June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 1

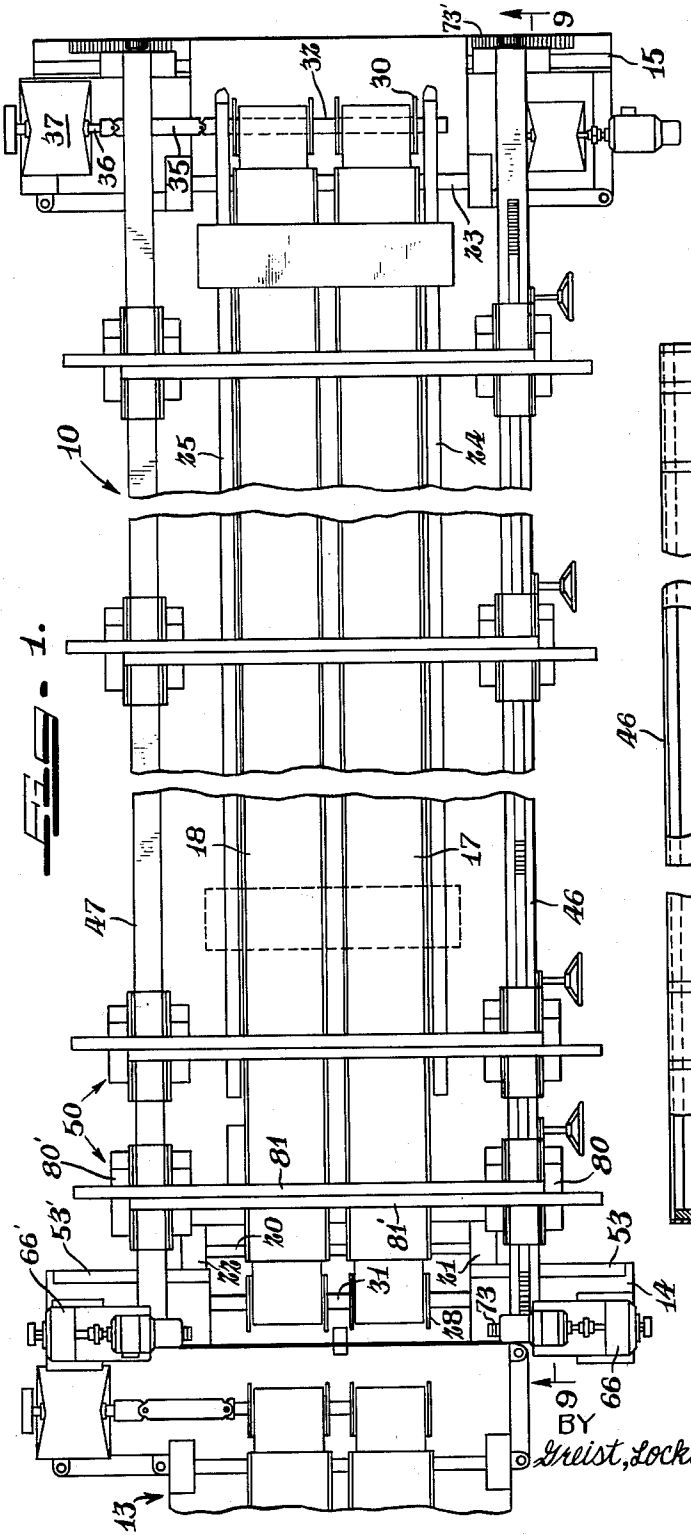


FIG. 1.

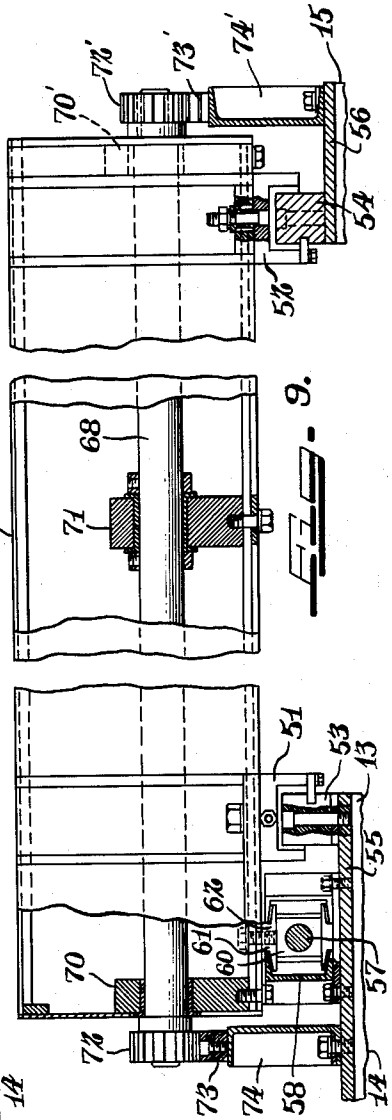


FIG. 9.

INVENTOR
DARIO BUCCICONE

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 2

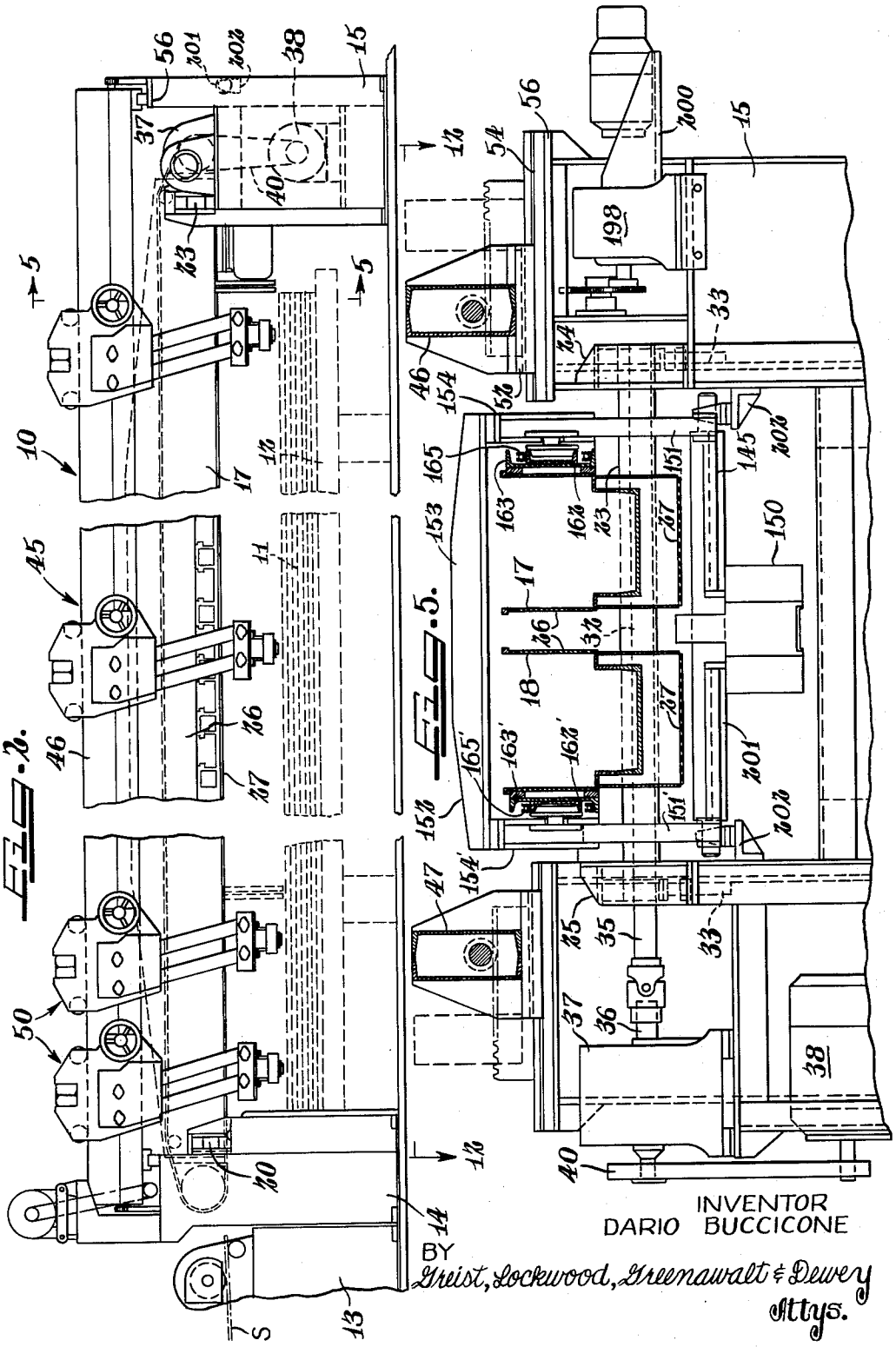


FIG. 2.

