Jan. 14, 1941. G. A. MARTIN 2,228,913

SHEET FEEDING APPARATUS

Filed Nov. 13, 1939 3 Sheets-Sheet 1

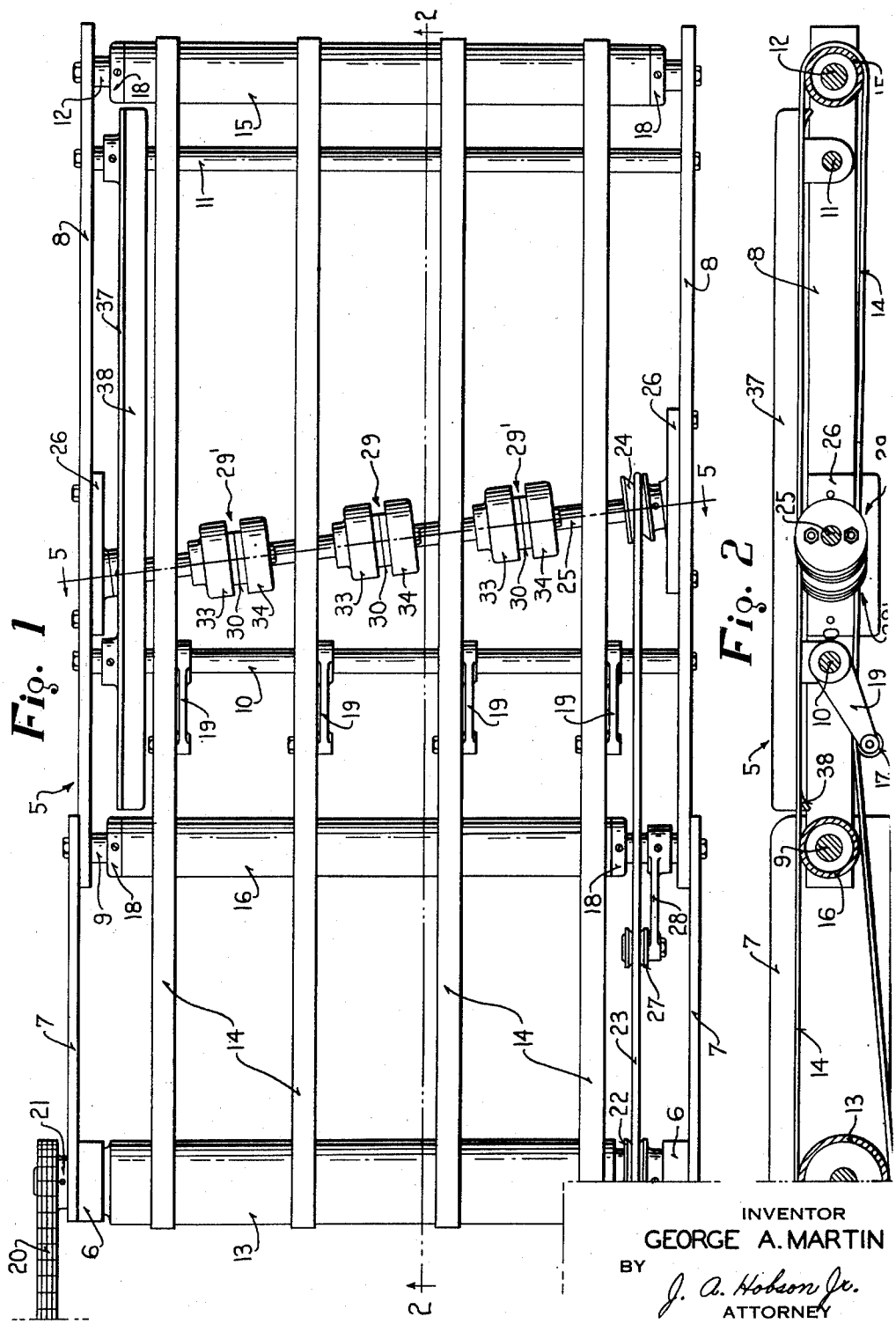


Fig. 1

Fig. 2

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SHEET FEEDING APPARATUS

