April 24, 1956 S. E. SCHROEDER 2,742,827

AUTOMATIC PARTITION STRIP NESTING MACHINE

Filed June 8, 1950 9 Sheets-Sheet 1

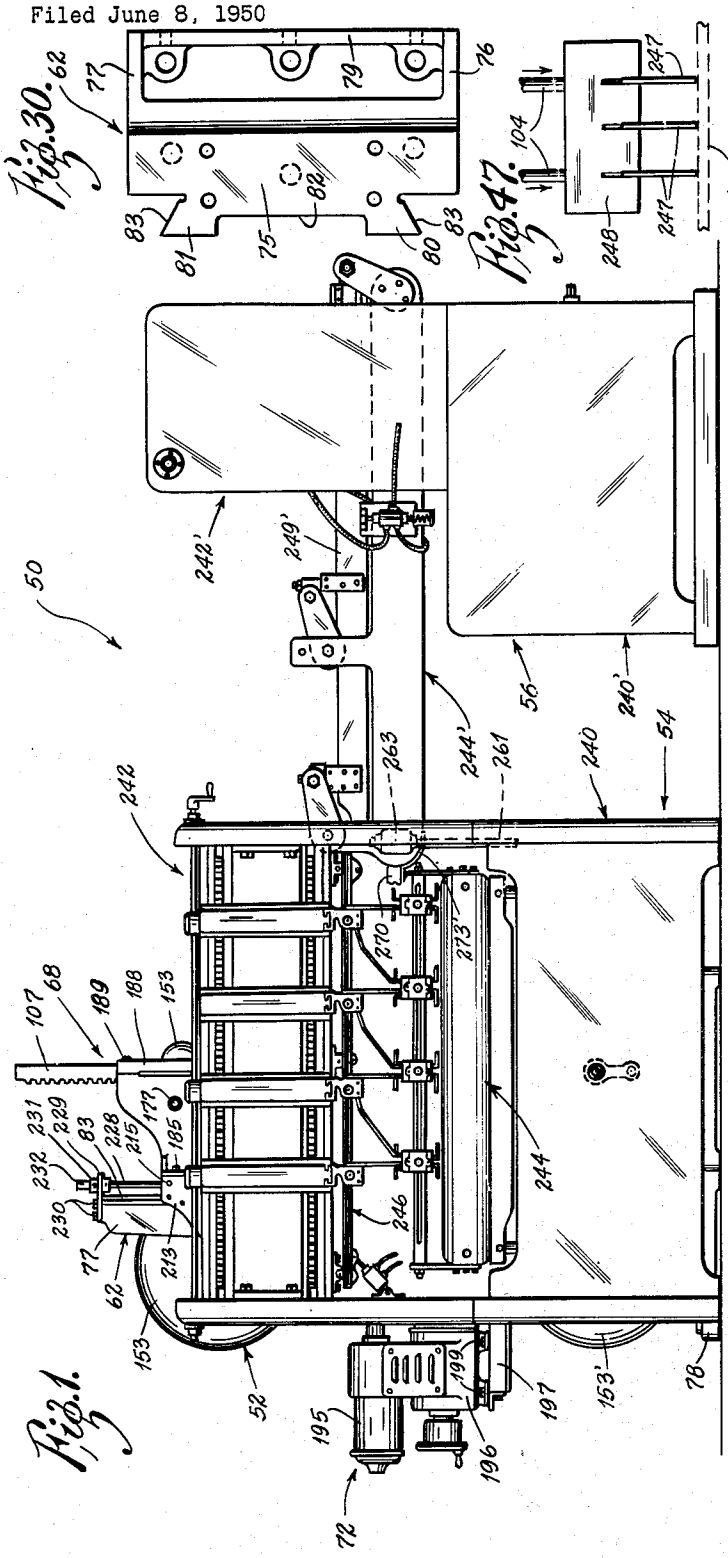


Fig. 1.

Fig. 30.

Fig. 47.

Fig. 46.

Fig. 45.

Fig. 44.

Fig. 43.

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AUTOMATIC PARTITION STRIP NESTING MACHINE

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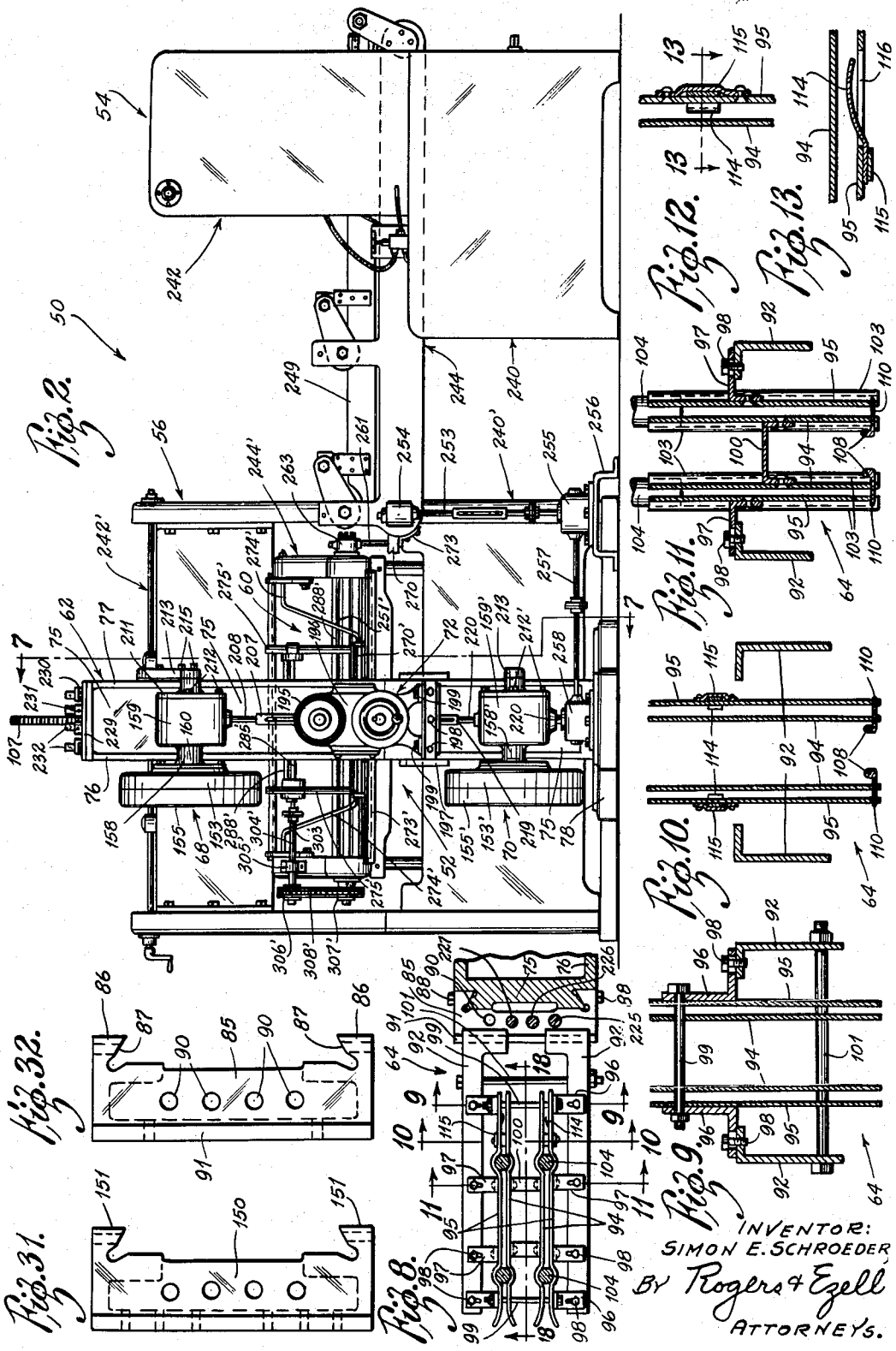


Fig. 2.

Fig. 12.

Fig. 13.

Fig. 11.

Fig. 10.

Fig. 9.

Fig. 32.

Fig. 31.

Fig. 8.

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AUTOMATIC PARTITION STRIP NESTING MACHINE

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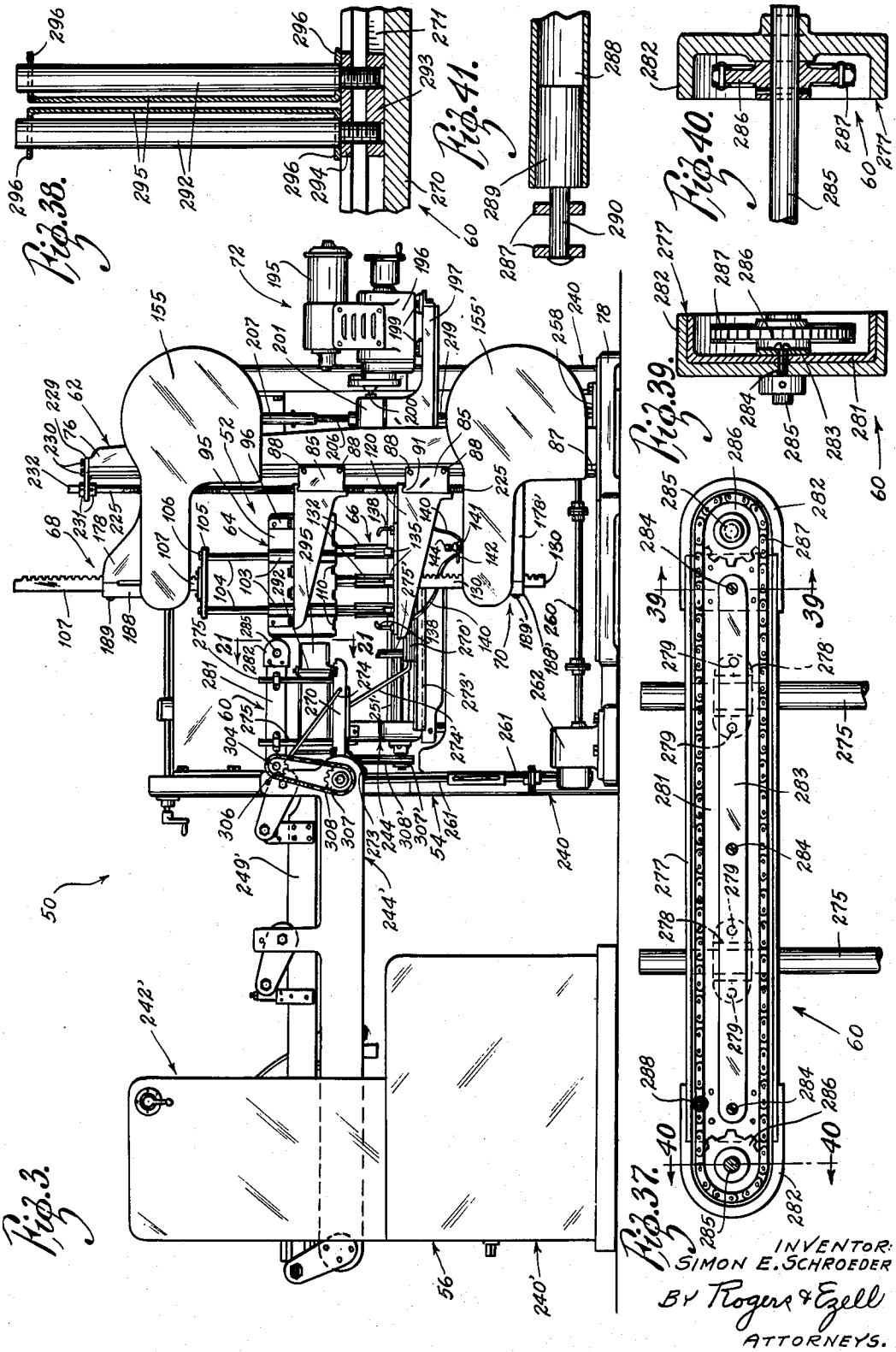