FIG. 5.

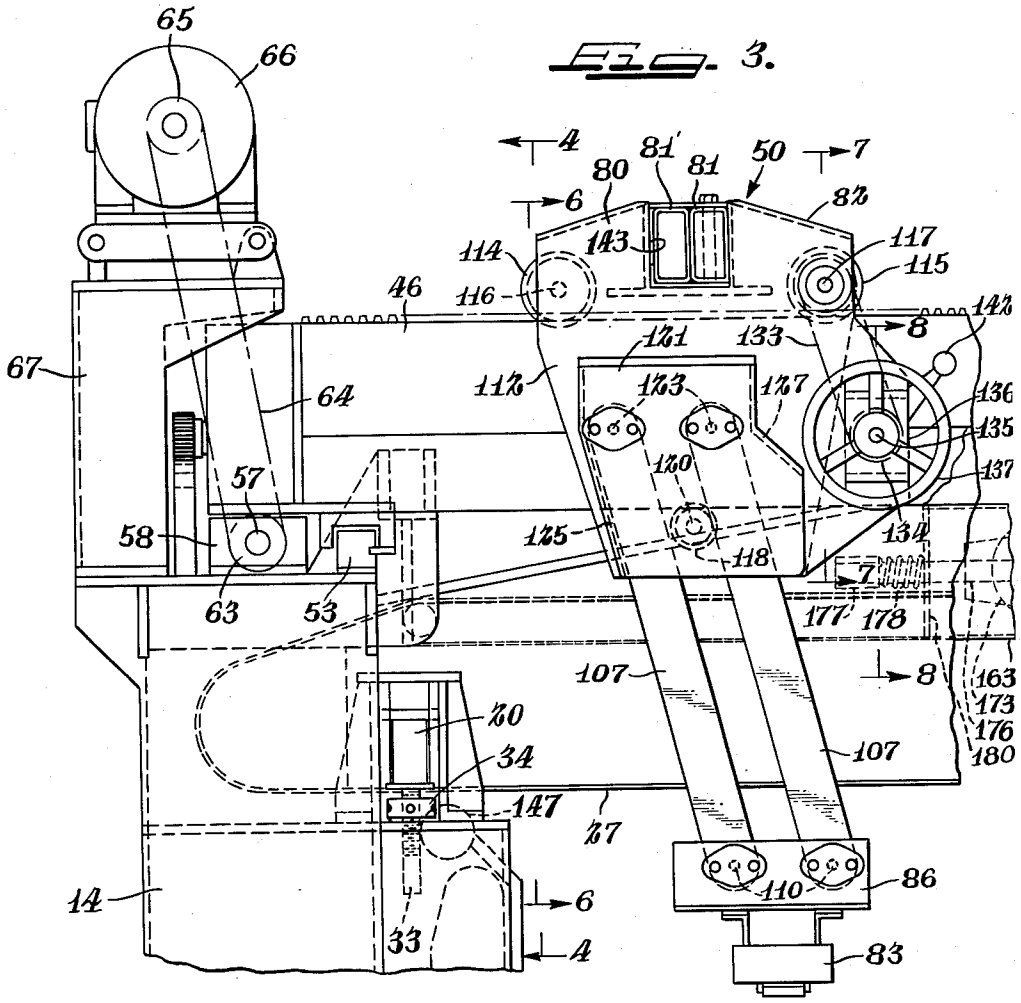
INVENTOR
DARIO BUCCICONE

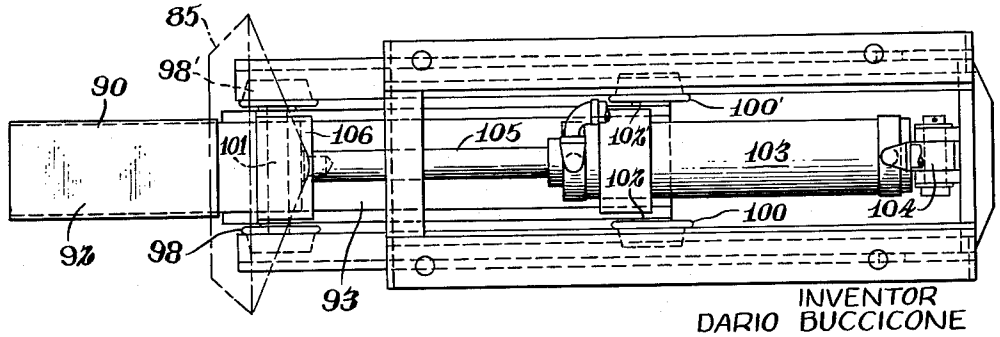
BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 3





INVENTOR
DARIO BUCCICONE

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

FIG. 10.

June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 4

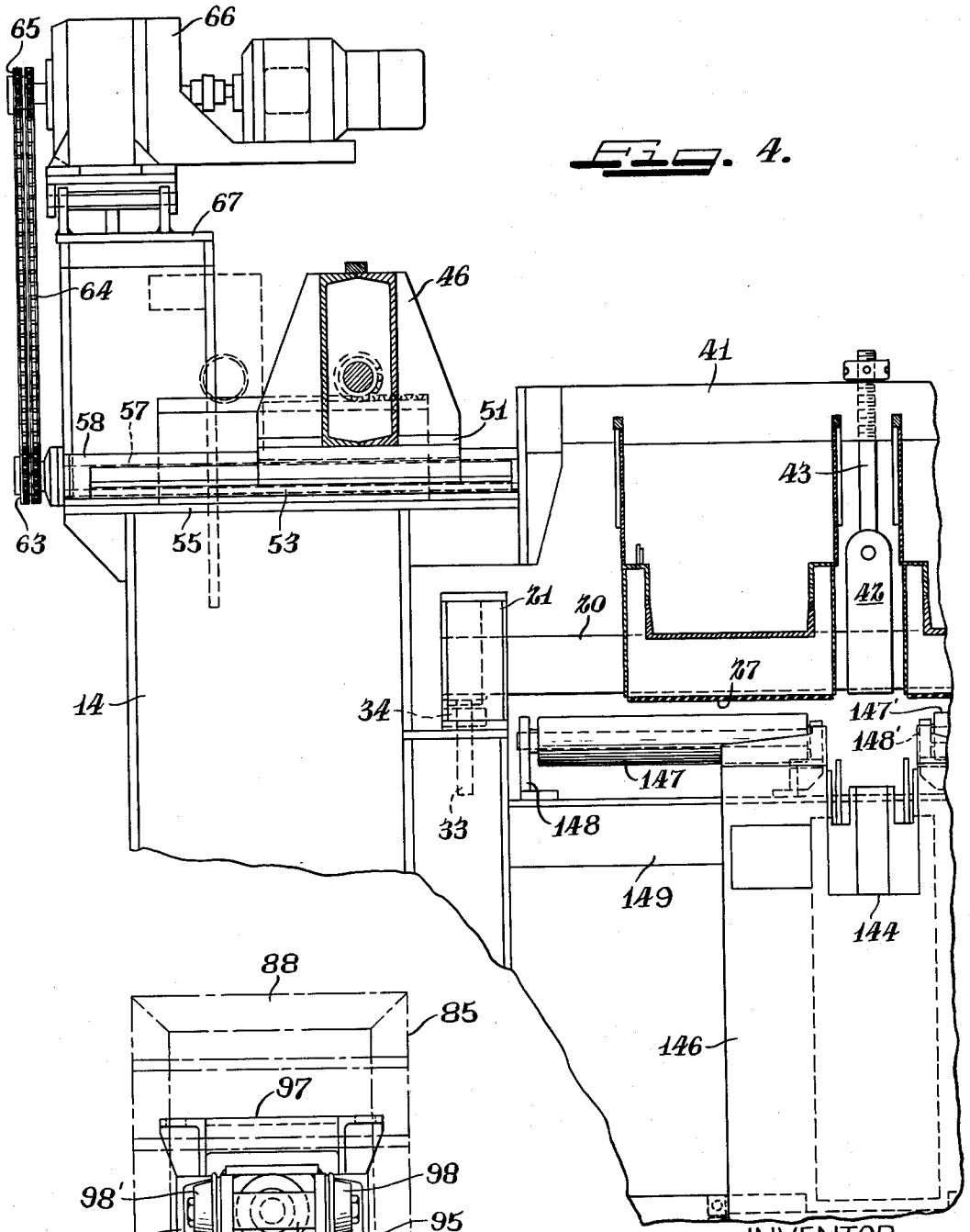


FIG. 4.