Filed Nov. 13, 1939 3 Sheets-Sheet 2

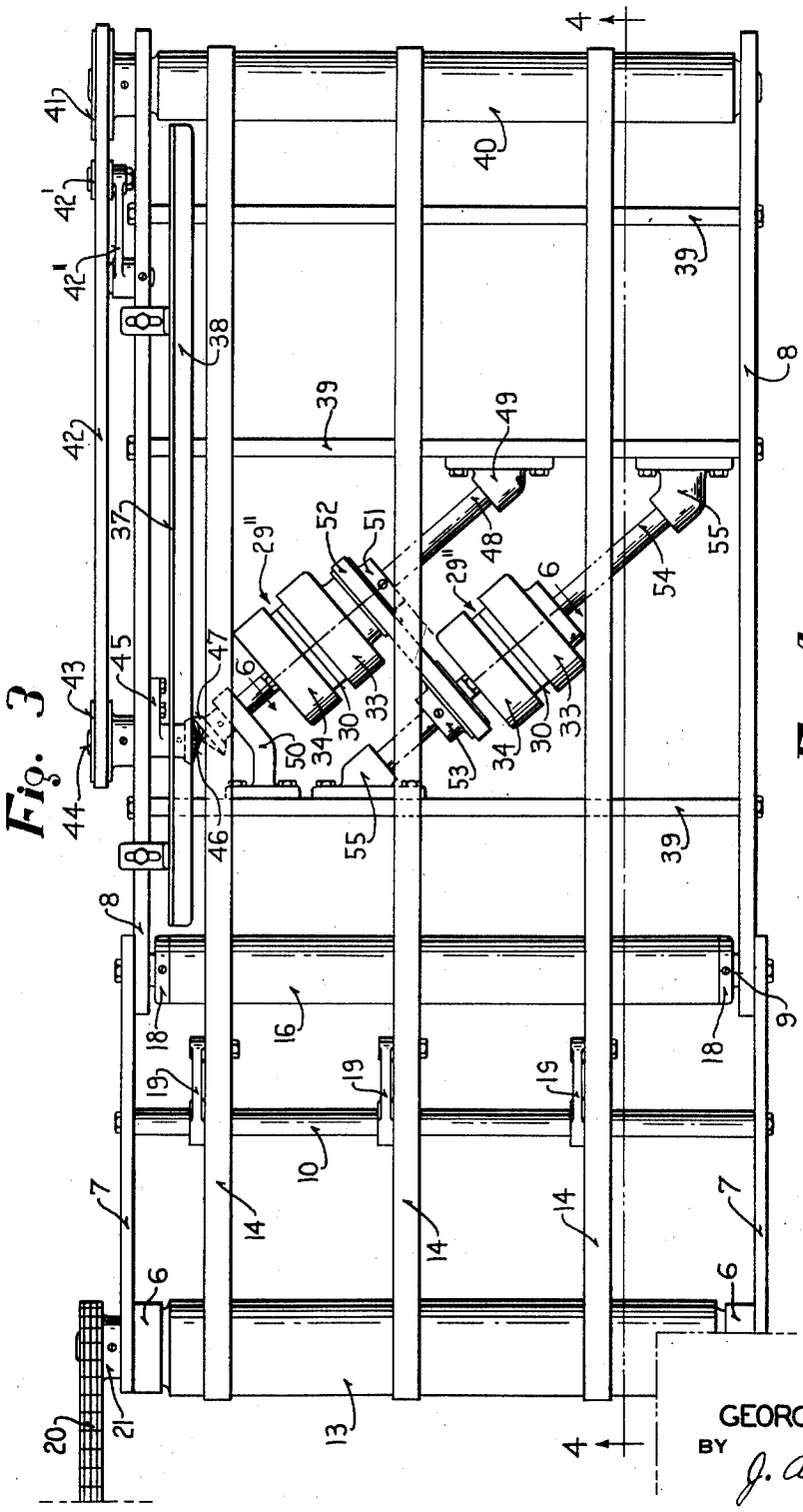


Fig. 3

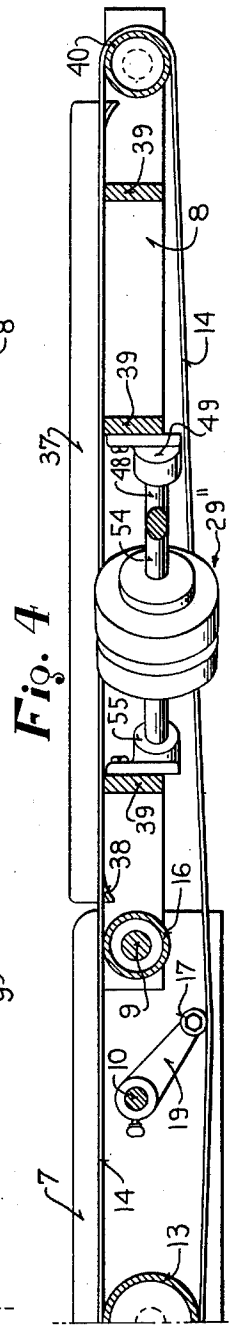


Fig. 4

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Filed Nov. 13, 1939 3 Sheets-Sheet 3

