Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 1

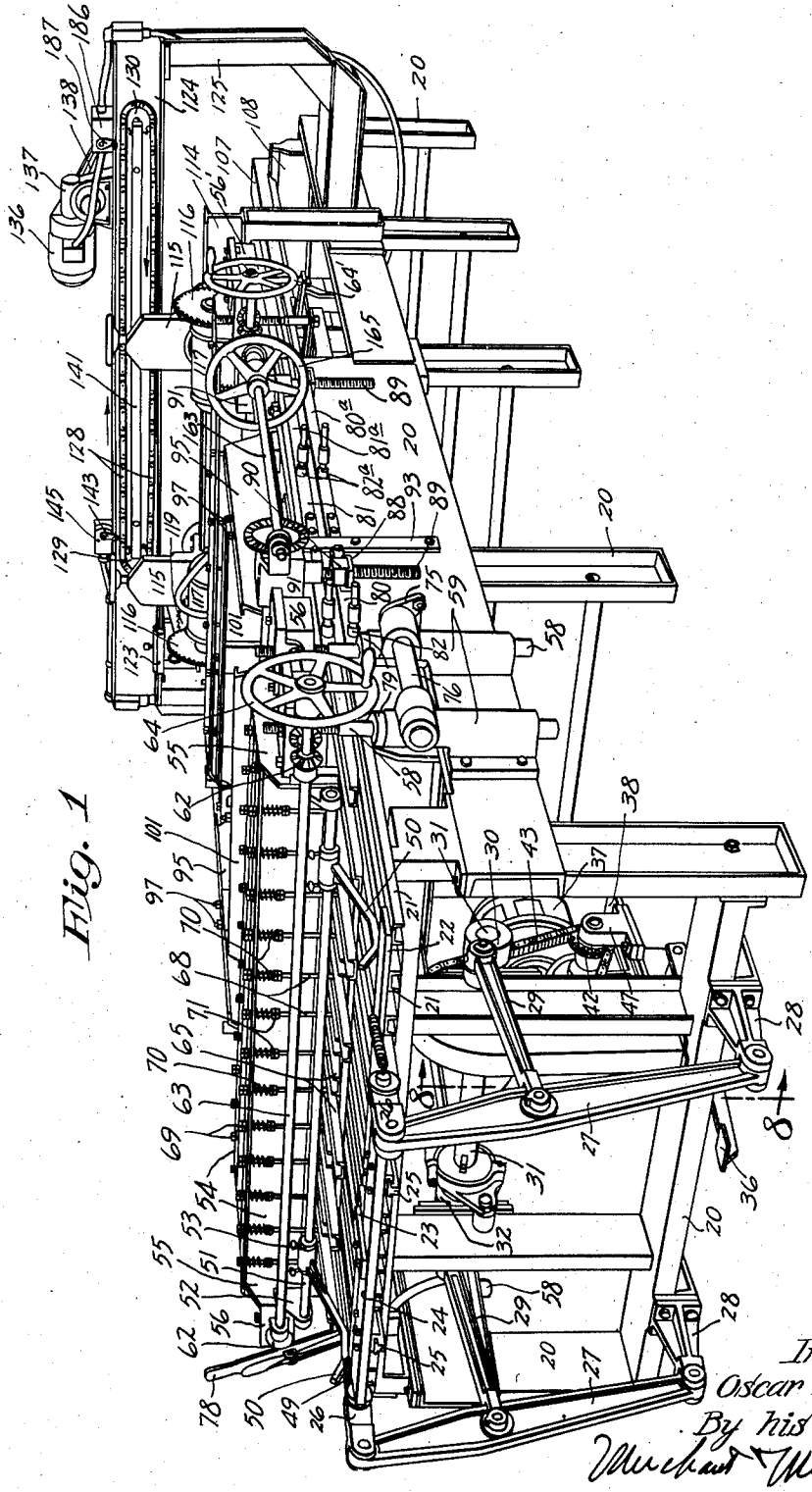


Fig. 1

Inventor
Oscar S. Bolling
By his Attorneys
Merchant & Merchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 2