FIG. 11.

INVENTOR
DARIO BUCCICONE

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 5

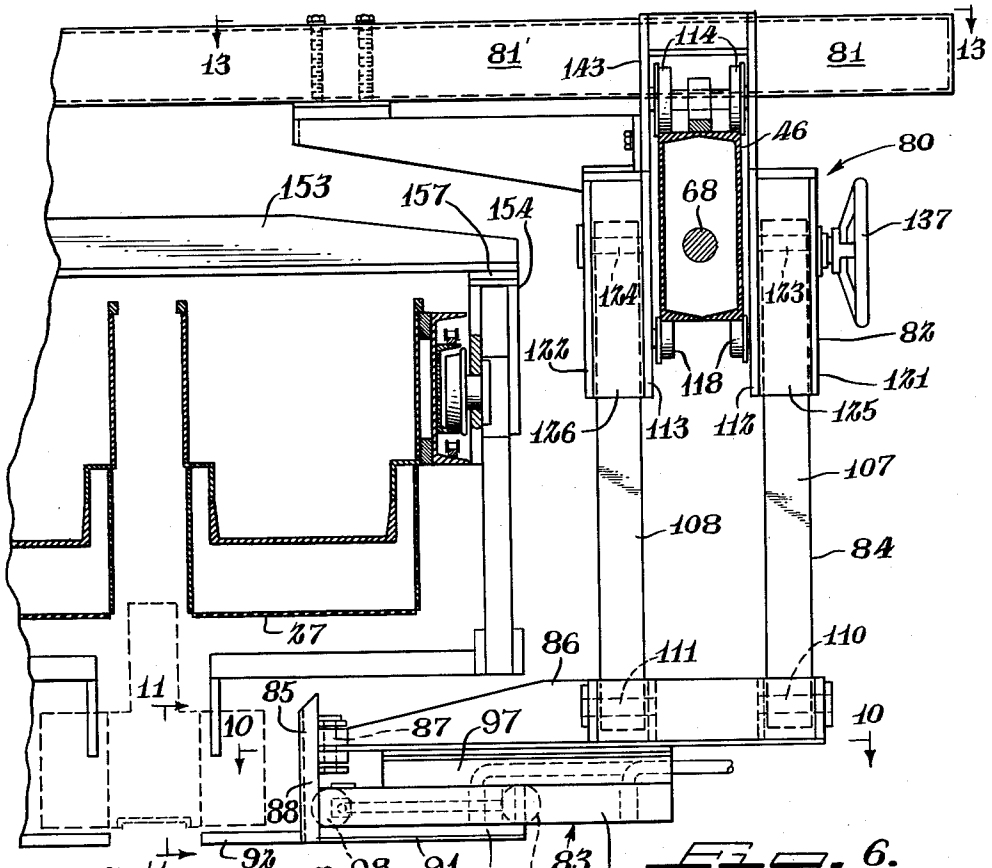


Fig. 6.

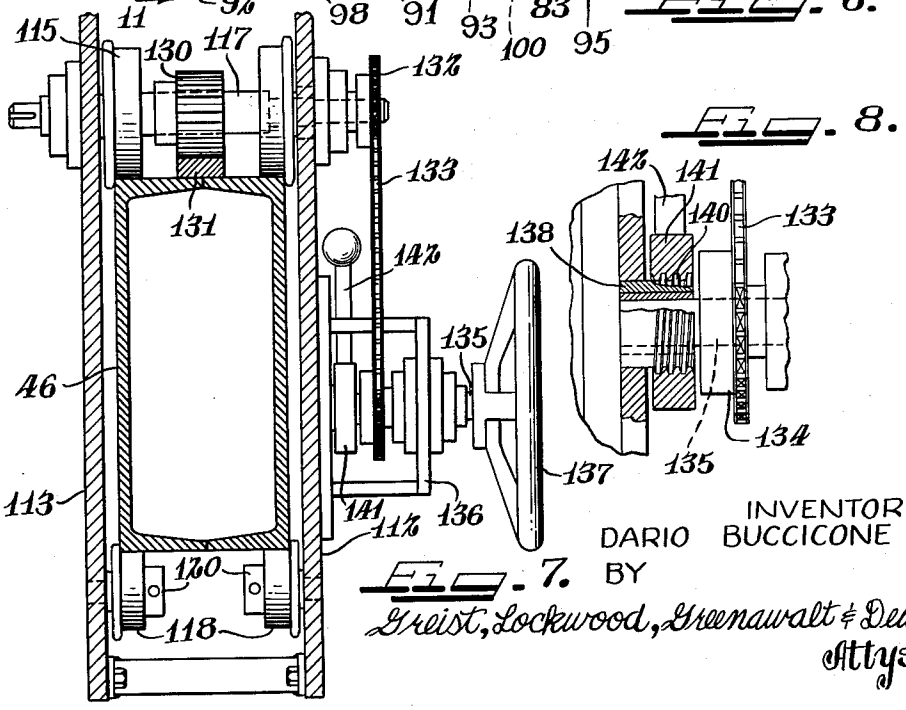


Fig. 8.

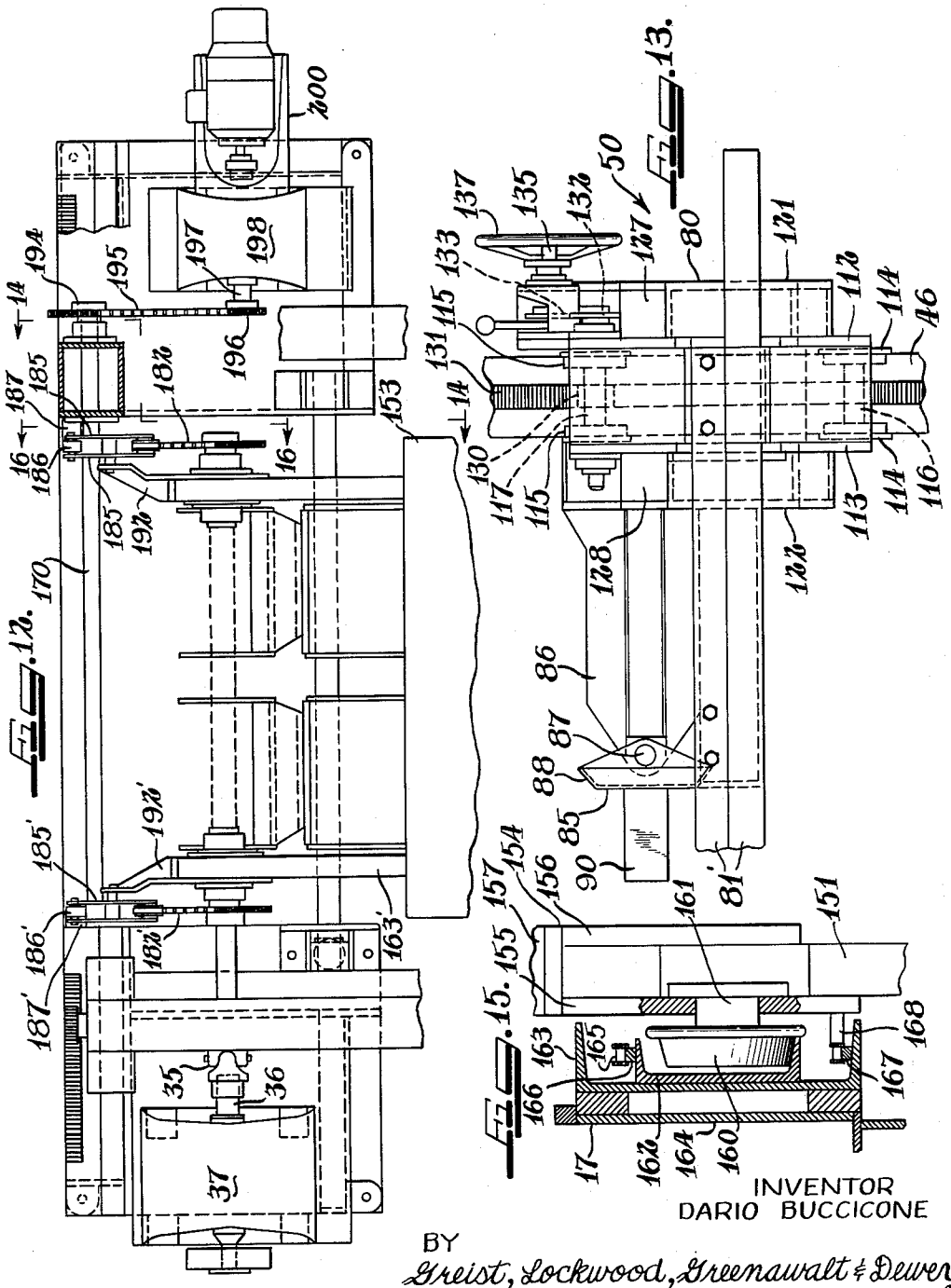
Fig. 7.