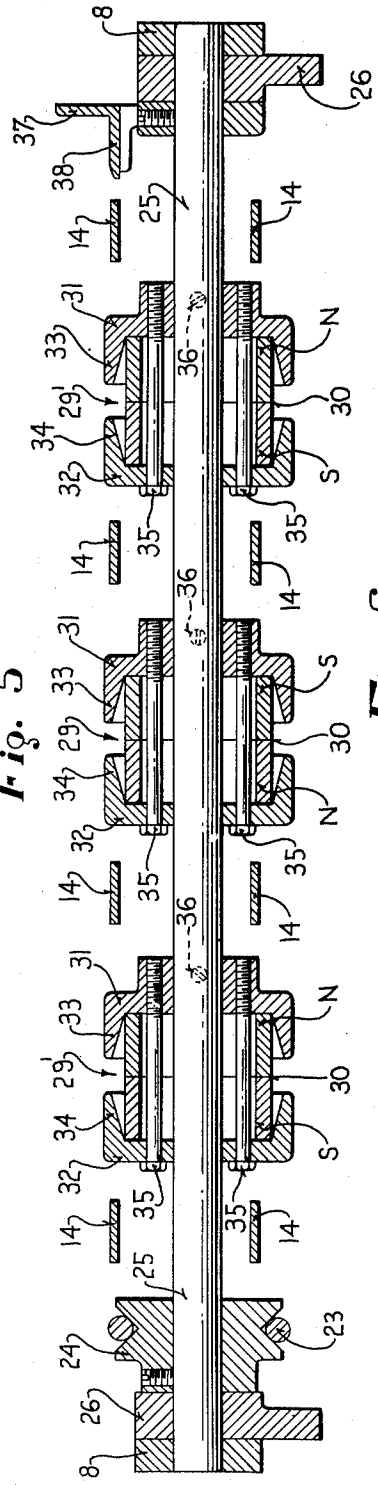


Fig. 5

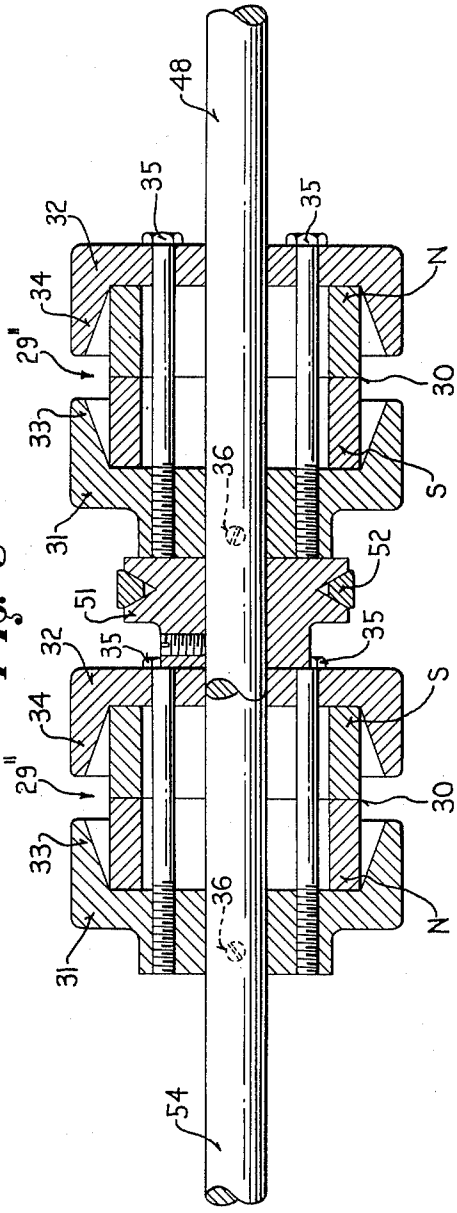


Fig. 6

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UNITED STATES PATENT OFFICE

2,228,913

SHEET FEEDING APPARATUS

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Application November 13, 1939, Serial No. 304,051

5 Claims. (Cl. 271—49)

This invention relates to sheet feeders and more particularly to mechanism for feeding metal sheets from a supply thereof and side registering the sheets with respect to a printing press, coating machine, slitting machine or other instrumentality acting on such sheets.

One object of the present invention is to provide mechanism for side registering metal sheets by application of magnetic sheet moving action thereto.

Another object of the present invention is to provide an improved mechanism for side registering metal sheets without interrupting the forward movement of the sheets.

Another object of the present invention is to provide an improved mechanism for side registering metal sheets through magnetic gripping action applied thereon in such manner as to move the sheets sidewise while they are being advanced to the printing or other machine.

Another object of the present invention is to provide an improved mechanism for side registering metal sheets through magnetic gripping action rotatably applied thereon in such manner as to move the sheets sidewise, without turning thereof, while they are being advanced to the printing or other machine.

These and other objects of the present invention will appear as the following description thereof proceeds and in order to more clearly understand said invention reference may be had to the accompanying drawings which illustrate two embodiments of said invention and wherein like reference characters designate like parts throughout the several views.

In said drawings:

Fig. 1 is a top plan view of a conveyor and side registering means constituting one embodiment of the present invention;

Fig. 2 is a vertical longitudinal sectional view on the line 2—2 of Fig. 1;

Fig. 3 is a top plan view of a conveyor and side registering means constituting another embodiment of the present invention;

