less than the thickness of belts D. All of the magnets in an individual rail are energized with the same polarity so that flux flows between the center of each magnet and retainer 30 to the side pieces or magnetic poles 2, as is shown by arrows W. This condition is present in successive transverse zones established by the spaced pairs of magnets throughout the length of the rail to establish the distinct magnetic zones hereinbefore referred to. In addition the magnets of adjoining rails are energized with reversed polarity so that the magnets of one set of alternate rails are all positive and the magnets of intermediate rails are all negative. As a result, flux will also flow between the side of plates of adjoining rails, as indicated by arrows Z in Figure 5. This enhances the lifting power of the magnets and also aids materially in establishing the longitudinally spaced transverse zones.

In operation, a sheet C discharged from a shear conveyor or the like so that it is attracted by the first three pairs of magnets which are constantly energized and pulled thereby against the moving belts D which carry the sheet into post switch wheel 72. This closes switch 70 and relay 98 and energizes the rearward magnets until the sheet is carried past the wheel 72 to permit switch 70 to open. This deenergizes the rearward magnets beyond wheel 72 and permits sheet C to drop therefrom. In case it is desired to carry a defective sheet beyond the regular release point, manual switch 88 may be closed to keep the magnets energized after switch 70 has opened.

While I have shown and described one specific embodiment of my invention, it will be understood that this embodiment is merely for the purpose of illustration and description and that various other forms may be devised within the scope of my invention, as defined in the appended claims.

I claim:

1. Apparatus for conveying magnetic material, comprising a support, said support having longitudinally extending magnetic side frames, a plu-

rality of magnetic coils mounted between said magnetic side frames, means for causing magnetic flux from said coils to flow in well-defined longitudinally spaced transverse zones, said means comprising a longitudinally aligned extending magnetic members beneath said magnetic coils and at least one movable belt positioned below said coils, said magnetic members having an air gap between the ends thereof.

2. Apparatus for conveying magnetic material, comprising a support, said support having longitudinally extending magnetic side frames, a plurality of magnetic coils mounted between said magnetic side frames, said coils having like polarity, means for causing magnetic flux from said coils to flow in well-defined longitudinally spaced transverse zones, a plurality of longitudinally extending magnetic members beneath said magnetic coils, said magnetic members having an air gap between the ends thereof and at least one movable belt positioned below said coils.

3. Apparatus for conveying magnetic material, comprising a support, said support having longitudinally extending magnetic side frames, a longitudinally extending non-magnetic bottom member between said side frames, a plurality of magnetic coils mounted above said non-magnetic member, means for causing magnetic flux from said coils to flow into well-defined longitudinally spaced transverse zones, said means comprising a plurality of longitudinally extending magnetic members beneath said non-magnetic member, said magnetic members having an air gap between the ends thereof and at least one movable belt having a face below said last mentioned member.

4. Apparatus for conveying magnetic material, comprising a support, said support having vertically disposed longitudinally extending magnetic side frames, a non-magnetic bottom member between said side frames, a plurality of magnetic coils mounted above said non-magnetic member, means for causing magnetic flux from said coils to flow in well-defined longitudinally spaced transverse zones, said means comprising a plurality of longitudinally aligned magnetic members beneath said non-magnetic member, said last mentioned members having an air gap between the ends thereof and at least one movable belt having a face below said last mentioned members.

5. Apparatus for conveying magnetic material, comprising a support, said support having vertically disposed longitudinally extending magnetic side frames, a non-magnetic bottom member between said side frames, a plurality of magnetic coils mounted above said non-magnetic member, said coils having like polarity, means for causing magnetic flux from said coils to flow in well-defined longitudinally spaced transverse zones, said means comprising a plurality of longitudinally aligned magnetic members beneath said non-magnetic member, said last mentioned members having an air gap between the ends thereof and at least one movable belt having a face below said last mentioned members.

6. Apparatus for conveying magnetic material, comprising a rail member, said rail member having spaced parallel magnetic side frames, a non-magnetic plate member between said side frames and extending substantially the full length thereof, a plurality of magnetic coils above said non-magnetic member, a plurality of longitudinally aligned magnetic members beneath said non-magnetic member, said last mentioned members having a gap between the ends thereof, said rails

being notched at their lower edges in transverse alignment with said gaps and at least one movable belt having a face below said support members.