INVENTOR
DARIO BUCCICONE
BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 6



INVENTOR
DARIO BUCCICONE

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

June 14, 1966 D. BUCCICONE 3,256,011

PILER MECHANISM FOR METAL SHEETS

Filed June 16, 1964 7 Sheets-Sheet 7

Fig. 14.

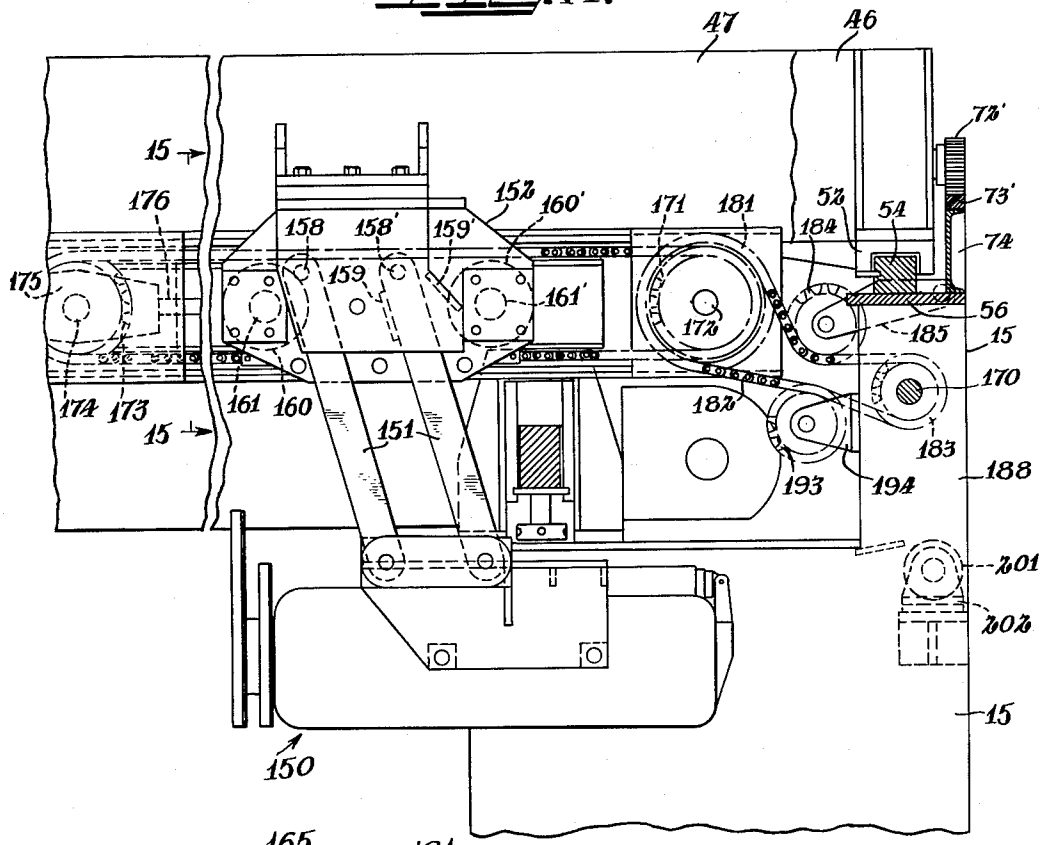
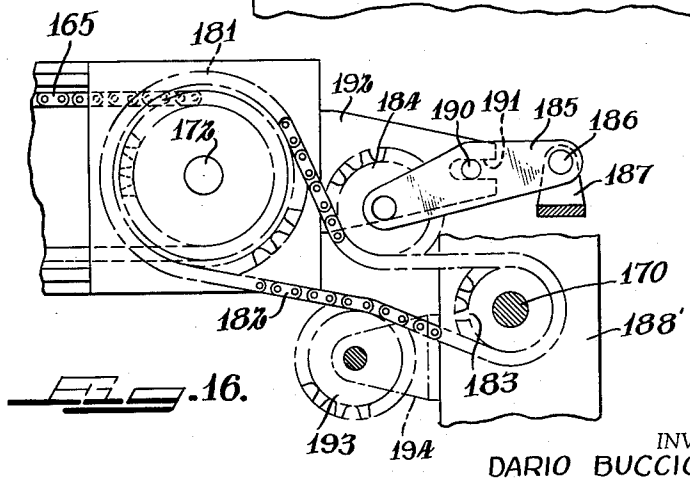


Fig. 16.



INVENTOR.
DARIO BUCCICONE

BY
Greist, Lockwood, Greenawalt & Dewey
Attys.

United States Patent Office 3,256,011 Patented June 14, 1966

3,256,011

PILER MECHANISM FOR METAL SHEETS

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

Filed June 16, 1964, Ser. No. 375,503
19 Claims. (Cl. 271—68)

This invention relates to mechanisms for piling metal sheets and is more particularly concerned with improvements in a mechanism for receiving corrugated metal sheets from a processing line and depositing them on a pile.

It is a general object of the invention to provide a sheet piler machine which is especially designed for use in a processing line in which corrugated sheets are formed and sheared or cut directly from a coil of steel, the machine being adapted to stack sheets up to a predetermined length, to allow sheets over a predetermined length to pass clear through the machine and to have associated with it a mechanism for rejecting defective sheets before they reach the piler.

It is a more specific object of the invention to provide a piler mechanism for metal sheets which employs overhead conveyors of rail-like form having traveling belts and electromagnets for holding the sheets against the bottom surface of the belts and also having side guide and end stop devices which are especially adapted for handling corrugated sheet material.

It is another object of the invention to provide a piler for metal sheets which employs overhead magnetic conveyors mounted on spaced end frames and having improved side guide mechanisms which are adjustable longitudinally and transversely of the piler so as to adjust the same for sheets which are of different width and length.

It is still another object of the invention to provide in a sheet piler which employs overhead magnetic conveyors mounted on spaced end frames and side guide units which are adjustable longitudinally of the piler and which are also independently adjustable laterally of the piler so as to permit the guide units to be properly positioned for piling sheets which are not on center line as they are fed to the machine.

It is a further object of the invention to provide a sheet piler employing overhead magnetic conveyors mounted on spaced end frames and pairs of side guide mechanisms which are independently adjustable along the sides of the piler, with the guides of each pair thereof being independently adjustable laterally of the piler, so as to handle sheets of different size and sheets which are fed in different lines, each side guide unit having a sheet tensioning finger unit which is fastened to the lower end of a supporting linkage so as to enable the finger units to swing outwardly when lateral force is applied thereto and thereby avoid damage to the same.

It is a still further object of the invention to provide a piler of the type described wherein side guide units are disposed on opposite sides of overhead magnetic conveyors with means for adjusting the position thereof laterally and longitudinally of the piler and also mechanism for locking each of the individual side guide units in adjusted position.

Another object of the invention is to provide a sheet piling machine for corrugated sheets, or the like, wherein overhead rail-like magnetic conveyors are supported on longitudinally spaced end frames so as to be adjustable vertically for accommodating sheets of different thickness and an end stop bumper assembly is mounted on a carriage which is supported on longitudinally extending track formations associated with the conveyor units and having a chain drive for connecting the carriage with a power source which is arranged so as to enable the position of the end stop bumper assembly to be readily adjusted for handling sheets of different length.