Fig. 4 is a vertical longitudinal sectional view on the line 4—4 of Fig. 3;

Fig. 5 is a transverse vertical sectional view on the line 5—5 of Fig. 1; and

Fig. 6 is a transverse vertical sectional view on the line 6—6 of Fig. 3.

Referring to Figs. 1, 2 and 5 of the drawings which illustrate one embodiment of the present invention, 5 indicates broadly a conveyor onto which metal sheets are delivered from a sheet supply by a sheet feeder (not shown) and advanced by said conveyor toward a printing press, coating machine, slitting machine or other instrumentality associated therewith, the conveyor being provided, in accordance with the present invention, with novel means for side registering the sheets during movement imparted thereto by the conveyor. Said conveyor and side registering means are preferably mounted, constructed and operated as follows.

Bolted or otherwise suitably secured to the front uprights 6 of the sheet feeder frame are side plates 7 which, in turn, have bolted or otherwise suitably secured thereto and extending forwardly thereof side members 8. The side plates 7 and the side members 8 constitute the frame of the conveyor and are connected together by stay shafts 9, 10, 11 and 12 bolted or otherwise suitably secured thereto. Journalled in suitable bearings formed in the front uprights 6 and in the side plates 7 is a transversely extending feed roller 13 around which passes a plurality of tapes 14. The front portions of the tapes 14 pass around a tape roller 15, and said tapes also travel over a second tape roller 16 and suitable tape tightening rollers 17. The tape rollers 15 and 16 are journalled on the stay shafts 12 and 9, respectively, and endwise displacement of the rollers on their respective shafts is prevented by collars 18 which are secured to said shafts at opposite ends of said rollers. The tape tightening rollers 17 are journalled on arms 19 which are adjustably secured to the stay shaft 10. The feed roller 13 and the tapes 14 passing thereabout are driven from any suitable source of power by a chain 20 connected therewith and passing around a sprocket 21 which is fixed on the outwardly projecting end of said roller.