Fig. 3.

Fig. 37.

Fig. 38.

Fig. 39.

Fig. 40.

Fig. 41.

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Fig. 1A.

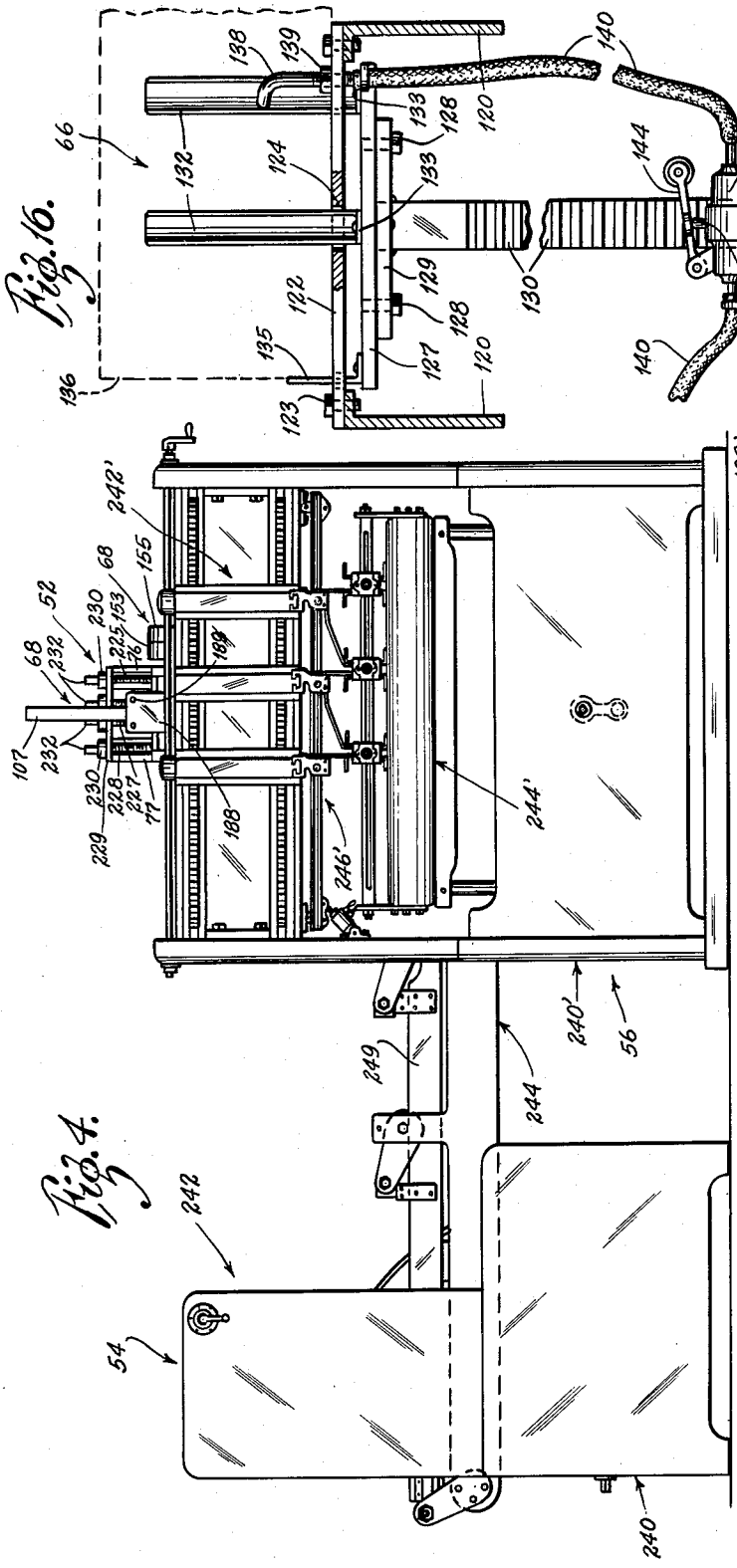
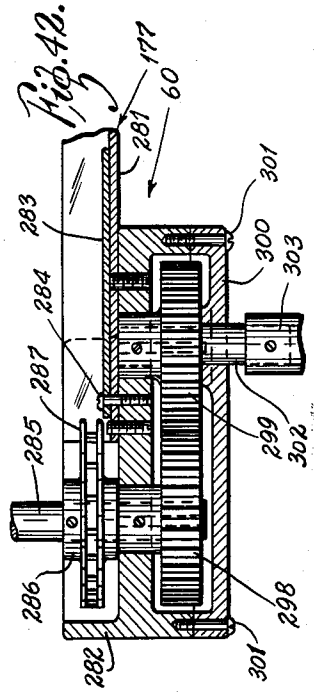


Fig. 4A.



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AUTOMATIC PARTITION STRIP NESTING MACHINE

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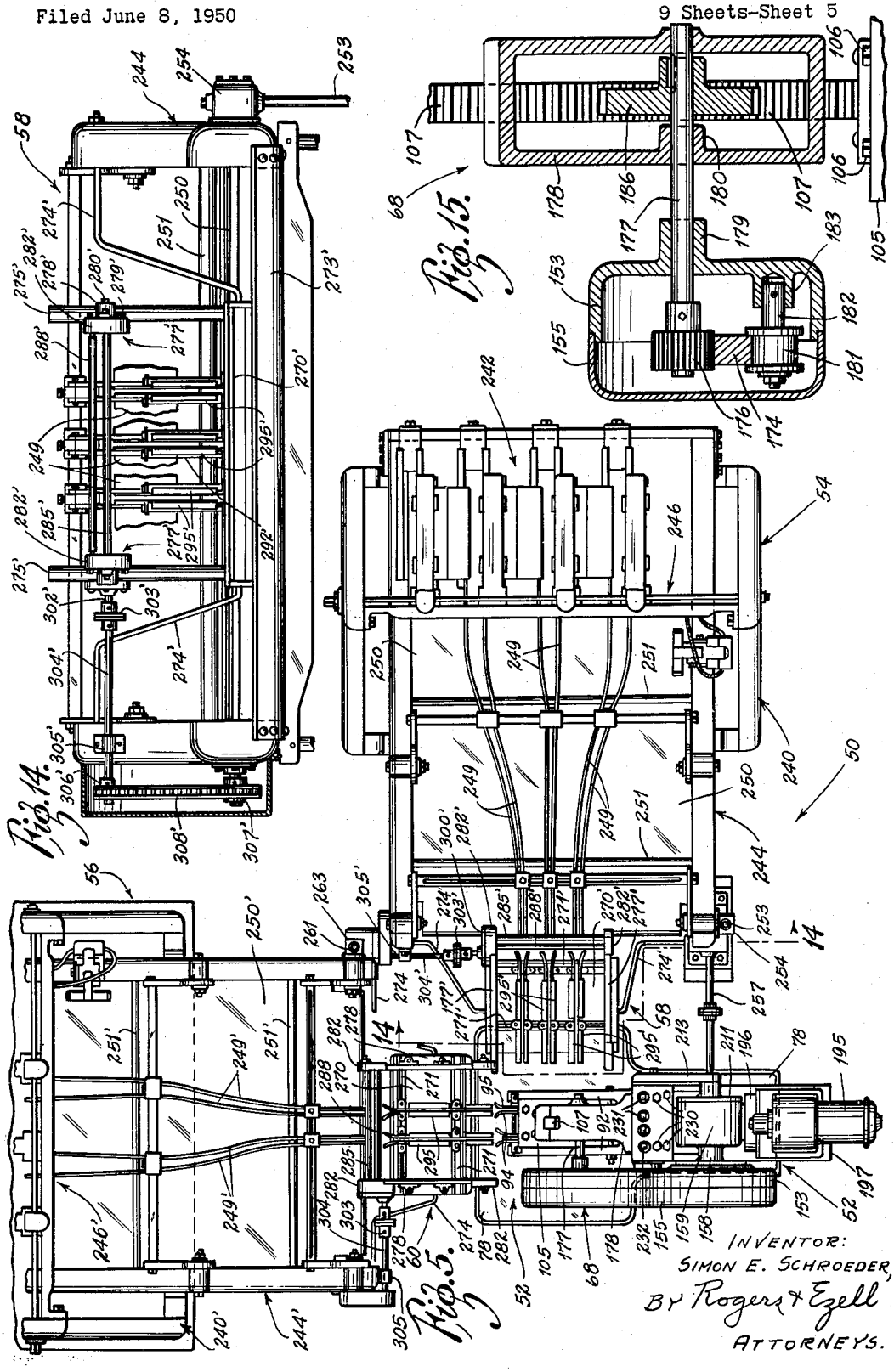


Fig. 14.

Fig. 15.

Fig. 5.

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AUTOMATIC PARTITION STRIP NESTING MACHINE

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Fig. 6.