Still another object of the invention is to provide in a piling machine having one or more vertically adjustable rail-type overhead magnetic conveyor units, an end stop supporting apparatus which comprises a supporting carriage mounted for longitudinal travel on the conveyor rails and driven by a chain drive connection with a fixed power shaft, the chain drive connection having a slack take-up device associated therewith which permits raising and lowering of the rail units and the carraige without disconnecting or disabling the chain drive.

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

FIGURE 1 is a plan view of a sheet piler machine embodying therein the principal features of the invention, with portions broken away and other portions omitted;

FIGURE 2 is a side elevation of the sheet piler with portions broken away and other portions omitted;

FIGURE 3 is a fragmentary side elevation at the entrance end of the piler machine, to a larger scale;

FIGURE 4 is a partial cross section taken along the lines 4—4 of FIGURE 3;

FIGURE 5 is a partial cross section taken along the lines 5—5 of FIGURE 2, to a larger scale;

FIGURE 6 is a partial cross section taken along the lines 6—6 of FIGURE 3;

FIGURE 7 is a section taken on the lines 7—7 of FIGURE 3;

FIGURE 8 is a fragmentary view of a portion of the apparatus shown in FIGURE 7 to a larger scale;

FIGURE 9 is a view taken on the lines 9—9 of FIGURE 1 to an enlarged scale and with portions broken away;

FIGURE 10 is a horizontal section taken on the lines 10—10 of FIGURE 6, to a larger scale;

FIGURE 11 is a vertical section taken on the lines 11—11 of FIGURE 6, to a larger scale;

FIGURE 12 is a fragmentary plan view of the discharge end of the machine, to a larger scale;

FIGURE 13 is a fragmentary plan view taken on the lines 13—13 of FIGURE 6;

FIGURE 14 is a partial vertical section taken on the lines 14—14 of FIGURE 12, with portions omitted;

FIGURE 15 is a fragmentary vertical section taken on the lines 15—15 of FIGURE 14, to a larger scale; and

FIGURE 16 is a fragmentary sectional view taken on the lines 16—16 of FIGURE 12 to a larger scale.

The apparatus **10** which is illustrated in the drawings (FIGURES 1 and 2) and which incorporates therein the principal features of the invention, is designed to receive individual metal sheets S from a processing line or the like and to deposit the sheets one by one on a stack or pile **11** on a bed structure **12** for removal in the lateral direction from the apparatus. The machine **10** may have associated with it a reject apparatus, indicated at **13**, at the entrance end of the machine **10** for piling defective sheets before they reach the present machine.

The apparatus comprises an upright supporting frame structure consisting of longitudinally spaced end frames **14** and **15** (FIGURES 1 and 2) supporting at opposite ends an overhead magnetic conveyor structure **16**, which, in the form shown, comprises two identical conveyor rail units **17** and **18**. The conveyor rail units **17** and **18** are of the straight bottom type which are disclosed in my copending application, Serial No. 356,566, filed April 1, 1964. The rail units **17** and **18** are transversely spaced and supported, at the receiving end of the machine **10**, on a cross beam **20** extending between upstanding, later-

ally spaced brackets 21 and 22 on the end frame structure 14. The conveyor rail units 17 and 18 are supported at the other end of the machine 10 on a cross beam 23 extending between upstanding, laterally spaced brackets 24 and 25 (FIGURE 5) on the end frame structure 15. Each of the rail units 17 and 18 comprises an elongate frame 26 which houses a series of longitudinally spaced electromagnets (not shown) and a traveling belt 27 which is supported at opposite ends on pulleys 28 and 30. Pulleys 28 at the entrance end of the machine are idler pulleys which are carried on a cross shaft 31 while the pulleys 30 at the opposite or exit end of the machine are mounted on a driven shaft 32 and drive the belts 27. The rail units 17 and 18 have a limited vertical adjustment and the drive shaft 32 has a connection with a power drive which permits vertical adjustment of the units 17 and 18 without interruption of the drive connection. Each end of each of the cross beams 20 and 23 is provided, as illustrated in FIGURE 3, with a depending threaded pin 33 and an adjusting nut 34. The pin 33 extends through an aperture in the base of the supporting bracket for the cross beam so that the nut 34 serves as a support and the nut 34 is adjusted on the pin 33 to raise and lower the end of the cross beam as required for proper vertical adjustment. A conveyor drive shaft 32 has a universal connection 35 (FIGURES 1, 5 and 12) with the output shaft 36 on a speed reducer 37 mounted on one side of the end frame structure 15. The speed reducer 37 is driven from a motor 38 mounted below the same and connected in driving relation therewith by the belt and pulley drive 40. The cross beam 20 at the entrance end of the machine 10 is additionally supported in the center of a cross frame member 41 (FIGURE 4) forming a part of the end frame structure 14 by means of a hanger bracket 42 which is secured on the lower end of a vertically adjustable depending hanger bolt 43.

The machine 10 is provided with a side guide structure 45 for guiding the side edges of the sheets as they are dropped from the conveyor rail units 17 and 18. The side guide structure 45 is mounted on longitudinally extending, laterally spaced supporting beams 46 and 47 which are substantially identical except for being rights and lefts and which are mounted at their opposite ends on the end frame structures 14 and 15 for lateral adjustment, the mounting and adjusting arrangement for each of the beams 46 and 47 being identical. As shown in FIGURES 3 and 4, the side guide supporting beam 46 may be conveniently formed by connecting two channels in facing relation so as to form an elongate housing of rectangular cross section which provides a track for longitudinally adjustable guide unit assembles 50. The beam 46 (FIGURES 1, 2, 3, 5 and 9) is provided at its opposite ends with downwardly facing track formations 51 and 52 which extend transversely of the machine and which are of generally U-shaped cross section. Co-operating rails 53 and 54 are mounted on top plates 55 and 56 of the end frame structures 14 and 15, respectively. The carriage forming or track forming channels 51 and 52 depend from the bottom face of the beam 46 near the ends thereof and co-operate with the rails 53 and 54 to support the beam. At the infeed end of the machine an adjusting screw or shaft 57 is rotatably mounted in an elongate housing 58 which extends transversely of the end frame 14 and is mounted on the top plate 55 adjacent to and parallel with the rail 53. The shaft 57 is journaled at opposite ends of the housing 58 and has a nut 60 carried in threaded engagement thereon which is bolted or otherwise secured to the bottom face of the beam 46 and has a neck forming portion 61 extending through a slot 62 in the top of the housing 58 so that rotation of the shaft 57 moves the nut 60 axially thereof and adjusts the beam 46 in a direction laterally of the machine. The shaft 57 extends at the outer end of the housing 58 and carries a pair of sprockets 63 (FIGURE 4) which are connected by drive chain 64 with a pair of sprockets 65 on the drive shaft of a combination speed reducer and motor drive apparatus 66 adjustably mounted on the top of an upstanding bracket 67 on the end frame structure 14. A motion equalizing shaft 68 is journaled in suitable end bearing supports 70 and 70' in the ends of the beam 46 and supported intermediate thereof by suitable bearing assemblies 71. The shaft 68 carries at its opposite ends pinions 72 and 72' which engage with rack formations 73 and 73' supported on the top edge of bracket forming beam sections 74 and 74' extending above the frame plates 55 and 56 in parallel relation with the track forming rail members 53 and 54. The supporting beam 47 on the opposite side of the machine is constructed and mounted at its opposite ends in the same manner as the beam 46 being driven at the infeed end of the machine by the motor and gear reduction assembly 66' (FIGURE 1).