Each sheet delivered on the conveyor 5 and advanced thereby toward the machine associated therewith is moved laterally on said conveyor to side register the sheet with respect to said machine. In accordance with the present invention this side registration is effected by magnetic means and without interrupting the forward travel of the sheets on the conveyor, and said means is preferably mounted, constructed and operated as follows.

Fixed on one end of the feed roller 13 interiorly of the adjacent front upright 6 and rotated by said feed roller is a pulley 22 around which passes a belt 23 driven by said pulley and also passing around and driving a pulley 24. The pulley 24 is fixed on and drives a shaft 25 which extends transversely of the conveyor and is disposed diagonally of the tapes 14 and beneath the upper reaches thereof. This shaft 25 is made of bronze, brass or other non-magnetic material and is journalled in suitable bearings in brackets 26 which are bolted or otherwise suitably secured to the inner sides of the side members 8. The belt 23 also passes over a belt tightening roller 27 journalled on an arm 28 which is adjustably secured to the stay shaft 9.

Secured to the diagonally disposed non-magnetic shaft 25 in spaced relation thereon and pro-

jecting upwardly between the tapes 14 in approximately the same plane as the upper reaches thereof are a plurality of rollers comprised by permanent magnets, there being an intermediate roller indicated broadly at 29 and outer rollers indicated broadly at 29'. These rollers 29 and 29' are substantially identical as respects their mounting, construction and operation and a description of one roller will therefore be sufficient. It might be pointed out, however, that the north and south poles of the intermediate roller 29 are reversed with respect to the north and south poles of the outer rollers 29' so that the magnetic forces between the intermediate and the outer rollers are repelling instead of attracting in order to insure magnetic sheet gripping effect of said rollers. Each of the rollers 29, 29' is comprised by a two-part hollow permanent magnet 30 (Fig. 5) engaged over the non-magnetic shaft 25 and having a north and south pole as indicated at N and S, respectively. Each permanent magnet 30 is interposed between a pair of spaced circular shells 31 and 32 provided with horizontal magnetically attracting sheet engaging rims 33 and 34, respectively, which project toward each other and are spaced apart at their inner ends. Each pair of shells 31, 32 and the permanent magnet 30 therein are clamped together as a unit by bolts 35 which project through suitable openings formed in the shell 32. The bolts 35 extend through the adjacent permanent magnet 30 and are threaded in suitable threaded openings formed in the shell 31. Each unit comprised by shells 31, 32 and the permanent magnet 30 therein is, in turn, secured to the shaft 25 for rotation thereby by a set screw 36 threaded in the shell 31 and engaging said shaft.

The shells 31 and 32 are made of soft iron or any other suitable material which will be magnetized by the permanent magnets 30, and said shells, due to their engagement with opposite sides of magnets 30, also have north and south poles which produce magnetic fluxes across the rims 33 and 34 and cause the metal sheets to adhere to said rims when moved in engagement therewith. The rims 33 and 34 are beveled on the under sides thereof to prevent contact of said rims with the magnets 30 and thus insure proper distribution of the magnetic forces to the shells 31 and 32. Extending along the conveyor 5 at one side thereof and parallel with the tapes 14 is a sheet guide 37 provided with a laterally extending plate 38 for supporting the margins of the sheets during movement of the same along said guide. The sheet guide 37 is secured to and adjustable along the stay shafts 10 and 11.

It will thus appear that as each metal sheet is fed forwardly along the conveyor 5 by the tapes 14, the front edge portion of the sheet will progressively engage the upper surfaces of the transversely spaced rotating rollers 29 and 29' and adhere to said rollers through the application of magnetic forces applied to the underside of the sheet at spaced points across the same. Upon continued rotation of the rollers 29 and 29' and due to the angular arrangement of said rollers, the sheet adhering thereto will be moved forwardly and laterally thereby until the side edge of the sheet engages the sheet guide 37. Engagement of the side edge of the sheet with the sheet guide 37 will be maintained by the rollers 29 and 29' during the remaining portion of the forward travel of the sheet, thus properly positioning the sheet for delivery from the conveyor to the machine associated therewith.