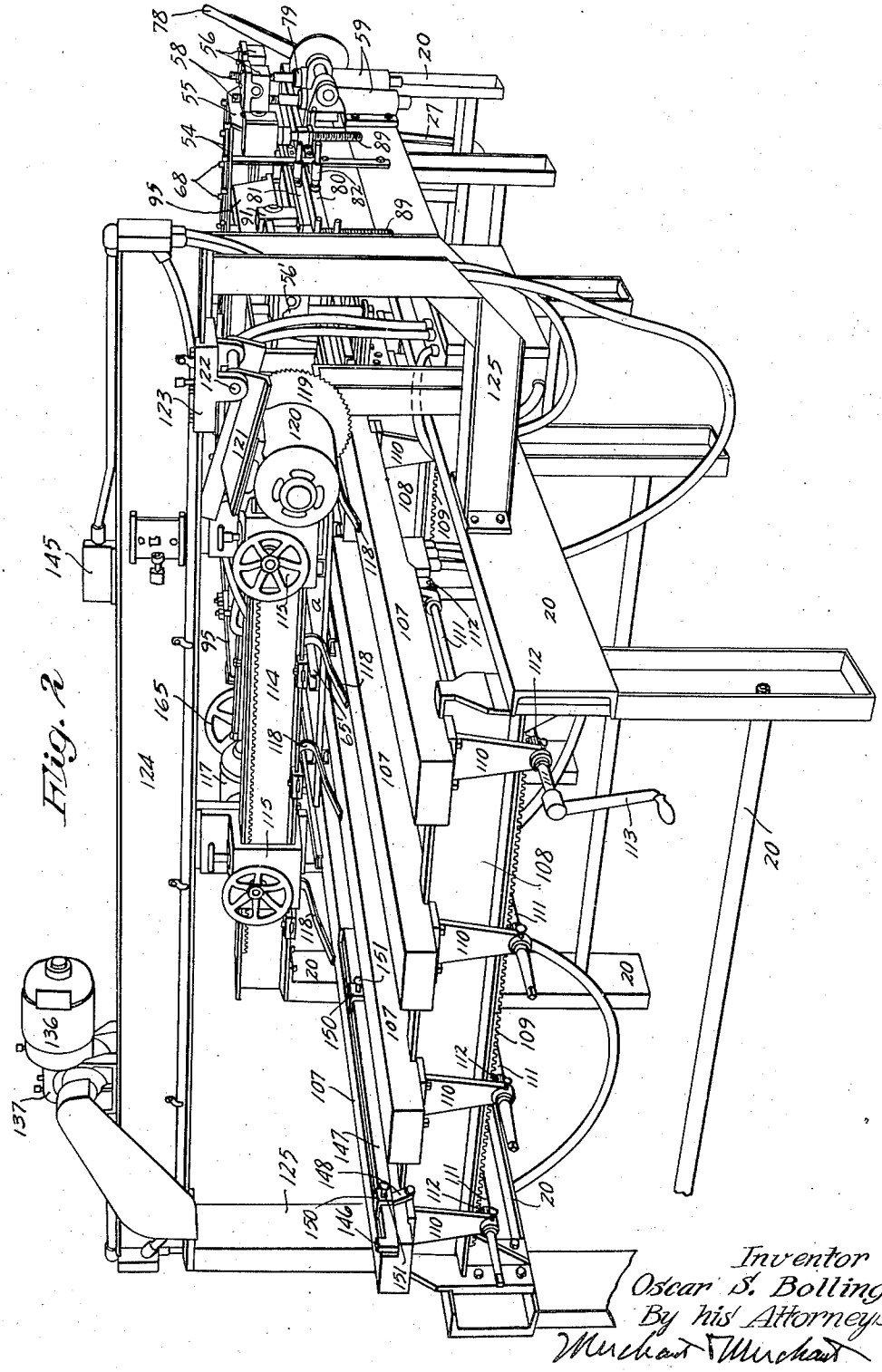


Fig. 2

Inventor
Oscar S. Bolling
By his Attorneys
Merchant & Merchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 1½ Sheets-Sheet 3