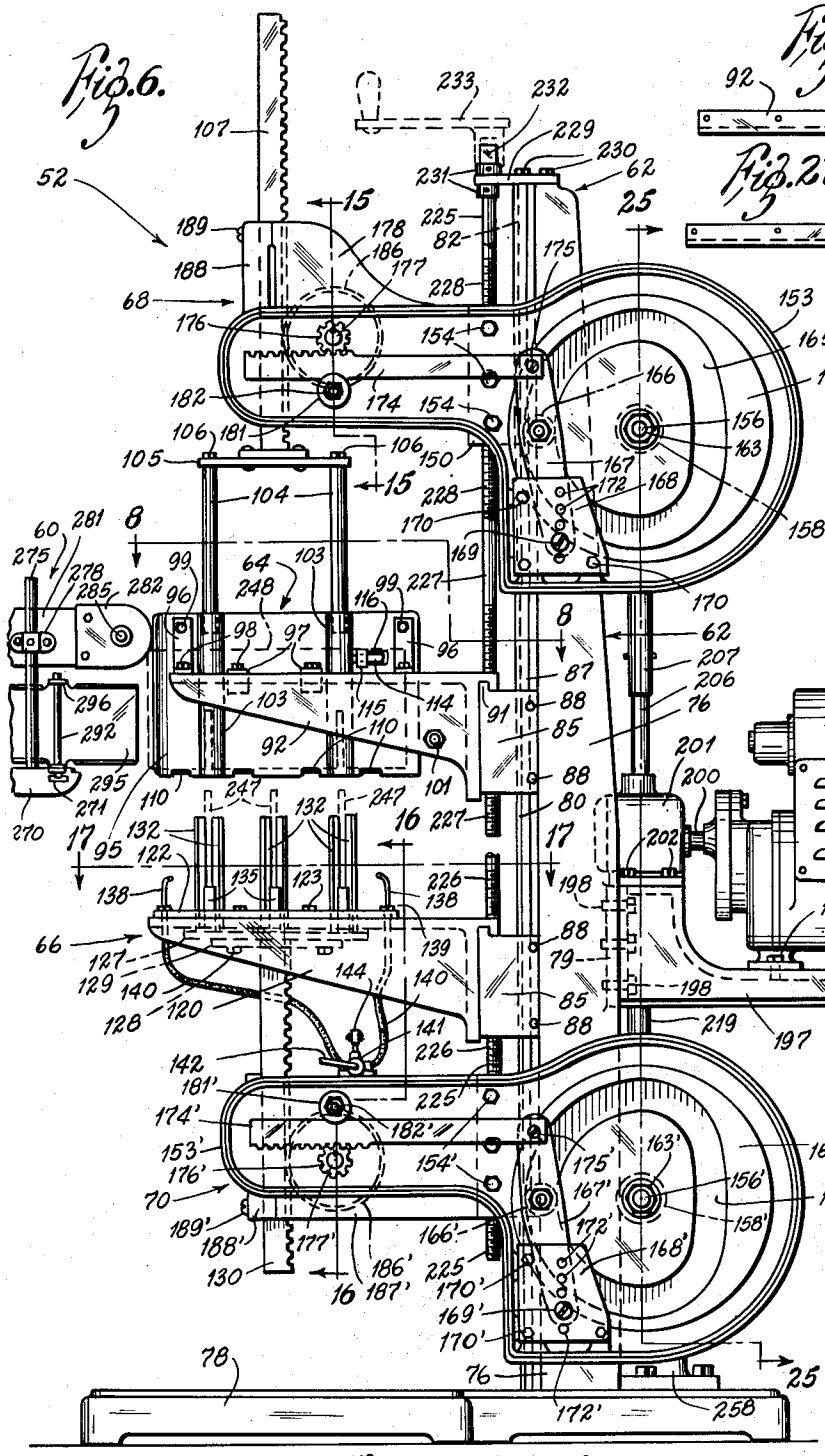


Fig. 26.



Fig. 27.

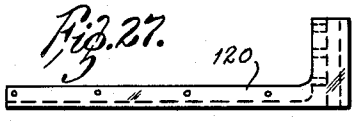


Fig. 28.

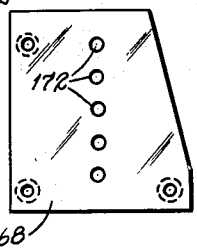
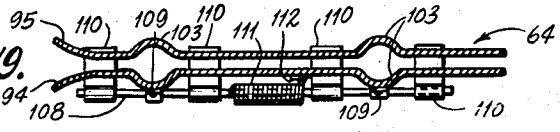


Fig. 29.



Fig. 19.



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AUTOMATIC PARTITION STRIP NESTING MACHINE

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Fig. 7.

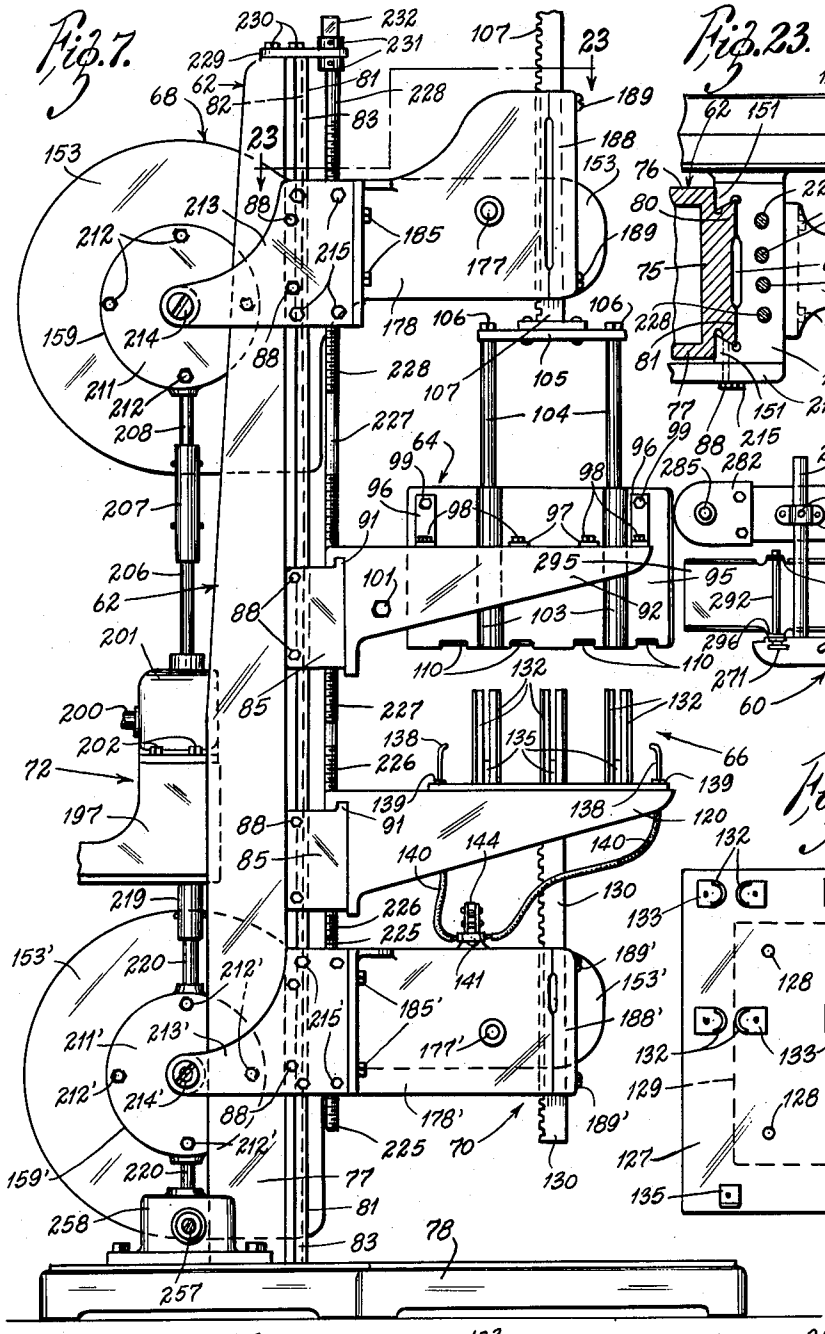


Fig. 23.

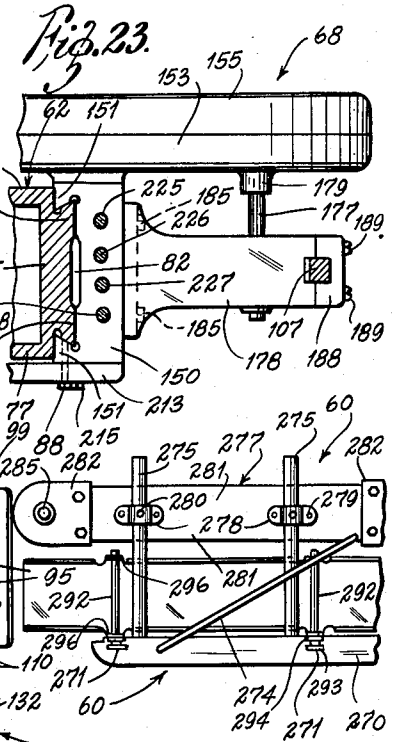


Fig. 24.

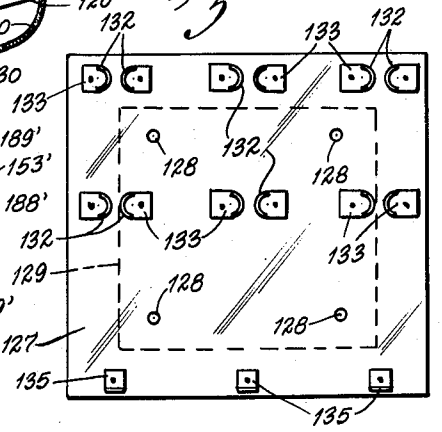


Fig. 18.

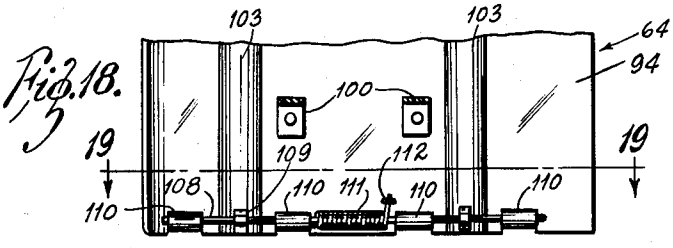
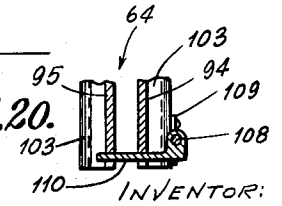


Fig. 20.