Referring now to Figs. 3, 4 and 6 of the drawings which illustrate another embodiment of the present invention, the mounting, construction and operation of the conveyor therein shown is the same as that of the previously described conveyor 5 except that the stay shaft 10 carrying the tape tightening arms 19 is arranged between the side plates 7 and bolted or otherwise suitably secured thereto; the side members 8 are connected together by cross bars 39 bolted or otherwise suitably secured to said side members; and the sheet guide 37 is adjustably secured on one of the side members 8. Further, the front portions of the tapes 14 pass around and drive a tape roller 40 which is journalled in suitable bearings formed in the side members 8 at the forward ends thereof. In this second embodiment of the invention, however, the side registering rollers, indicated broadly at 29'', are arranged and operated as follows.

Secured to the outwardly projecting end of the driven tape roller 40 and rotated by said tape roller is a pulley 41 around which passes a belt 42 driven by said pulley and also passing around and driving a pulley 43. Belt 42 has engaged therewith a belt tightening roller 42' journalled on an arm 42'' adjustably secured in any suitable manner on the adjacent side member 8. The pulley 43 is fixed on the outwardly projecting end of a short shaft 44 which is journalled in suitable bearings formed in the adjacent side member 8 and in a bracket 45 through which said shaft extends. The bracket 45 is bolted or otherwise suitably secured to the adjacent side member 8 at the inner side thereof. Fixed on the inner end of the short shaft 44 is a bevel gear 46 which meshes with and drives a similar gear 47. This gear 47 is fixed on and rotates a shaft 48 which is disposed diagonally of the tapes 14 beneath the upper reaches thereof. Shaft 48 is made of bronze, brass or other non-magnetic material and is journalled in suitable bearings in brackets 49 and 50 which are bolted or otherwise suitably secured to the intermediate and rear cross bars 39.

Fixed on and rotated by the shaft 48 is a pulley 51 around which passes a belt 52 driven by said pulley and passing around and driving a pulley 53. This pulley 53 is fixed on and drives a shaft 54 which is also disposed diagonally of the tapes 14 rearwardly of and parallel with the shaft 48. This shaft 54 is also made of bronze, brass or other non-magnetic material and is journalled in suitable bearings in brackets 55 which are bolted or otherwise suitably secured to the intermediate and rear cross bars 39. The rollers 29'' and the rollers 29 and 29' are identical in construction and the parts thereof are indicated by the same reference characters. A detail description of the rollers 29'' is therefore unnecessary except to point out that the rollers 29'' are secured to the non-magnetic shafts 48 and 54 by the set screws 36 and are so arranged on said shafts and spaced relative to each other that the points of sheet contact on the upper surfaces of rollers 29'' lie in a straight line extending transversely of the conveyor and at right angles to the tapes 14.

It will thus appear, in connection with the last described embodiment of the invention, that as each metal sheet is fed forwardly along the conveyor by the tapes 14, the front edge portion

of the sheet will simultaneously engage the upper surfaces of the two angularly disposed rollers 29'' and adhere to said rollers through the application of magnetic forces applied thereby simultaneously to the underside of the sheet at spaced points across the same. Due to the spaced angular arrangement of rollers 29'' and simultaneous application of magnetic forces to the sheet at spaced points across the same, the sheet is held against turning movement relative to the rollers 29'' while said sheet is moved forwardly and laterally by said rollers. The metal sheet, when moved forwardly and laterally by the rollers 29'', engages the sheet guide 37 and thereafter the side edge of the sheet is maintained in engagement with said guide by the rollers 29'' for the remaining portion of the forward travel of the sheet imparted thereto by said rollers. Proper positioning of the sheet for delivery from the conveyor to the machine associated therewith is thus insured.

The present description and accompanying drawings set forth with more or less particularity two embodiments of the present invention, but it is to be expressly understood that said invention is not limited to said embodiments or otherwise than by the terms of the appended claims.