7. Apparatus for conveying magnetic material, comprising a rail member, said rail member having spaced parallel magnetic side frames, a non-magnetic plate member between said side frames and extending substantially the full length thereof, a plurality of magnetic coils above said non-magnetic member, said coils having like polarity, a plurality of longitudinally aligned magnetic members beneath said non-magnetic member, said last mentioned members having a gap between the ends thereof, said rails being notched at their lower edges in transverse alignment with said gaps and at least one movable belt having a face below said support members.

8. Apparatus for conveying magnetic sheet material, comprising a plurality of longitudinally extending supports arranged in spaced parallel relationship, each of said supports having magnetic side poles, a plurality of magnets between said side poles, means for causing magnetic flux from said coils to flow in well-defined longitudinally spaced transverse zones, said means comprising a discontinuous center pole under said magnets and at least one movable belt under the magnets and center pole in each support.

9. Apparatus for conveying magnetic sheet material, comprising a plurality of longitudinally extending supports arranged in spaced parallel relationship, each of said supports having magnetic side poles, a plurality of magnets of like polarity between said side poles, means for causing magnetic flux from said magnets to flow in well-defined longitudinally spaced transverse zones, said means comprising a discontinuous center pole under said magnets and at least one movable belt under the magnets and center pole in each support.

10. Apparatus for conveying magnetic sheet material, comprising a plurality of longitudinally extending supports arranged in spaced parallel relationship, a plurality of magnets of like polarity in each support, each of said supports having magnetic side poles, means for causing magnetic flux from said magnets to flow in well-defined longitudinally spaced transverse zones, said means comprising a discontinuous center pole under said magnets, the magnets in each support having opposite polarity with respect to the magnets of the adjoining support whereby transverse lines of flux are established extending continuously beneath the assembled supports and at least one movable belt under the magnets and center pole in each support.

11. Apparatus for conveying magnetic sheet material, comprising a plurality of longitudinally extending supports arranged in spaced parallel relationship, each of said supports having magnetic side poles, a plurality of magnets of like polarity arranged in pairs between said side poles, means for causing magnetic flux from said magnets to flow in well-defined longitudinally spaced transverse zones, said means comprising a center pole under each of said pairs of magnets and at least one movable belt under the magnets and center pole in each support.

12. Apparatus for conveying magnetic sheet material, comprising a plurality of longitudinally extending supports arranged in spaced parallel relationship, a plurality of magnets of like polarity arranged in pairs in each support, each of said supports having magnetic side poles,

means for causing magnetic flux from said magnets to flow in well-defined longitudinally spaced transverse zones, said means comprising a discontinuous center pole under said magnets, the magnets in each support having opposite polarity with respect to the magnets of the adjoining support whereby transverse zones of flux are established extending continuously beneath the assembled supports and at least one movable belt under the magnets and center pole in each support.

13. Apparatus for conveying magnetic sheet material, comprising a plurality of supports arranged in spaced parallel relationship, each of said supports having magnetic side poles, a plurality of magnets of like polarity between said side poles, a center pole under said magnets, at least one movable belt under the magnets and center pole in each support and a switch operable by the passage of a sheet along said conveyor at a spaced distance from the entering end of said conveyor, the magnets on the entering side of said switch being continuously energized and the magnets on the delivery side of said switch being adapted to be energized by the actuation of said switch.

14. Apparatus for conveying magnetic sheet material, comprising a plurality of supports arranged in spaced parallel longitudinally extending relationship, a plurality of magnets of like polarity in each support, each of said supports having magnetic side poles, a plurality of longitudinally aligned center poles under said magnets, the magnets in each support having opposite polarity with respect to the magnets of the adjoining support whereby transverse zones of flux are established extending continuously beneath the assembled supports, at least one movable belt under the magnets and center pole in each support and a switch operable by the passage of a sheet along said conveyor at a spaced distance from the entering end thereof, the magnets on the entering side of said switch being continuously energized and the magnets on the delivery side of said switch being adapted to be energized by the actuation of said switch.

DARIO BUCCICONE.

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The following references are of record in the file of this patent:

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2,374,174	Buccione	Apr. 24, 1945

Certificate of Correction

Patent No. 2,486,733 November 1, 1949

DARIO BUCCICONE

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 5, line 5, before the word "longitudinally" insert *plurality of*; column 6, line 25, for "coils" read *magnets*;

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 28th day of February, A. D. 1950.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.