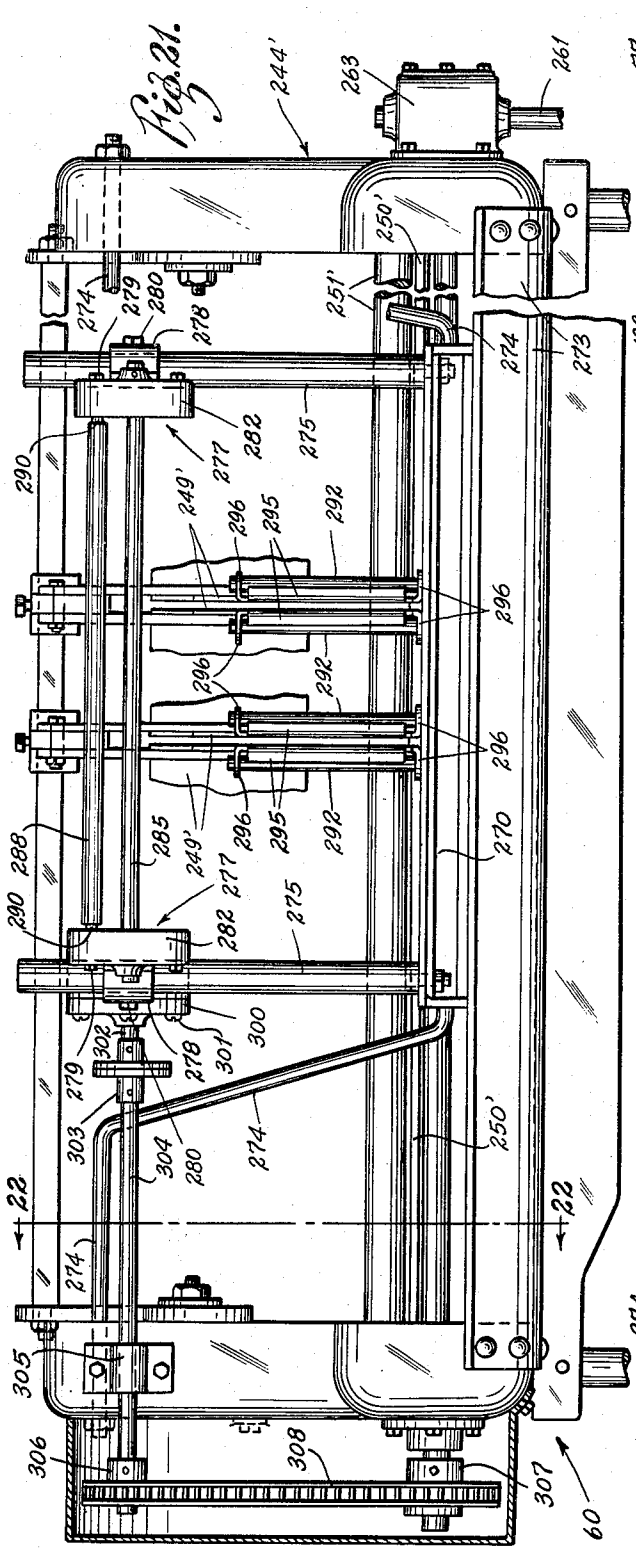


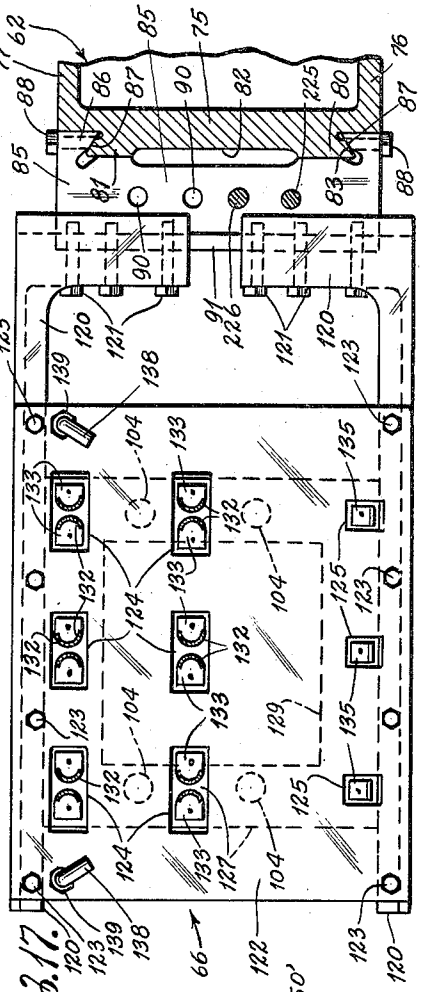
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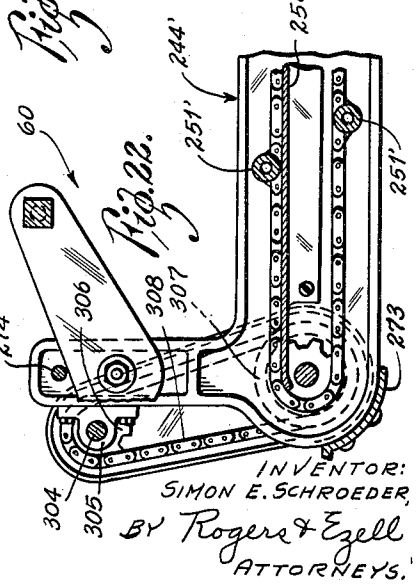
April 24, 1956 S. E. SCHROEDER 2,742,827

AUTOMATIC PARTITION STRIP NESTING MACHINE

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AUTOMATIC PARTITION STRIP NESTING MACHINE

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Fig. 33.

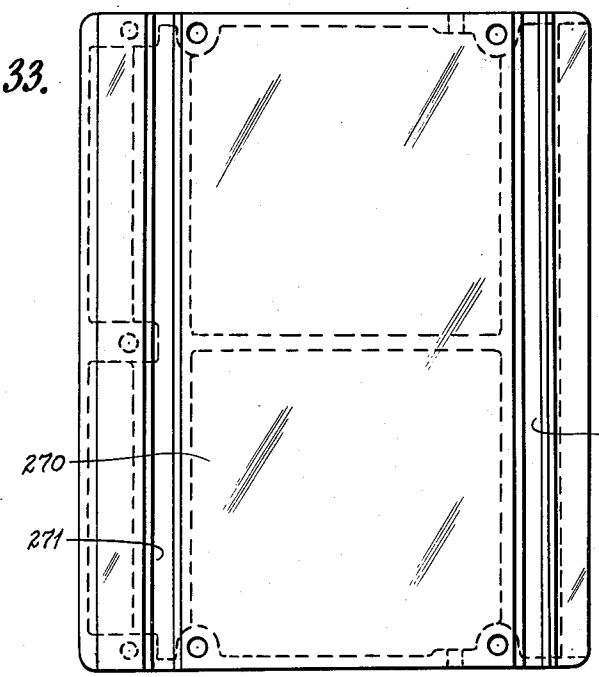


Fig. 34.

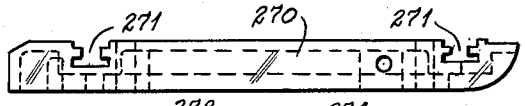


Fig. 35.

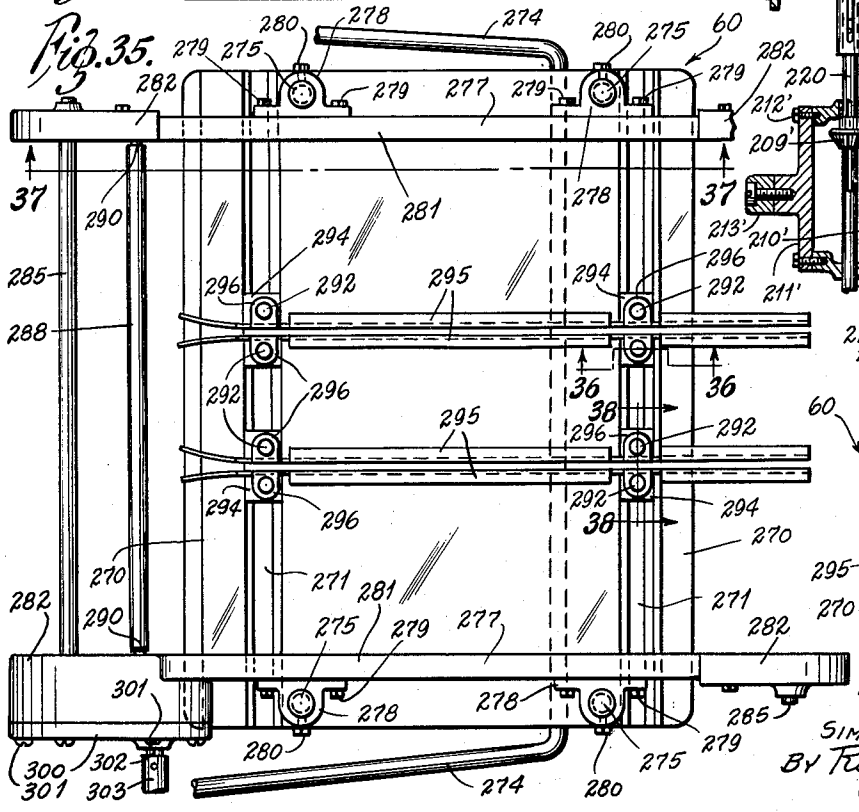


Fig. 25.