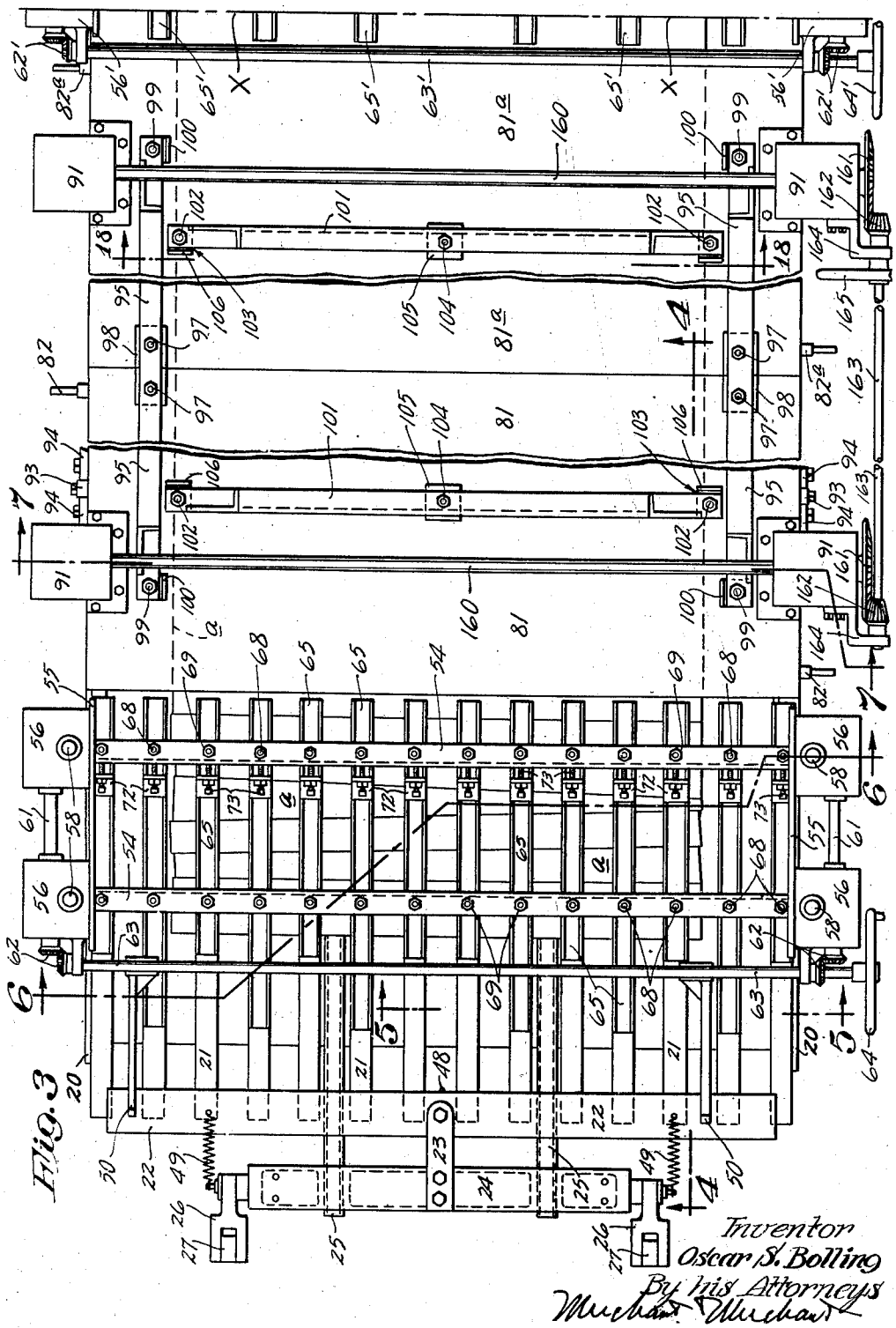


Fig. 3

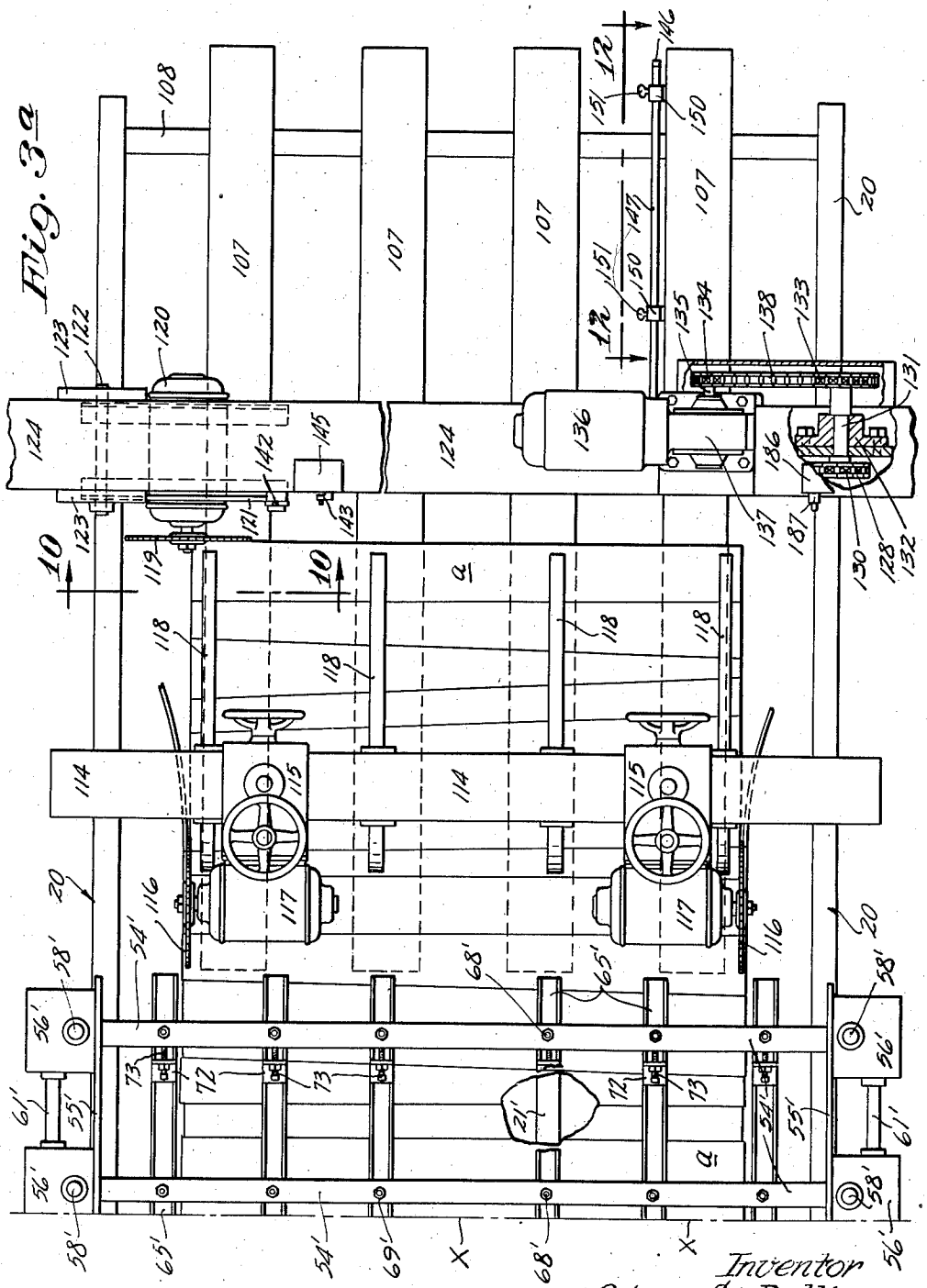
Inventor
Oscar S. Bolling
By his Attorneys
Merchant & Merchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 4