Each of the side guide assemblies 50 (FIGURES 1, 2, 3, 6 to 11 and 13) comprises a pair of side guide devices 80 and 80' which are connected for simultaneous movement longitudinally of the machine by a pair of cross bar or beam members 81 and 81'. The side guide devices 80 and 80' are of identical construction except for being rights and lefts and only one of these devices will be described in detail. The side guide device 80 (FIGURES 3, 6 and 7) comprises a carriage forming top structure 82, a sheet guiding and supporting finger structure 83 and connecting linkage structure 84 which depends from the carriage structure 82 and supports in suspended relation thereon the finger structure 83. The side edge guide and sheet supporting finger structure 83 comprises a vertically disposed sheet edge guiding plate 85 (FIGURES 6, 10 and 13) mounted on the inner end of an upwardly facing channel-shaped bracket 86 by pivot pin 87 extending through a block on the end of the bracket 86 and a pair of vertically spaced apertured mounting ears on the outside face of the plate 85. The plate 85 has a limited swinging movement on the vertically disposed pivot 87. The plate 85 has a beveled flange 88 on its top and side edges and is provided with a bottom slot 89 for accommodating a slidably mounted sheet supporting finger 90. The finger 90 constitutes the forward end of an elongate plate or bar member 91 and may have on its upper face a suitable sheet engaging pad 92 or the like. The bar member 91 is carried in the bottom of an elongate carriage 93. The carriage 93 is slidably mounted in a housing 94 which includes track forming, oppositely facing, spaced, parallel channels 95 and 96 which depend on opposite sides of an elongate supporting frame member or bracket 97 which is bolted or otherwise secured to the bottom face of the supporting bracket 86. The carriage 93 is provided with pairs of wheel forming, flanged rollers 98, 98' and 100, 100' (FIGURES 6, 10 and 11) which are mounted on the shaft 101 at the forward end of the housing 94 and on stub shafts 102 and 102' at the other end thereof and which ride in the tracks formed by the channels 95 and 96. The carriage 93 is reciprocated by an air cylinder 103 which is mounted in the housing 94. The cylinder 103 is pivotally mounted on the pin 104 fixed in the housing 94 and with its piston 105 connected to a bearing forming member 106 on the cross shaft 101 at the forward end of the housing 94. Operation of the air cylinder 103 will, of course, reciprocate the carriage 93 and retract or extend the finger 90 into and out of sheet supporting position relative to the edge guiding plate 85.

The bracket 86 is suspended on the lower ends of two pairs of links 107 and 108 (FIGURES 3 and 6) which constitute the supporting linkage 84. The links 107 are pivoted at 110 at their lower ends and at the outermost end of the bracket 86. The links 108 are connected at their lower ends to the bracket 86 by the pivot pins 111. The links 107 and 108 are pivotally connected at their upper ends to the carriage forming housing 82. The supporting carriage or housing 82 comprises a pair of lat-

erally spaced plates **112** and **113** disposed in parallel vertical planes and spaced apart a sufficient distance to accommodate between them the support beam **46**. Two pairs of flanged wheels or rollers **114** and **115** are mounted on cross shafts **116** and **117**, extending between the plates **112** and **113**, and spaced to ride on the top face of the beam **46**, as shown in FIGURES 3 and 6. A pair of flanged wheels or guide rollers **118** are mounted on stub shafts **120** near the bottom of the plates **112** and **113** and spaced so as to ride on the lower face of the beam **46**. The plates **112** and **113** have downwardly opening housings **121** and **122** (FIGURES 3, 6 and 13) mounted on their outer faces for receiving the upper ends of the pairs of links **107** and **108**, the latter being mounted in the housings on the supporting pins **123** and **124**. The links **107** and **108** are mounted so that they are inclined downwardly and in the direction of forward movement of the sheets with the rearward link of each pair thereof having its upper end resting against the rear walls **125** and **126** of the housings **121** and **122**. The housings **121** and **122** have inclined wall sections **127** and **128** at the forward side thereof which act as stop members to limit the forward movement of the linkage **84**. This arrangement permits considerable movement of the linkage **84** and avoids damage in the event the linkage or the finger assembly **83** is stuck by a sheet which is misaligned as the latter advances from the entrance end of the machine.

Each of the side guide supporting devices **80** at one side of the machine is provided with a locking mechanism (FIGURES 6, 7, 8 and 13) for securing each pair of the devices in position after they are adjusted on the supporting beams **46** and **47**. The cross shaft **117** (FIGURE 7) carries a pinion **130** which engages with a racket **131** mounted on the top face of the beam **46**. At its outer end the shaft **117** carries a sprocket **132** which is connected by the chain **133** with a sprocket **134** on a stub shaft **135**. The stub shaft **135** is journaled in a rectangular shaped supporting box or bracket **136** on the outer face of the plate **112** and carries a hand wheel **137** on its outer end which enables the operator to move the device **80** along the beam **46**. The inner end of the shaft **135** (FIGURE 8) is mounted in a fixed cylindrical bearing sleeve **138** which is threaded at **140** on the exterior surface of the outer end thereof and receives thereon a threaded locking nut forming member **141**, the latter being provided with a handle forming member **142** which may be turned to draw the nut **141** against the hub of the adjacent sprocket **134** so as to frictionally lock the sprocket **134** against rotational movement. Unlocking is accomplished by reverse rotation of the handle **142** to back off the nut **141** and release the sprocket **134** for rotating by turning the hand wheel **137**.

The devices **80** and **80'** are connected in pair relation by the cross bars or beams **81** and **81'** which are arranged in side-by-side sliding relation transversely of the machine with their ends seated in a guideway forming slot **143** and **143'** in the housing for each of the devices **80** and **80'**. The respective cross bars **81** and **81'** are each secured at the one end thereof to its associated device **80** and **80'** and lateral movement of the beams **46** and **47** toward and from each other will result in relative sliding movement of the cross bars **81** and **81'** so that the devices **80** and **80'** of each pair thereof are maintained in transverse alignment and moved longitudinally of the machine simultaneously for adjustment to accommodate the length of sheet being handled in the machine. The machine is provided with a backstop assembly **144** (FIGURE 4) and an end stop assembly **145** (FIGURES 5 and 14). These backstop and end stop mechanisms may be of the type shown, for example, in my Patent No. 3,020,810, dated February 15, 1962. The backstop mechanism which is indicated at **144** is mounted at the top of a vertically disposed backstop plate **146** on the vertical face of the end frame **14** at the entrance end of the piler. The backstop mechanism **144** is below the entrance plane of the sheets which is determined by the sheet supporting entrance rollers **147** and **147'** (FIGURE 4), the latter being journaled in pairs of bearing forming support brackets **148** and **148'** carried on a cross beam **149** on the end frame **14**.

The end stop assembly **145** (FIGURES 5 and 14) is supported for longitudinal adjustment on the conveyor units **17** and **18** so as to adapt the machine for the handling of sheets of varying length. The end stop assembly **145** comprises an end stop mechanism **150** which is suspended beneath the rail units **17** and **18** by two pairs of parallel links **151** and **151'** depending on opposite sides of a traveling carriage **152** which spans the conveyor rail units **17** and **18** and is supported thereon for adjustment longitudinal of the machine. The carriage **152** is in the form of a rectangular frame with a top cross beam **153** and side assemblies **154** and **154'** which side assemblies are identical except for being rights and lefts and only one thereof will be described. The assembly **154** (FIGURE 15) comprises spaced, parallel, vertically disposed inner and outer plate members **155** and **156** connected by a cross plate **157** at the top edges which is bolted or otherwise fastened to the end of the cross beam **153**. The two vertical plates **155** and **156** form a housing which is partially closed at the ends of the shorter outer plate **156** (FIGURE 14) and which is open at the bottom to accommodate movement of the pair of links **150**, the latter having their upper ends supported between the plates **155** and **156** on the pivots **158** and **158'** which extend between the two plates **155** and **156**. The bars forming links **151** are normally positioned at an incline of approximately 15° from the vertical by inclined limit stop plates **159** and movement in the opposite direction is limited by an inclined end plate **159'** so that the end stop mechanism **150** has a limited range of movement in an upward and forward direction relative to the plane of travel of the sheets which are being handled. The inner plate **155** carries a pair of flanged wheels **160** and **160'** which are mounted in longitudinal alignment on longitudinally spaced stub shafts **161** and **161'**. The wheels **160** and **160'** ride on a track formed by the lower flange of a longitudinally extending channel **162** which is mounted in outwardly opening relation in a larger channel member **163**, also opening outwardly and secured in any desired manner on the outer side wall **164** of the housing for the rail unit **17**. The channel **163** provides a housing for an endless chain **165** which is supported on parallel, vertically spaced top and bottom rails **166** and **167** which are in turn mounted on the upper and lower flanges, respectively, of the channels **162** and **163**. A bracket **168** attached to the inside wall of the lower margin of the plate **155** forms a connection between the chain **165** and the carriage assembly **154**. The frame assembly **154'** (FIGURE 5) at the other side of the machine is constructed in a similar manner and supported on the side face of the conveyor unit **18** by similar channels **162'** and **163'**. The chains **165** and **165'** are supported in the channels **163** and **163'** in an identical manner and are connected in driven relation with a cross drive shaft **170** (FIGURES 12 and 14) at the leading end of the machine. The chain **165** is mounted at the one end of the channel **163** on a sprocket **171** (FIGURE 14) which is supported on the stub shaft **172** in fixed position in the channel. At the other end of the channel **163** the chain **165** is mounted on an idler sprocket **173** (FIGURES 3 and 14) on a stub shaft **174** mounted in a slidably supported bracket **175** which is on one end of a slidably mounted pin **176** having a nut **177** on its free end which extends beyond the end of the channel **163** and carrying a compression spring **178** extending between the nut **177** and the end member **180** of the channel **163** so as to apply tension to the chain **165**. The stub shaft **172** extends beyond the outer face of a channel **163** and carries a sprocket **181** which is connected by the chain **182** with a sprocket **183** on the trans-