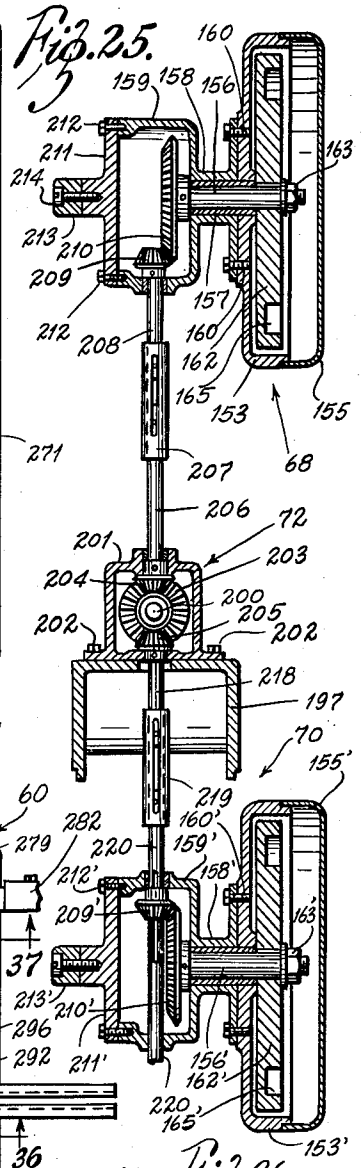
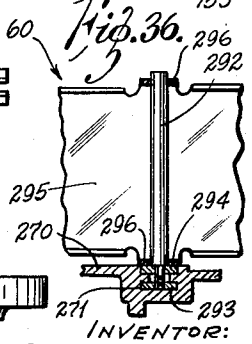


Fig. 36.



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United States Patent Office 2,742,827 Patented Apr. 24, 1956

2,742,827

AUTOMATIC PARTITION STRIP NESTING MACHINE

Simon E. Schroeder, Oshkosh, Wis., assignor, by mesne assignments, to Clinton Foods Inc., New York, N. Y., a corporation of Delaware

Application June 8, 1950, Serial No. 166,863

18 Claims. (Cl. 93—37)

The present invention relates generally to partition forming machines, and more particularly to an automatic partition strip nesting or assembling machine which will handle preformed longitudinal and transverse partition strips of various sizes and of various types of material to assemble them into completed partition assemblies or carton dividers.

The partition forming industry has long required a partition forming machine of the automatic type which will not only efficiently handle partition strips of relatively narrow gauge, but will also efficiently handle corrugated paperboard which is relatively thick and crushable. Automatic partition forming machines presently in use in the making of paperboard partitions of compressed stock of relatively narrow gauge cannot handle corrugated paperboard without seriously damaging this crushable material. Presently used semiautomatic machines for assembling preformed corrugated partition strips are extremely slow and frequently damage the stock resulting in machine stoppages and damaged partitions.

In brief, the present improved automatic partition strip nesting machine incorporates two right angularly disposed automatic partition strip feeding mechanisms, two partition strip conveyor mechanisms, one being at the discharge end of each feeding mechanism, and a nesting mechanism located at the focal point of the two conveyor mechanisms which receives edgewise disposed partition strips from the conveyor mechanisms and positively nests them to form partition assemblies. The two automatic partition strip feeding mechanisms are identical with each other and with the corresponding parts of the automatic partition strip feeding mechanism fully disclosed in the applicant's copending application, Serial No. 150,442, filed March 18, 1950, such corresponding parts of said copending application being fully incorporated herein by reference. The present machine requires that preformed partition strips be stacked in the hoppers of the feeding mechanisms, but it is fully automatic in its handling of such stacked partition strips to form completed partitions. The several component mechanisms of the instant machine are adjustable so that partition strips of various lengths, widths, and thicknesses may be handled.

Therefore, an object of the present invention is to provide an automatic partition strip nesting machine which will efficiently and speedily handle preformed partition strips of corrugated paperboard, or of any other paperboard or like material, to produce undamaged partition assemblies at a fast rate.

Another object is to provide a novel and improved automatic partition strip nesting machine which is of high elasticity in being widely adjustable in its several component mechanisms.

Another object is to provide an improved automatic partition strip nesting machine which is positive in its nesting or assembling action so that, with any particular selected adjustments, the nesting actions are identical to provide fully nested partitions.

Another object is to provide an improved automatic partition strip nesting machine which will assemble crushable corrugated partition strips at high speeds without damage to the individual partition strips and without damage to the assembled partitions, and which will also handle partition strips of other materials in like manner.

Another object is to provide an improved automatic partition strip nesting machine which is fully automatic in the nesting of supplied preformed partition strips of any selected material.

Another object is to provide an improved automatic partition strip nesting machine which incorporates novel nesting mechanism for moving a superposed group of edgewise partition strips into nesting relation with another group of edgewise partition strips disposed at right angles thereto which is positive in its assembling action.

Other objects are to provide an improved automatic partition strip nesting machine which, although massive, is of relatively simple construction and of relatively simple operation, which is capable of attaining and maintaining a high efficient speed of operation, which is rugged in its massiveness, thereby reducing maintenance to a minimum including maintenance required in the replacing of moving parts, which is multi-adjustable throughout its component mechanisms in a manner rendering adjustments easily accessible and speedy so that lost time caused by a changeover to accommodate a different size or type of partition strip is reduced to a bare minimum which is a positive improvement over existing partition forming machines, which incorporates a minimum number of moving parts thereby reducing breakdown possibilities, which, in comparison with other partition forming machines, is relatively inexpensive, which pushes groups of partition strips into the nesting zone, and which otherwise overcomes the deficiencies existing in partition forming machines presently employed by the industry.

The foregoing and other objects and advantages are apparent from the following description taken with the accompanying drawings, in which:

Fig. 1 is a rear elevational view of an automatic nesting machine for preformed partition strips incorporating the concepts of the present invention, some of the elements which would appear in the far distance being omitted for clarity (sheet 1);

Fig. 2 is a right hand elevational view thereof, some of the elements in the background being omitted for clarity (sheet 2);

Fig. 3 is a front elevational view thereof, the cover for a sprocket chain being omitted (sheet 3);

Fig. 4 is a left hand elevational view thereof, some of the elements in the far distance being omitted for clarity (sheet 4);

Fig. 5 is a top plan view thereof (sheet 5);

Fig. 6 is an enlarged front elevational view of the nesting mechanism, the cover plates for the housings enclosing the horizontal rack bars and associated elements being removed (sheet 6);

Fig. 7 is an enlarged rear elevational view of the nesting mechanism taken on substantially the line 7—7 of Fig. 2 (sheet 7);

Fig. 8 is a horizontal cross-sectional view on the line 8—8 of Fig. 6 (sheet 2);

Figs. 9, 10 and 11 are enlarged vertical cross-sectional views on the respective lines 9—9, 10—10 and 11—11 in Fig. 8 (sheet 2);

Fig. 12 is an enlarged cross-sectional view of a portion of Fig. 10 (sheet 2);

Fig. 13 is a horizontal cross-sectional view on the line 13—13 of Fig. 12 (sheet 2);

Fig. 14 is a fragmentary elevational view, partly in section, on approximately the line 14—14 of Fig. 5 (sheet 5);

Fig. 15 is an enlarged vertical cross-sectional view on the line **15—15** of Fig. 6 (sheet 5);

Fig. 16 is an enlarged vertical cross-sectional view on the line **16—16** of Fig. 6 (sheet 4);

Fig. 17 is an enlarged horizontal cross-sectional view on the line **17—17** of Fig. 6 (sheet 8);

Fig. 18 is a further enlarged vertical cross-sectional view on the **18—18** of Fig. 8 (sheet 7);

Fig. 19 is a horizontal cross-sectional view on the line **19—19** of Fig. 18 (sheet 6);

Fig. 20 is a fragmentary cross-sectional view on an enlarged scale of the lower left hand portion of Fig. 11 (sheet 7);

Fig. 21 is an enlarged fragmentary elevational view, partially in section, of one conveyor mechanism indicated as taken on the line **21—21** of Fig. 3 (sheet 8);

Fig. 22 is a vertical cross-sectional view on a slightly reduced scale, taken on the line **22—22** of Fig. 21 (sheet 8);

Fig. 23 is a fragmentary horizontal cross-sectional view on the line **23—23** of Fig. 7 (sheet 7);

Fig. 24 is a top plan view of a finger plate for positioning and holding the lower fed partition strips (sheet 7);

Fig. 25 is a vertical cross-sectional view on the line **25—25** of Fig. 6 (sheet 9);

Fig. 26 is a top plan view of one of the two supporting brackets which hold the guide plates receiving the upper fed partition strips (sheet 6);

Fig. 27 is a top plan view of one of the two supporting brackets which holds the lower fed partition strip support plate (sheet 6);

Fig. 28 is a view of a mounting plate for a cam operated lever (sheet 6);

Fig. 29 is a view of a lever pivotally supported by such mounting plate (sheet 6);

Fig. 30 is a top plan view on an enlarged scale of the support column of the nesting mechanism (sheet 1);

Fig. 31 is a top plan view of one of the vertically adjustable blocks which support the horizontal rack bar housings (sheet 2);

Fig. 32 is a top plan view of one of the vertically adjustable blocks which support partition strip receiving units (sheet 2);

Fig. 33 is a top plan view on an enlarged scale of one of the partition strip conveyor base plates (sheet 9);

Fig. 34 is an end view thereof (sheet 9);

Fig. 35 is a top plan view of one partition strip conveyor mechanism shown detached (sheet 9);

Fig. 36 is an enlarged vertical cross-sectional view on the line **36—36** of Fig. 35 (sheet 9);

Fig. 37 is an enlarged vertical cross-sectional view on the line **37—37** of Fig. 35 (sheet 3);

Fig. 38 is a vertical cross-sectional view on the line **38—38** of Fig. 35 (sheet 3);

Figs. 39 and 40 are enlarged vertical transverse cross-sectional views on the respective lines **39—39** and **40—40** of Fig. 37 (sheet 3);

Fig. 41 is a cross-sectional detail of the pusher bar mounting (sheet 3);

Fig. 42 is a horizontal cross-sectional view on an enlarged scale of the lower left-hand corner portion of Fig. 35 (sheet 4);

Fig. 43 is a side elevational view of one of the partition strips which are fed into the assembly or nesting zone at the lower level (sheet 1);

Fig. 44 is a similar view of one of the partition strips which are fed into the assembly or nesting zone at the upper level (sheet 1);

Fig. 45 is an end view of a partition assembly or carton divider (sheet 1);

Fig. 46 is a top plan view thereof (sheet 1); and

Fig. 47 is a diagrammatic illustration of the assembly or nesting operation at the half-way point (sheet 1).