What I claim is:

1. The combination with a conveyor for advancing a metal sheet and comprising a series of laterally spaced driven tapes, and a registering device arranged adjacent one side of said conveyor and extending longitudinally of the same, of means for moving the metal sheet laterally against the registering device while the sheet is being advanced by the conveyor, said means comprising a plurality of automatically operated permanent magnet devices disposed across the conveyor and power operated means on which the permanent magnet devices are mounted in spaced relation each between a pair of said tapes, said permanent magnet devices having smooth unbroken sheet engaging surfaces upper portions of which are disposed substantially in the plane of the sheet supporting surfaces of the tapes and adapted to engage the underside of the metal sheet at points spaced transversely thereacross and draw the advancing metal sheet sidewise into engagement with said registering device.

2. The combination with a conveyor for advancing a metal sheet and comprising a series of laterally spaced driven tapes, and a registering device arranged adjacent one side of the conveyor and extending longitudinally of the same, of means for moving the metal sheet laterally against the registering device while the sheet is being advanced by the conveyor, said means comprising a plurality of driven permanent magnet rollers disposed diagonally of the conveyor and in spaced relation transversely thereacross, and power operated means on which the permanent magnet rollers are mounted in spaced relation each between a pair of said tapes, said rollers having smooth unbroken sheet engaging peripheries upper portions of which are disposed substantially in the plane of the sheet supporting surfaces of the tapes and adapted to engage the underside of the metal sheet at points spaced transversely thereof and draw the advancing sheet sidewise into engagement with said registering device.

3. The combination with a conveyor for advancing a metal sheet and comprising a series of laterally spaced driven tapes, and a registering device adjacent one side of and extending longitudinally of the conveyor and along which the metal sheet is advanced thereby, of means for moving the metal sheet laterally against the registering device while the sheet is being advanced by the conveyor, said means comprising a plurality of driven permanent magnet rollers disposed diagonally across the conveyor and power operated means on which the permanent magnet rollers are mounted in spaced relation each between a pair of said tapes, each of the rollers comprising a permanent magnet and a pair of spaced opposed circular shells enclosing said magnet and magnetically energized solely thereby, the magnetically energized circular shells of said rollers having smooth unbroken peripheries upper portions of which are disposed substantially in the plane of the sheet supporting surfaces of the tapes and adapted to engage the underside of the metal sheet at points spaced transversely thereof and exert a continuous sidewise magnetic thrust on the metal sheet while engaged therewith to thereby draw the metal sheet laterally against and maintain it in engagement with said registering device as said sheet is advanced therealong by said conveyor.

4. The combination with a conveyor for advancing a metal sheet and comprising a series of laterally spaced driven tapes, and a registering device arranged adjacent one side of said conveyor and extending longitudinally of the same, of means for moving the metal sheet laterally against the registering device while the sheet is being advanced by the conveyor, said means comprising a series of driven permanent magnet rollers arranged in spaced coaxial relation across the conveyor diagonally thereof and power operated means on which the permanent magnet rollers are mounted in spaced relation each between a pair of said tapes, said rollers having smooth unbroken sheet engaging peripheries upper portions of which are disposed substantially in the plane of the sheet supporting surfaces of the tapes and adapted to engage the underside of the metal sheet at points spaced transversely thereacross and draw the advancing metal sheet sidewise into engagement with said registering device.

5. The combination with a conveyor for advancing a metal sheet and comprising a series of laterally spaced driven tapes, and a registering device arranged adjacent one side of said conveyor and extending longitudinally of the same, of means for moving the metal sheet laterally against the registering device while the sheet is being advanced by the conveyor, said means comprising a plurality of transversely spaced driven permanent magnet rollers having smooth unbroken sheet engaging peripheries and disposed diagonally of the conveyor across the same on spaced parallel axes, and power operated means on which the permanent magnet rollers are mounted in spaced relation, said rollers each being located between a pair of said tapes and upper portions of the peripheries of the rollers being disposed substantially in the plane of the sheet supporting surfaces of the tapes so as to simultaneously engage the underside of the metal sheet at points spaced transversely thereacross and draw the advancing metal sheet sidewise against said registering device without turning movement of said sheet.

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