verse drive shaft 170. The upper run of the chain 182 is engaged by a slack take-up sprocket 184 (FIGURES 12 and 16) rotatably supported on one end of a bracket arm 185. The bracket arm 185 is connected by pivot 186 at its other end to a fixed bracket 187 extending from a vertical wall of the post-like end frame member 188 which supports the horizontal frame plate 56. The bracket arm 185 carries a center pin 190 which engages in a forwardly opening slot 191 in the free end of a bracket 192 extending from the end of the channel 163. The lower run of the chain 182 is adapted to engage, when it is in lowered position, with a take-up sprocket 193 rotatably mounted in a bracket 194 extending from the rear side wall of the frame post 188. A corresponding drive connection with shaft 170 is provided at the end of the channel 163' at the other side of the machine. The drive shaft 170 is journaled in the post forming portions 188 and 188' extending upwardly on the top portion of the end frame structure 15. A sprocket 194 is carried on one end of the shaft 170 and connected by a drive chain 195 with a sprocket 196 on the power shaft 197 of a drive motor and gear reduction unit 198 supported on the bracket 200 on the end frame 15. This arrangement enables the units 17 and 18 to be raised and lowered, within predetermined limits, without interrupting or disconnecting the drive for the chains 165 and 165'.

A pass-through roller 201 (FIGURE 5) is mounted at the forward or exit end of the machine which is mounted on bearing supporting brackets 202 and 202' and which supports the sheet when, for any reason, it is desired to forward a sheet to other equipment and not have it deposited on the pile 11. This, of course, requires the use of an end stop assembly 145 which is capable of being moved out of the path of travel of the sheet.

In using the machine which is illustrated, the conveyor units 17 and 18 are adjusted vertically to accommodate the thickness of the sheet which is being handled, there being, of course, considerable variation in the thickness of material and depth of corrugation in corrugated sheet material. The end stop assembly 145 is adjusted longitudinally of the piler to accommodate the length of sheet it is desired to pile, the drive connection between the chains which move the carriage 152 for the end stop assembly 145 automatically adjusts itself with the raising and lowering of the conveyor rails so that these adjustments may be made quickly and without any difficulty. The side guide mechanisms 150 are adjusted both longitudinally of the machine and laterally thereof. Longitudinal adjustment is accomplished by rotation of the hand wheels 137 and each pair of side guide assemblies 83 is adjusted so that the side edges of the sheet are guided by the vertical plates 85 regardless of the center line on which the sheets are delivered at the entrance end of the machine. The lateral adjustment of the assemblies 83 is accomplished by operating the drive assemblies 66 and 66' so as to position the supporting beams 46 and 47 at the desired location relative to the longitudinal center line of the machine. The sheet supporting lifts 90 of the assemblies 83 are operated as required through operation of the air motors 103. If stagger piling is desired, the machine is equipped with end stop and backstop apparatus 144 and 145 which includes stagger piling devices for accomplishing this operation. Also, the end stop mechanism 145 is arranged so that the bumper pad may be moved out of the path of a sheet when it is desired to advance the sheet through the machine, as for example, when a sheet reaches the machine which is too long for piling thereby.

I claim:

1. A piler machine for metal sheets comprising a rail-type overhead electromagnetic conveyor mounted at opposite ends on spaced upright end frames and having traveling belts for advancing on the bottom face thereof successive sheets which are delivered to an entrance end of the conveyor and advanced to a piling area between said end frames, an end stop device for arresting the forward travel of the sheets when they are released by the conveyor, and sheet side guide mechanism, said side guide mechanism comprising parallel support beams extending longitudinally of the conveyor and mounted for lateral adjustment, a plurality of side guide assemblies mounted on said support beams for adjustment longitudinally of the conveyor, each of said side guide assemblies comprising a pair of carriages each mounted on one of said support beams and secured to a transversely extending bar member, said bar members being slidably connected to each other so that each pair of carriages is movable as a single unit longitudinally of the machine, each of said carriages having pairs of depending link bars pivoted thereto at their upper ends for swinging movement in a longitudinal path, a supporting frame pivoted to the lower ends of said link bars, stop means limiting the swinging movement of the link bars, a vertically disposed side guide plate mounted on the inner end of each supporting frame and a carriage mounted on said supporting frame for sliding movement in a direction extending transversely of the conveyor and having an inner end portion adapted to move inwardly beneath said vertical guide plate so as to form a finger-like support for the sheets when they are freed from the conveyor and drop towards the pile.

2. A piler machine for metal sheets comprising a rail-type overhead electromagnetic conveyor mounted at opposite ends on spaced upright end frames and having traveling belts and electromagnets for carrying on the bottom face successive sheets which are delivered to an entrance end thereof for advance to a piling area between said end frames, an end stop device adjustably mounted on the conveyor for arresting the forward travel of the sheets when they are released by the conveyor, and sheet side guide mechanism, said side guide mechanism comprising parallel support beams extending longitudinally of the conveyor and mounted at opposite ends on said end frames, means for adjusting said support beams laterally of the conveyor, a plurality of side guide assemblies mounted on said support beams for adjustment longitudinally of said conveyor, each of said side guide assemblies comprising a pair of carriages mounted on said support beams and each secured at one end of a transversely extending bar member, the bar member of each carriage being slidably connected to the bar member of the other carriage of each pair thereof so that the carriages of each pair thereof are movable longitudinally of the machine as a single unit, each of said carriages having a pair of depending link bars pivotally connected thereto at their upper ends for swinging movement in a longitudinal plane, an elongate frame pivoted to the lower ends of said link bars, means for limiting the swinging movement of the link bars, a vertically disposed side guide plate mounted on a vertical pivot at the inner end of said elongate frame and a sheet supporting finger mounted on said elongate frame for sliding movement in a direction extending transversely of the conveyor and beneath said side guide plate with the inner end thereof adapted to form a temporary support for the sheets when they are freed from the conveyor and drops towards the pile.

3. A piler as recited in claim 2, and an hydraulic motor mounted on said elongate frame with its piston connected to said sheet supporting finger for reciprocating said finger between extended and retracted positions.

4. A sheet piler machine comprising a rail-type overhead electromagnetic conveyor mounted on spaced upright end frames and having power driven belts and electromagnets for holding sheets on the bottom face of the conveyor so as to deliver the sheets to a piling area be-

tween said end frames, an end stop device for arresting the forward travel of the sheets when they are released by de-activating the conveyor magnets and sheet side guide mechanism which comprises parallel support beams extending longitudinally of the conveyor and mounted on said end frames, a plurality of side guide assemblies mounted on said support beams for adjustment longitudinally of the conveyor, each said side guide assembly comprising a pair of carriages mounted in oppositely disposed relation on said beams and each carriage secured to a transversely extending bar member, the bar members being connected to each other so that each pair of carriages may be moved longitudinally of the machine as a unit, each of said carriages having depending link bars pivoted thereto at the upper ends thereof for movement in a longitudinal and vertical plane, a side guide plate supporting frame pivoted to the lower ends of said link bars, stop means limiting the swinging movement of the link bars, and a vertically disposed guide plate pivotally mounted on the inner end of said plate supporting frame.