Referring to the drawings more particularly by reference numerals, **50** indicates generally an automatic assembling or nesting machine for preformed partition strips which incorporates the teachings of the present invention. Broadly, the nesting machine **50** includes a nesting mechanism **52** which assembles two tiers of supplied spaced edgewise partition strips into partition assemblies, two identical automatic partition strip feeding mechanisms **54** and **56** which are disposed at right angles to each other and which feed edgewise partition strips towards the nesting mechanism **52** for nesting, and two partition strip conveyor mechanisms **58** and **60** which receive edgewise partition strips from the feeding mechanisms **54** and **56**, respectively, and deliver them to the nesting mechanism **52** for assembly.

The nesting mechanism **52** is the focal point of the instant machine **50** and broadly includes a vertical support column **62** (Figs. 2, 6, 7, 23 and 30), an upper longitudinal partition strip receiving and lowering construction **64** (Figs. 3, 6–13, 18–20, 26 and 32), a lower transverse partition strip receiving construction **66** (Figs. 3, 6, 7, 16, 17, 24, 27 and 32), upper actuating construction **68** for effectuating the upper receiving and lowering construction **64** (Figs. 2, 3, 5–7, 15, 25, 28, 29 and 31), lower actuating construction **70** for effectuating the lower receiving construction **66** (Figs. 2, 3, 6, 7, 16, 25, 28, 29 and 31), a power construction **72** (Figs. 2, 3, 5–7 and 25), and interrelating elements and connections.

The vertical support column **62** is of channel cross section and includes a vertical base wall **75** and vertical side walls **76** and **77** (Figs. 2, 6, 7, 23 and 30). The support column **62** is bolted to a wide, low, heavy platform **78** which rests upon a floor or other supporting surface. A transversely disposed intermediate vertical plate **79** is welded to or formed integral with the side walls **76** and **77** for a purpose more particularly described below. The base wall **75** is of the horizontal cross section clearly shown in Figs. 8, 23 and 30, and includes diverging vertical guide flanges **80** and **81** between which is a channel **82**. Each guide flange **80** and **81** has a divergent guide surface **83**.

The longitudinal partition strip receiving and lowering construction **64** is adjustably mounted upon the support column **62** (Figs. 3, 6–13, 18–20, 26 and 32). A block **85** of the configuration shown in Fig. 32 includes guide flanges **86** having convergent guide surfaces **87** which engage the divergent guide surfaces **83** of the guide flanges **80** and **81** of the support column **62** for up and down movement, the block **85** being secured in selected adjusted position by suitable bolts **88** which thread the flanges **86** and engage the surfaces **83** of the support column **62**. The block **85** also includes four transversely aligned openings **90** and a vertically extending wall **91**. A pair of opposed brackets **92** of the configuration clearly shown in Figs. 6, 8 and 26 engage the wall **91** of the block **85** and are clamped in position by suitable bolts which can be loosened to permit adjustment along the wall **91**.

The brackets **92** support between them two pairs of plates **94** and **95**, details of which are illustrated in Figs. 6 through 13 and 18 through 20, by means of end angle brackets **96** and intermediate angle brackets **97**, all of which are secured to the upper surfaces of the supporting brackets **92** through suitable bolt and slot connections **98** to permit lateral adjustment, the vertical sides of the brackets **96** suspending the plates **94** and **95** by means of long bolts **99** and associated nuts (Figs. 8 and 9), the vertical sides of the angle brackets **97** being riveted or otherwise secured directly to the outer sides of the outer plates **95** (Figs. 8 and 11). A pair of brackets **100** are riveted to the opposing sides of the two inner plates **94** to further insure a relatively rigid construction. A suitable long bolt and nut asembly **101** limits outward movement of the supporting brackets **92**. Each plate **94** and **95** is formed with a pair of vertical

channels 103 of arcuate cross section, the four opposed pairs of vertical channels 103 receiving four plunger rods 104 which are suspended from a horizontal plate 105, being secured thereto by bolts 106. The plate 105 is secured by suitable bolts or rivets to the lower end of a movable rack bar 107 which is more particularly referred to below in respect to its support and actuating construction.

A rod 108 is rotatably mounted in brackets 109 along the lower edges of the opposed faces of the two plates 94 (Figs. 10, 11 and 18 through 20). Four trap-door hinge elements 110 are keyed or otherwise secured to the rod 108 for movement therewith and extend through notches formed in the bottom edges of both the plates 94 and 95. A coil spring 111 biases the rod 108 to dispose the trap-door elements 110 in the horizontal closing position shown in the drawings, one end of the spring 111 being anchored to the rod 108 and the other end being anchored to the plate 94 at 112. Manifestly, the trap-door elements 110 form a collapsible bottom for each of the two pairs of plates 94 and 95, each pair of plates 94 and 95 being spaced to receive between them partition strips of any material. The springs 111 are just strong enough to support partition strips. A leaf spring 114 is mounted on each plate 95 by means of a suitable bracket or clamp 115 and extends through an opening 116 into the space between pairs of plates 94 and 95 which engages received partition strips to prevent rebound and subsequent misalignment thereof, it being necessary that the partition strips received between the plates 94 and 95 be aligned for accurate nesting with partition strips disposed below them.

Directly beneath the just described construction 64 is the transverse partition strip receiving construction 66 which also includes a supporting block 85 like that described above which is similarly mounted on the support column 62 for vertical adjustment (Figs. 3, 6, 7, 16, 17, 24, 27 and 32). Supporting brackets 120 of the form clearly shown in Figs. 6, 17 and 27 are secured to the wall 91 of the supporting block 85 in spaced relation by bolts 121. A rectangular plate 122 is secured to the horizontal flanges of the supporting brackets 120 by suitable bolts 123 (Figs. 16 and 17). Three pairs of aligned rectangular openings 124 are formed in the plate 122, and a substantially square opening 125 is formed in the plate 122 aligned with each pair of openings 124 and spaced therefrom, as is clear from Fig. 17.

A substantially square finger plate 127 is mounted beneath the plate 122, being secured by bolts 128 to a horizontal plate 129 which is welded to the upper end of a rack 130 (Figs. 16 and 24), the support and actuator construction therefor being more particularly discussed below. Six pairs of fingers 132 are riveted or spot welded to the finger plate 127 through base portions 133, said fingers 132 being of arcuate cross section and being disposed in spaced opposed divergent relation, the pattern being clearly shown in Fig. 24, each pair of fingers 132 extending through an opening 124 in the plate 122 in one extreme position of movement. Three stop brackets 135 are riveted to the finger plate 127 in positions to extend through the openings 125 in the plate 122 and to serve as stops for partition strips, as for the one indicated in broken lines 136 in Fig. 16. As illustrated, the fingers 132 are adapted to receive three partition strips and to support them for nesting reception of partition strips received and lowered by the above-described construction 64, the fingers 132 being adapted to be lowered in timed relation to permit discharge from the machine 50 of each partition or carton divider as it is completed.

For quick removal of completed partitions, air is supplied through nozzles 138 extending through the plate 122 and secured thereto by suitable nuts 139 (Figs. 6, 16 and 17). A hose 140 is secured to each nozzle 138 and to a double outlet standard air supply valve 141 which is connected to a source of supplied air under pressure through a hose 142. The air valve 141 includes a plunger 143 which is depressed by a pivotally mounted lever 144 to deliver air to the nozzles 138 each time the lever 144 is engaged by the plate 129 which supports the finger plate 127, or by some suitable member moving with or in timed relation with the plate 129.

The upper actuating construction 68 for operating the upper receiving and lowering construction 64 includes a supporting block 150 of the configuration clearly shown in Figs. 6, 23 and 31, including attachment flanges 151 which engage the guide flanges 80 and 81 of the support column 62 in the same manner as the flanges 86 of the supporting block 85 described above, being secured in adjusted position by suitable bolts extending through the flanges 151 and engaging the guide surfaces 83 of the guide flanges 81 (Figs. 2, 3, 5 through 7, 15, 23, 25, 28, 29 and 31). A large housing 153 of banjo configuration, as is clearly shown in Figs. 3, 6 and 7, is secured by suitable bolts 154 to that side of the supporting block 150 which is remote from the feeding mechanism 54, as is clear from Fig. 5. The housing 153 is normally closed by a cover 155, the latter frictionally engaging a shoulder formed in the former (Fig. 25), the cover 155 being in place in Fig. 3 and being removed in Fig. 6. A stub shaft 156 is rotatably mounted in a bearing sleeve 157 supported by the neck 158 of a gear housing 159 which is secured to the outer surface of the housing 153 by suitable bolts 160 (Fig. 25). A heavy disc 162 is keyed to that end of the stub shaft 156 which extends into the housing 153, being maintained against removal by a suitable nut and washer assembly 163. A continuous eccentric track or channel 165 is formed in the outer surface of the disc 162. A cam roller 166 rotatably mounted on a lever 167 is disposed in the track 165, the lever 167 being pivotally mounted at its lower end on a plate 168 by a suitable pivot bolt 169, the plate 168 being secured by bolts 170 to bosses formed integral with and within the housing 153 (Fig. 6). For adjustment purposes, the lever 167 includes a plurality of mounting apertures 171 (Fig. 29), and the plate 168 includes a plurality of apertures 172 for reception of the bolt 169 (Fig. 28). A rack bar 174 is pivotally mounted at 175 to the other end of the lever 167 and is in meshing engagement with a pinion 176 keyed or secured by setscrews to a shaft 177 which extends from the housing 153 and through a housing 178, having bearing support on a sleeve 179 of the housing 153 and a boss 180 of the housing 178 (Figs. 6 and 15). The rack bar 174 rests on a flanged roller 181 for reciprocative movement, the roller 181 being rotatably mounted on a stub shaft 182 secured in a cup 183 formed integral with the housing 153.

The housing 178 is secured by suitable bolts 185 to the supporting block 150 and encases a gear 186 keyed to the shaft 177 and has the rack bar 107 extending vertically therethrough in meshing engagement with the gear 186 (Figs. 7, 15, and 23). An end cap 188 secured to the housing 178 by suitable screws 189 permits lateral removal of the rack bar 107. Manifestly, upon rotation of the disc 162, the cam roller 166 will be cammed back and forth by the track 165 to effect reciprocation of the rack bar 174 and therethrough to effect vertical reciprocation of the rack bar 107 which carries the plunger rods 104, there being a complete cycle of movement of the rack bar 107 for each three hundred and sixty degrees of rotation of the disc 162. The power construction 72 for rotating the stub shaft 156 which carries the disc 162 is more particularly described below.