Fig. 3a



Inventor
Oscar S. Bolling
By his Attorneys
Merchant & Merchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 5

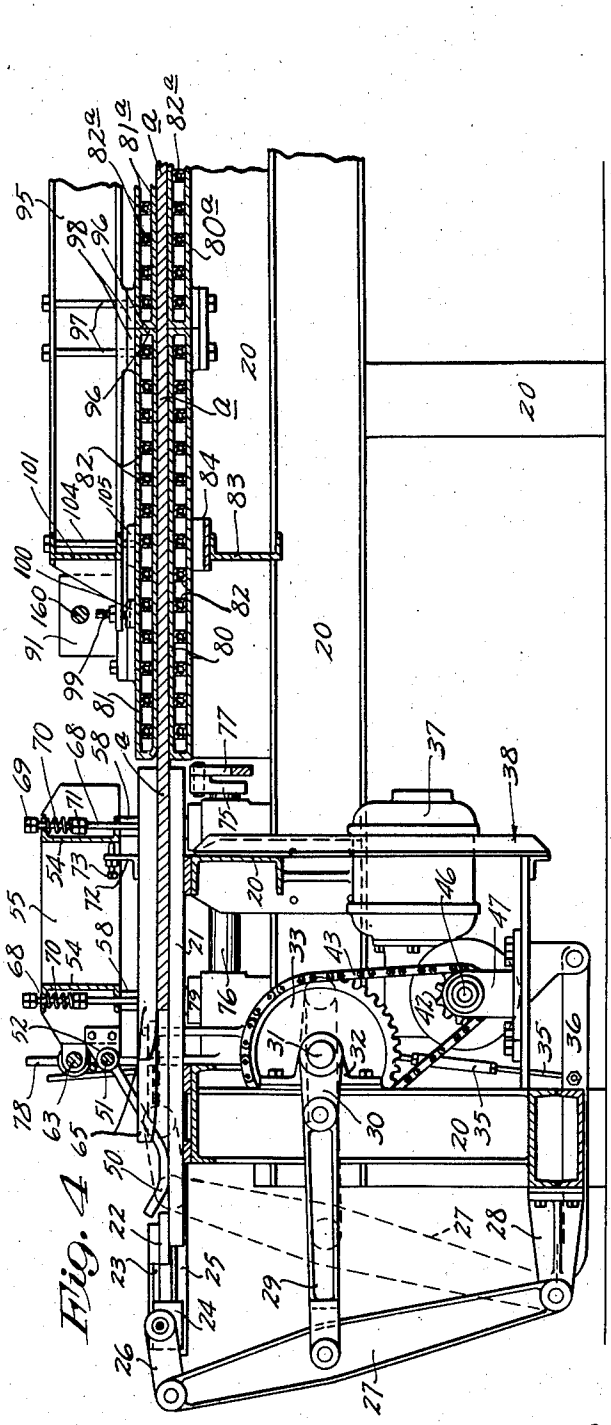


Fig. 4

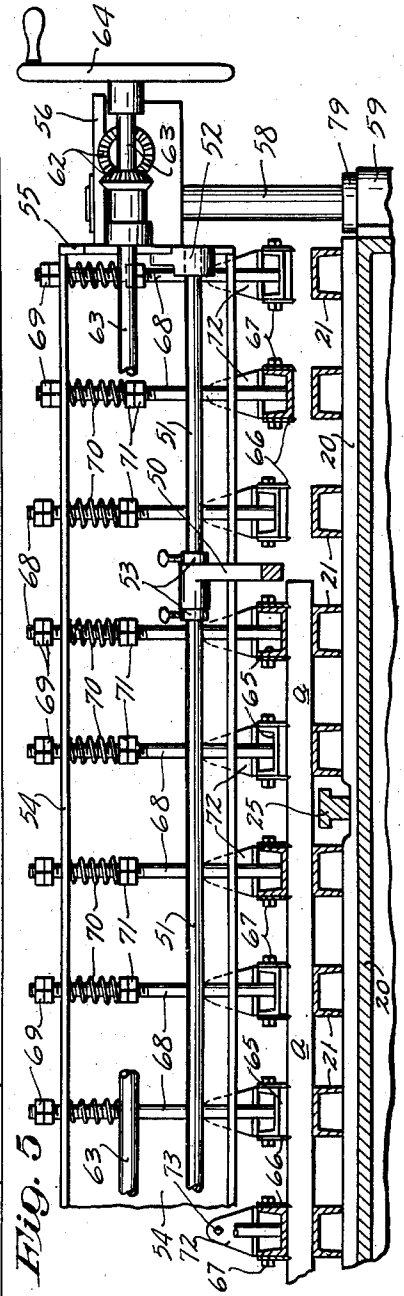