5. A sheet piling machine comprising a rail-type overhead electromagnetic conveyor mounted on spaced upright end frames and having power driven belts and electromagnets for holding sheets on the bottom face of the conveyor so as to deliver the sheets to a piling area between said end frames, an end stop device for arresting the forward travel of the sheets when they are released by de-activating the conveyor magnets and sheet side guide mechanism which side guide mechanism comprises parallel support beams extending longitudinally of the conveyor and mounted for adjustment laterally of the conveyor, a plurality of side guide assemblies mounted on said support beams for adjustment longitudinally of the conveyor, each said side guide assembly including a pair of carriages mounted in oppositely disposed relation on said beams and each carriage secured to a transversely extending bar member, said bar members of each pair thereof being connected to each other so that each pair of carriages are movable longitudinally of the machine as a unit, each of said carriages having depending link bars pivoted thereto at the upper ends thereof for movement in a longitudinal path, a supporting frame pivoted to the lower ends of said link bars, and a vertically disposed side guide plate mounted on said supporting frame.

6. A sheet piling machine as recited in claim **5**, and means on said side guide assemblies for manually moving said carriages longitudinally of said support beams.

7. A sheet piling machine as recited in claim **5**, and a rack member extending longitudinally of one of said support beams, a pinion journaled in one of said carriages and engaging said rack member, and manually operable drive means on said one carriage for rotating said pinion.

8. A sheet piling machine as recited in claim **7**, and a locking device on said one carriage associated with said manually operable drive means for locking said one carriage against movement on the associated support beam.

9. A machine for piling metal sheets comprising a rail-type overhead electromagnetic conveyor mounted on spaced upright end frames and having power driven belts and electromagnets positioned for holding on the bottom face of the belts successive sheets which are delivered to an entrance end thereof, an end stop device for arresting the forward travel of the sheets when they are released by deactivating the electromagnets and side guide mechanism for guiding the side edges of the sheets as they drop onto a pile between said end frames which side guide mechanism comprises parallel support beams extending longitudinally on opposite sides of the conveyor, a plurality of side guide assemblies mounted on said support beams for adjustment longitudinally thereof, each of said side guide assemblies comprising a pair of carriages mounted in oppositely disposed relation on said support beams and secured to a frame forming transversely extending member so that the carriages of each pair thereof are movable longitudnally of the machine as a single unit, each of said carriages having depending members for supporting a side guide frame at their lower ends, a vertically disposed side guide plate mounted on a vertically extending pivot on the inner end of said supporting frame and a retractable and extensible finger-like support for the sheets mounted on said supporting frame for catching the sheets when they are freed from the conveyor and drop towards the pile.

10. A machine as recited in claim **9**, and said support beams having carriage forming members at their opposite ends and track forming members on said upright end frames extending transversely of the machine for slidingly receiving said carriage forming members.

11. A machine as recited in claim **10**, and a transversely extending drive shaft journaled in said end frame at each side of the machine, a traveling nut on said drive shaft having a connection with the end of a support beam and power means for rotating said drive shaft to adjust the lateral position of the support beam.

12. A machine as recited in claim **10**, and said support beams each having a longitudinally extending motion equalizing shaft journaled thereon, pinions carried on the ends of said motion equalizing shaft and engaging transversely extending rack members mounted on said upright end frames.

13. A machine as recited in claim **12**, and transversely extending drive shafts journaled on said end frame at one end of said support beams, a traveling nut on each of said drive shafts and connected to a support beam, and drive means for said transversely extending drive shafts.

14. A machine for piling metal sheets comprising an overhead electromagnetic conveyor mounted at opposite ends on spaced upright end frames, said conveyor having an elongate rail-like frame, electromagnets, and power driven belts supported on end pulleys for receiving on the bottom face thereof successive metal sheets which are delivered to an entrance end of the conveyor and held on the belts by the electromagnets for advance to a piling area between said end frames, means for adjusting the vertical position of said overhead conveyor frame, an end stop apparatus mounted for longitudinal adjustment on said overhead conveyor frame, which end stop apparatus comprises track forming members extending longitudinally on said overhead conveyor frame, a carriage movably mounted on said track forming members, a drive chain mounted on sprockets at opposite ends of said track forming members and connected to said carriage, one of said sprockets being mounted on a cross shaft, a driven cross shaft mounted in fixed position on the one upright end frame, a sprocket on said driven cross shaft, a sprocket on said first mentioned cross shaft, a chain connecting said last mentioned sprockets, and means for automatically taking up the slack in said last mentioned chain as the overhead conveyor frame is raised or lowered in adjusting the vertical position thereof.

15. A machine for piling metal sheets comprising an overhead rail-like conveyor mounted at opposite ends on spaced upright end frames and having an elongate frame, electromagnets, and power driven belts supported on end pulleys on said elongate frame for receiving on the bottom face thereof successive metal sheets which are held thereon by the electromagnets for advance to a piling area between said end frames, means at opposite ends of said conveyor for adjusting the vertical position of said conveyor frame, and an end stop apparatus mounted for longitudinal adjustment on said conveyor frame, which end stop apparatus includes a carriage movably mounted on track forming members extending longitudinally on said conveyor frame, a carriage positioning chain mounted on sprockets at opposite ends of said track forming members and connected to said carriage, one of said sprockets being mounted on a cross shaft, a

driven cross shaft mounted in fixed position on the one upright end frame, a drive connection between said cross shafts which includes a drive chain extending between said cross shafts which chain has a substantial amount of slack in one position of the conveyor frame, and means for automatically taking up the slack in said last mentioned chain as the conveyor frame is raised in adjusting the vertical position thereof.

16. A piling machine as recited in claim 15, and said means for automatically taking up the slack in said drive chain being actuated by vertical movement of said conveyor frame.

17. A piling machine as recited in claim 15, and said means for automatically taking up the slack in said drive chain including a bracket member extending from the end of said conveyor frame, an arm pivotally connected intermediate its ends on said bracket member, said arm having its outermost end pivotally connected to the associated end frame and an idler sprocket journaled on its opposite end and engaging said drive chain between said cross shafts.

18. A piler machine for metal sheets comprising an overhead conveyor mounted at opposite ends on spaced upright end frames and having an elongate rail-like frame, electromagnets therein and traveling belts supported on end pulleys for receiving on the bottom face thereof successive sheets which are held thereon by the electromagnets and advanced to a piling area between said end frames where they are released for piling, means for adjusting the vertical position of said conveyor frame, an end stop apparatus mounted for longitudinal adjustment on said overhead conveyor frame, which end stop apparatus comprises a carriage and supporting track forming members extending longitudinally on said conveyor frame, a position adjusting chain mounted on sprockets on cross shafts journaled in said conveyor frame at opposite ends of said track forming members, a driven cross shaft mounted in fixed position in the one upright end frame beyond the end of the conveyor frame, a sprocket on said driven cross shaft, a sprocket on the cross shaft at the end of said conveyor frame which carries the adjusting chain, a drive chain connecting said last mentioned sprockets and having a substantial amount of slack in the lowered position of the conveyor frame, and means for taking up the slack in said drive chain which is responsive to movement of the overhead conveyor frame as said conveyor frame is raised or lowered in adjusting the vertical position thereof.

19. A metal sheet piling machine comprising an overhead conveyor mounted at opposite ends on spaced upright end frames, said overhead conveyor having an elongate rail-like frame, power driven belts supported on end pulleys in said rail-like frame and cooperating electromagnets for holding sheets on the bottom face thereof and for delivering the sheets to a piling area between said end frames, means for adjusting the vertical position of said overhead conveyor frame, an end stop apparatus mounted for longitudinal adjustment on said overhead conveyor frame, which end stop apparatus comprises a carriage track forming members extending longitudinally on said overhead conveyor frame for supporting said carriage, means for adjusting the position of the carriage longitudinally of said conveyor frame, support members depending from said carriage, an end stop support frame mounted on the lower ends of said depending support members, an end stop device mounted on said end stop support frame which is normally positioned in the path of the sheets so as to stop the sheets for deposit by gravity in the piling area and including means which is adapted to be lowered to an inoperative out-of-the-way position below the normal path of the sheets so as to permit sheets to advance past the piling area and pass out of the machine and a sheet supporting roller positioned on the adjacent end frame for supporting sheets which are advanced past the piling area and the end stop device so that they move across said end frame and out of the machine.

References Cited by the Examiner

UNITED STATES PATENTS

2,761,682	9/1956	Buccicone	271—86
3,126,657	3/1964	Hajos	271—71 X

SAMUEL F. COLEMAN, *Primary Examiner.*

RICHARD E. AEGERTER, *Examiner.*