The lower actuating construction 70 for operating the lower transverse partition strip receiving construction 66 is identical with the actuating construction 68 just described in detail, as is clearly evident from a consideration of Figs. 2, 3, 6, 7, 16, 25, 28, 29 and 31. Hence, the same reference numerals have been applied to identical parts with primes to shorten the present specification. It is manifest that the tracks 165 and 165' are adjusted in

relation to each other so that the upper longitudinal partition strips are moved downwardly in nesting relation with the stationary lower transverse partition strips and the fingers **132** are withdrawn substantially simultaneously in timed relation so that the completed partition may be air discharged substantially immediately nesting is completed so that additional transverse and longitudinal partition strips may be fed into nesting positions.

The power construction **72** through which the discs **162** and **162'** are rotated includes an electric motor **195** and reduction gearing **196**, preferably built as a single unit as illustrated, mounted on a bracket **197** secured by suitable bolts **198** to the plate **79** above-mentioned as secured to and between the walls **76** and **77** of the support column **62** (Figs. 2, 3, 5 through 7, and 25). A conventional on-off switch and wiring are provided (not shown). Bolts **199** anchor the motor **195** to the bracket **197**. A power take-off stub shaft **200** is connected at one end operatively into the reduction gearing **196** and has its other end extending into a small gear box **201** secured by bolts **202** to the top of the bracket **197** (Figs. 6 and 25). A bevelled gear **203** is secured by a setscrew or key to the end of the stub shaft **200** in the housing **201**. In mesh with the bevelled gear **203** are opposed bevelled pinions **204** and **205**. The bevelled pinion **204** is secured by a setscrew to the lower end of a rotatably mounted shaft segment **206** which extends upwardly therefrom and telescopically receives by a pin and slot connection a sleeve **207** upon the other end. A shaft segment **208** has its lower end adjustably engaged in the sleeve **207** through a slot and pin connection and has secured to its upper end a bevelled pinion **209** which is disposed within the gear housing **159**, the shaft segment **208** having bearing support in the wall thereof. The bevelled pinion **209** is in mesh with a bevelled gear **210** secured by a suitable setscrew to an end of the stub shaft **156** which mounts the disc **162** upon the other end. The gear housing **159** is closed by a cover **211** through suitable screws **212**. The gear housing **159** is additionally braced by a plate **213** which is secured to the center of the cover **211** by a suitable screw **214**, the plate **213** being secured by suitable bolts **215** to one side of the supporting block **150** (Figs. 7 and 23). Similarly, the bevelled pinion **205** is secured by a setscrew to the upper end of a shaft segment **218**, the lower end of which extends into a sleeve **219** to which it is connected by a slot and pin connection (Fig. 25). A second shaft segment **220** extends into the sleeve **219** for a pin and slot connection and extends through a gear housing **159'** in which it has rotative bearing support and has keyed thereto a pinion **209'** which is in mesh with a bevelled gear **210'** secured by a setscrew to the end of the stub shaft **156'**. The shaft segment **220** extends on through the gear housing **159'** for a power purpose more particularly described below. The gear housing **159'** is supported similarly to the gear housing **159**.

The two blocks **85** and their supported constructions **64** and **66** and the two supporting blocks **150** and their supported constructions **68** and **70** are vertically adjustable on the guide flanges **80** and **81** of the support column **62** by means of four threaded shafts **225**, **226**, **227** and **228** which extend through a plate **229** secured by bolts **230** to the top of the support column **62**, being maintained in suspended relation therefrom by upper and lower collars **231** located at opposite sides of the plate **229** (Figs. 5 through 8, 17 and 23). Each such threaded shaft has a squared upper end **232** for the reception of a crank handle indicated in Fig. 6 by broken lines **233**. The shaft **225** passes freely through the upper block **150** and the two blocks **85** and has threaded engagement with the lower block **150**. Similarly, the shaft **226** passes freely through the upper block **150** and the upper block **85**, but has threaded engagement with the lower block **85**, being terminated short of the lower block **150**; the shaft **227** passes freely through the upper block **150** and has threaded engagement with the upper block **85**, being cut off short of the lower block **85**; and the shaft **228** has threaded engagement with the upper block **150**, being cut off short of the upper block **85**. The several shafts **225** through **228** are broken off in Figs. 6 and 7 in a manner to clearly illustrate the relationship just described.

As stated above, the two automatic partition strip feeding mechanisms **54** and **56** are identical with each other and with corresponding parts of the automatic partition strip feeding mechanism disclosed in the applicant's copending application above-identified which is incorporated herein by reference as to such corresponding parts. Hence, it is unnecessary to burden the present lengthy application with a detailed description of each of these feeding mechanisms **54** and **56**. It is adequate for a full disclosure of the present invention to briefly point out that each feeding mechanism **54** and **56** includes a base construction **240** which supports an adjustable partition strip hopper construction **242** and adjustably supports a partition strip support and conveyor construction **244** which extends forwardly from the base construction **240** as is clear from the drawings. Each also includes a partition strip release construction **246** which is automatically actuated by the conveyor construction **244** to simultaneously release the bottom and top partition strips **247** and **248**, respectively, in the hopper construction **242** to permit such partition strips to drop by gravity onto plates which dispose them edgewise. Additionally, each feed mechanism **54** and **56** includes spaced pairs of guide plates **249**, three pairs being shown as part of the feed mechanism **54** and two pairs as part of the feed mechanism **56**, which guide partition strips to the partition strip conveyor mechanisms **58** and **60**, the partition strips sliding along a plate **250** and being simultaneously pushed by transverse pusher shafts **251** conveyed endlessly by endless chains forming part of the mentioned support and conveyor construction **244**. As stated and particularly described in the applicant's copending application, the several components of the feeding mechanisms **54** and **56** are adjustable to accommodate partition strips of various lengths, widths and thicknesses.

The sprockets of the conveyor constructions **244** and **244'** (reference numerals applied to the feeding mechanism **56** are primed) derive power from the motor **195** (Figs. 2, 5, 7 and 14). A composite extensible shaft **253** has its upper end extending into a bevelled gear case **254** wherein it is operatively connected through bevelled gears and bevelled pinions to one sprocket of the conveyor construction **244** in the same manner as disclosed in the applicant's above-identified copending application, and has its lower end extending into a bevelled gear casing **255** mounted on a support **256**, the bevelled gears and bevelled pinions within the casings **254** and **255** not being shown. A second composite shaft **257** extends into the casing **255** and into a casing **258** bolted to the platform **78** directly beneath the gear housing **159'**. The shaft segment **220** extends into the casing **258** as is clear from Figs. 7 and 25, the composite shaft **257** being operatively connected to the lower end of the shaft segment **220** within the casing **258** through the usual bevelled gear and bevelled pinion such as is shown in the gear housing **159'**, the composite shaft **257** being similarly operatively connected within the casing **255** to the composite shaft **253**, whereby power is transmitted to the conveyor construction **244** of the feed mechanism **54** to effect endless movement of its transversely disposed pusher shafts **251**. Similarly, power is transmitted to the conveyor construction **244'** of the feeding mechanism **56** through composite shafts **260** and **261** and operatively connecting bevelled gears and bevelled pinions within casings **262** and **263**, the composite shaft **260** being operatively connected to the bevelled gears and pinions within the casing **255** (Figs. 2, 3 and 5).

The partition strip conveyor mechanism **60** accepts aligned rows of edgewise upper partition strips **248** with the openings directed downwardly (Fig. 44) and pushes

them into position between the pairs of plates 94, 95 as described above. The details of the conveyor mechanism 60 are best followed in Figs. 3, 5, 21, 22 and 33 through 42, and includes a base plate 270 of the configuration clearly shown in Figs. 33 and 34. The base plate 270 has two transverse channels 271 extending fully thereacross of substantially double T-cross section. The base plate 270 is bolted along its rear edge to the horizontal flange of an angular transversely disposed member 273 centrally of the conveyor construction 244', the member 273 being bolted to the forward ends of the side members of the conveyor construction 244 (Fig. 21). As additional support for the base plate 270, rods 274 engage openings in the sides of the base plate 270 forwardly thereof and are anchored in integral vertical extensions of the side members of the conveyor construction 244'.

Four posts 275 extend vertically from wells in the base plate 270 and are supported thereby (Figs. 35 and 37). An endless chain support 277 is supported by each pair of posts 275 through the medium of brackets 278 which are secured by bolts 279 to the chain supports, the posts 275 extending through openings in the brackets 278 and being maintained in selective position of vertical adjustment by suitable setscrews 280. As is clear from Figs. 35, 37 and 39, each chain support 277 includes a central portion 281 and end portions 282, the end portions 282 externally slidingly engaging the central portion 281 and being maintained against removal by an internally located strap 283 which is secured to the several parts by suitable screws 284. The end portions 282 are of heavier construction and rotatably support shafts 285 to each end of which, within the chain support 277, are pinned sprockets 286 (Fig. 40). A chain 287 is disposed about each pair of sprockets 286. A single partition strip pusher shaft 288 of tubular cross section is secured to the two chains 287, such as by plugs 289 and reduced extensions 290 threading chain links (Fig. 41). The chains 287 are located above the surface of the base plate 270 so that the upper reaches are above partition strips 247 being fed to the conveyor mechanism 58, the pusher shaft 288 moving into operative position behind such partition strips 247 from above. This is clear from an inspection of Fig. 21 taken with Fig. 5.

Aligned pairs of guide plate support posts 292 are mounted in the channels 271, each post 292 including a reduced lower threaded extremity which threadedly engages threaded openings in small plates 293 and 294 slidably disposed in the head and subhead of the double T-cross section channel 271 (Figs. 35, 36 and 38). Aligned pairs of posts 292 support opposed pairs of guide plates 295 through the medium of horizontally disposed apertured ears 296. The guide plates 295 are flared at their partition strip receiving ends and extend beyond the posts 292 at their forward ends (Fig. 35).

Power is supplied to the conveyor mechanism 60 from the conveyor construction 244' of the feeding mechanism 56 as is clear from an inspection of Figs. 5, 21, 35 and 42. One end portion 282 is modified, as is shown in Figs. 35 and 42, for rotative support of two meshing gears 298 and 299, the former of which is secured by a suitable setscrew to an extension of the shaft 285. A cover 300 is secured by suitable screws 301 to the modified end portion 282 to enclose the gears 298 and 299 and to serve as additional rotative bearing support for a stub shaft 302 to which the gear 299 is secured by a suitable setscrew. As is clear from Figs. 5 and 21, the stub shaft 302 is secured by a suitable connector 303 to a shaft 304 which is rotatably supported by a bearing bracket 305 from an integral extension of the side member of the conveyor construction 244' of the feeding mechanism 56 and has secured to its free end by a suitable setscrew a sprocket 306. Below the sprocket 306 is a sprocket 307 secured by a suitable setscrew to an extension of the forward power driven shaft of the conveyor construction 244 (above described). An endless chain 308 is disposed about the two sprockets 306 and 307.