Fig. 5

Inventor
Oscar S. Bolling
By his Attorneys
Murchand & Murchand

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 6

Fig. 6

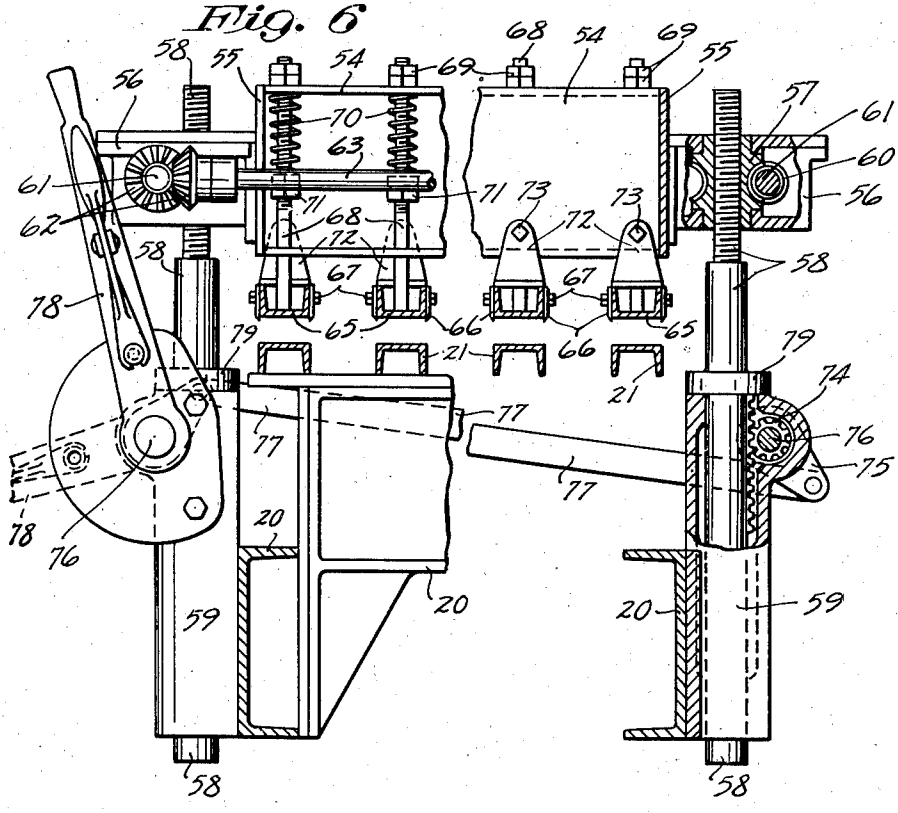
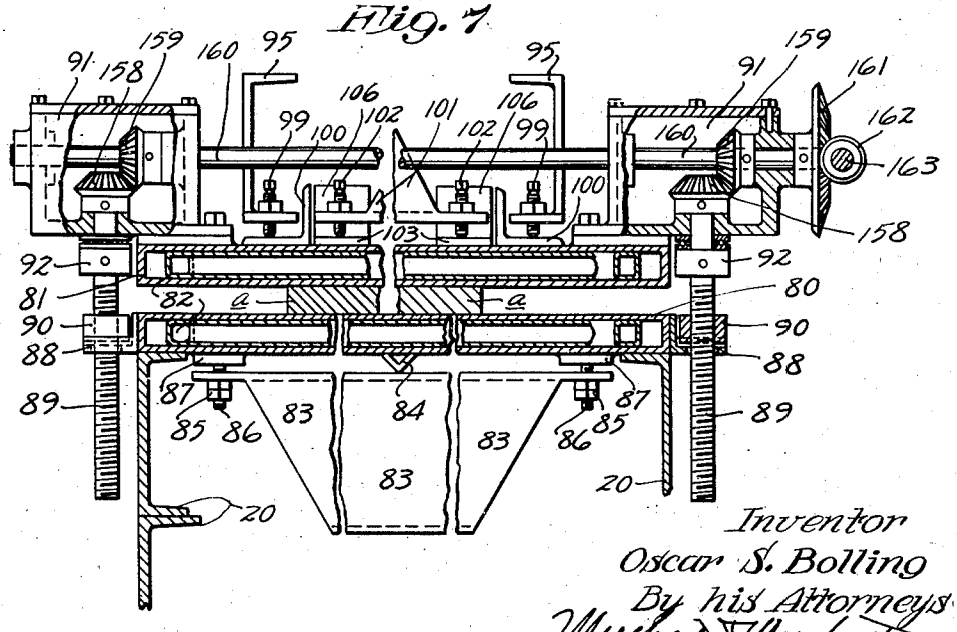