The conveyor mechanism 58 is identical with the conveyor mechanism 60 just described, and, therefore, the identical elements thereof are indicated by primed reference numerals corresponding to the reference numerals applied to the parts of the conveyor mechanism 60.

Operation

As is indicated above, the feeding mechanism 54 supplies edgewise disposed lower transverse partition strips 247 to the conveyor mechanism 58, and the feeding mechanism 56 supplies aligned edgewise disposed upper partition strips 248 to the conveyor mechanism 60. In thus supplying the partition strips 247 and 248, the feeding mechanisms 54 and 56 function in identically the same manner as is described in detail for corresponding parts in the applicant's copending application above-identified. The conveyor 58 through the immediate agency of its pusher bar 288' slides the received edgewise partition strips 247 onto the plate 122 between the fingers 132 and against the stops 135. Substantially simultaneously therewith, the pusher bar 288 of the conveyor mechanism 60 is effective to slide received edgewise partition strips 248 between the pairs of guide plates 94 and 95 of the receiving and lowering construction 64 which are sustained against dropping by the trap-door elements 110 and are prevented from rebounding by the leaf springs 114. As the two sets of partition strips 247 and 248 are positioned as stated, the plunger rods 104 are positively moved downwardly engaging the top edges of the partition strips 248 and quickly nesting them with the awaiting partition strips 247. As the plunger rods 104 begin their downward descent, the fingers 132 and the stops 135 begin withdrawal action under power from the rack bar 130 so that the completed partition may be air discharged from the machine 50 immediately the plunger rods 104 start upwardly. Meanwhile, additional sets of partition strips 247 and 248 are being moved towards the fingers 132 and the pairs of plates 94 and 95, the fingers 132 and the plunger rods 104 reappearing and clearing, respectively, just in time for the reception of the repeat partition strips 247 and 248. The timing effected through the cam tracks 165 and 165' is such that no bottlenecks exist in each cycle, thereby rendering the machine 50 capable of producing completed partitions at a high rate of speed. It is to be observed from an inspection of Fig. 6 that the dwell positions of the plunger rods 104 and the fingers 132 are those illustrated in the said Fig. 6. The downward movement and return of the plunger rods 104 and the downward movement and return of the fingers 132 are substantially continuous.

The effective action of the cam tracks 165 and 165' may be varied through selectively mounting the pivot screw 169 in an opening of the plate 168 or aperture 171 in the lever 167. The action of the cam tracks 165 and 165' through the several connected elements to the plunger rods 104 and the fingers 132 is of a positive nature which is a highly desirable feature for a partition forming machine.

The several component parts of the nesting mechanism 52 may be vertically adjusted through the medium of the threaded shafts 225 through 228 in the manner described above in detail. Any such adjustment can be quickly accomplished and may be necessary when different sized partition strips from those previously nested are desired assembled into partitions. The conveyor mechanisms 58 and 60 are also adjustable in respect to their component parts, as is particularly detailed above.

The machine 50 has been described in relation to nesting three transverse partition strips 247 and two longitudinal partition strips 248, but it is to be clearly understood that the machine 50 may be set up to nest a lesser or a greater number of each as is desired. As is explained in the applicant's copending application

above-identified, the feeding mechanisms **54** and **56** may supply a selected number of edgewise disposed partition strips, the illustration embodiment in that application supplying five such edgewise disposed partition strips. Similarly, more than three pairs of guide plates **295** may be readily and conveniently installed on the base plates **295** and **295'**. The plate **122** and the finger plate **127** may be replaced by a pair of plates incorporating a greater or lesser number of fingers **132** and stops **135**. Similarly, a greater number of pairs of guide plates **94** and **95** may be employed if desired.

It is manifest that there has been provided an automatic assembling or nesting machine for handling preformed partition strips which fulfills the objects and advantages sought therefor.

It is to be understood that the foregoing description and the accompanying drawings have been given by way of illustration and example. It is also to be understood that changes in form of the elements, rearrangement of parts, and substitution of equivalent elements, which will be obvious to those skilled in the art, are contemplated as within the scope of the present invention which is limited only by the claims which follow.

What is claimed is:

1. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the strips, said fingers being cyclically retractable for removal of a nested partition assembly, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable spring-biased holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, and positive action power means for moving said plunger means and said retractable fingers through their movement cycle.

2. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle including rack and pinion means operatively connected to said plunger means, cam and lever means operatively connected to said rack and pinion means, and eccentric means having an annular eccentric track receiving said cam portion of said cam and lever means for moving the same in a positive manner.

3. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, and means for automatically discharging the completed partition while the fingers are retracted and after said plunger means begins withdrawal.

4. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including pairs of parallel plates, each pair of plates having spring biased hinged members forming releasable bottoms therefor, plunger means for overcoming said releasable bottoms and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, and means for automatically discharging the completed partition while the fingers are retracted and after said plunger means begins withdrawal.

5. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, means for automatically discharging the completed partition while the fingers are retracted and after said plunger means begins withdrawal, means for feeding edgewise disposed longitudinal partition strips to said nesting mechanism from stacks of such strips, and means for feeding edgewise disposed transverse partition strips to said nesting mechanism from stacks of such strips.

6. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, means for automatically discharging the completed partition while the fingers are retracted and after said plunger means begins withdrawal, means for feeding sets of parallel partition strips to said first-mentioned receiving and holding means, and means for feeding sets of parallel partition strips to said second-mentioned receiving and holding means.

7. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition

strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, means for automatically discharging the completed partition while the fingers are retracted and after said plunger means begins withdrawal, means for edgewise disposing stacks of corrugated longitudinal partition strips and for pushing such edgewise disposed strips towards said nesting mechanism, conveyor means for accepting said longitudinal strips and for pushing such strips into nesting position in said nesting mechanism, means for edgewise disposing stacks of corrugated transverse partition strips and for pushing such edgewise disposed strips towards said nesting mechanism, and conveyor means for accepting said transverse strips and for pushing said strips into nesting position in said nesting mechanism.

8. In combination, an automatic partition strip nesting machine comprising a supporting standard, nesting means including means for receiving and holding a set of parallel longitudinal partition strips, means for receiving and holding a set of parallel transverse partition strips, said two receiving and holding means being individually mounted on said supporting standard in superposed relation, means for individually moving said two receiving and holding means vertically towards and away from each other, one of said receiving and holding means being disposed relative to the other for receiving partition strips therefrom in nesting relation with partition strips held thereby, means for forcing partition strips from said other receiving and holding means towards said one receiving and holding means, means for feeding sets of parallel longitudinal partition strips to said receiving and holding means therefor, and means for feeding sets of parallel transverse partition strips to said receiving and holding means therefor.

9. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising first means for receiving and holding groups of parallel partition strips, second means for receiving and holding groups of parallel partition strips, means for moving held strips from one means to the other for nesting, means for releasing a completed partition assembly to permit removal, and separate means for individually vertically adjusting said four means.

10. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including hinged elements for releasably supporting partition strips spring-biased into supporting positions, plunger means for overcoming said spring-biased hinged elements and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, and power means for moving said plunger means through its movement cycle.

11. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means through its movement cycle including rack and pinion means operatively connected to said plunger means, cam and lever means operatively connected to said rack and pinion means, said lever of said cam and lever means being mounted for adjustment of the stroke of said plunger, and eccentric means having an annular eccentric track receiving said cam portion of said cam and lever means for moving the same in a positive manner.

12. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips, including a plurality of pairs of retractable fingers which receive the strips, said fingers being cyclically retractable for removal of a nested partition assembly, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means and said fingers through their movement cycles including separate rack and pinion means operatively connected to each of said plunger means and said fingers, cam and lever means operatively connected to each of said rack and pinion means, and eccentric means having an annular eccentric track receiving said cam portion of each of said cam and lever means for moving the same in a positive manner.

13. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips, including a plurality of pairs of retractable fingers which receive the strips, said fingers being cyclically retractable for removal of a nested partition assembly, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, positive action power means for moving said plunger means and said fingers through their movement cycles including separate rack and pinion means operatively connected to each of said plunger means and said fingers, cam and lever means operatively connected to each of said rack and pinion means, said lever of each of said cam and lever means being mounted for adjustment of the stroke of said plunger, and eccentric means having an annular eccentric track receiving said cam portion of each of said cam and lever means for moving the same in a positive manner.

14. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, and power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished.

15. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including pairs of parallel plates, each pair of plates having spring biased hinged members forming releasable bottoms therefor, plunger means for overcoming said releasable bottoms and moving partition strips as sets into engagement with sets of partition strips held by said first

mentioned means, and power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished.

16. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, means for feeding edgewise disposed longitudinal partition strips to said nesting mechanism from stacks of such strips, and means for feeding edgewise disposed transverse partition strips to said nesting mechanism from stacks of such strips.

17. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, means for feeding sets of parallel partition strips to said first-mentioned receiving and holding means, and means for feeding sets of parallel partition strips to said second-mentioned receiving and holding means.

18. In combination, in an automatic partition strip nesting machine, partition strip nesting mechanism comprising means for receiving and holding one set of parallel partition strips including a plurality of pairs of retractable fingers which receive the partition strips, means for receiving and holding a second set of parallel partition strips transversely disposed relative to and above said one set of partition strips, said second mentioned means including releasable holding means, plunger means for overcoming said releasable holding means and moving partition strips as sets into engagement with sets of partition strips held by said first mentioned means, power means for moving said plunger means through its movement cycle and for retracting said fingers as nesting is being accomplished, means for edgewise disposing stacks of corrugated longitudinal partition strips and for pushing such edgewise disposed strips towards said nesting mechanism, conveyor means for accepting said longitudinal strips and for pushing such strips into nesting position in said nesting mechanism, means for edgewise disposing stacks of corrugated transverse partition strips and for pushing such edgewise disposed strips towards said nesting mechanism, and conveyor means for accepting said transverse strips and for pushing said strips into nesting position in said nesting mechanism.

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