Fig. 7



Inventor
Oscar S. Bolling
By his Attorneys
Murchant Murchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 7

Fig. 8

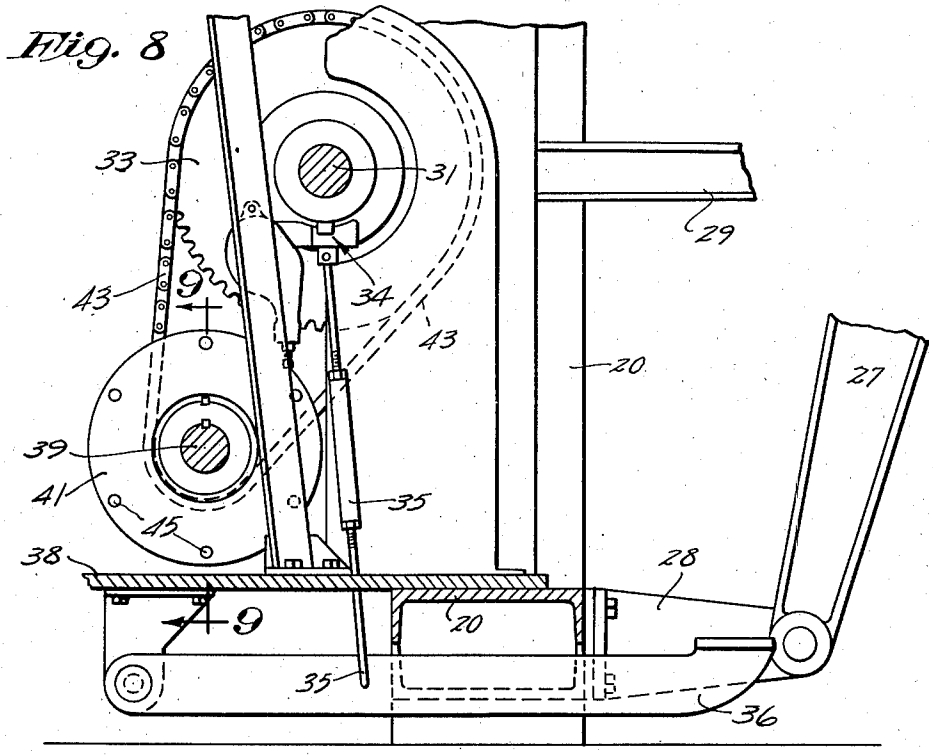
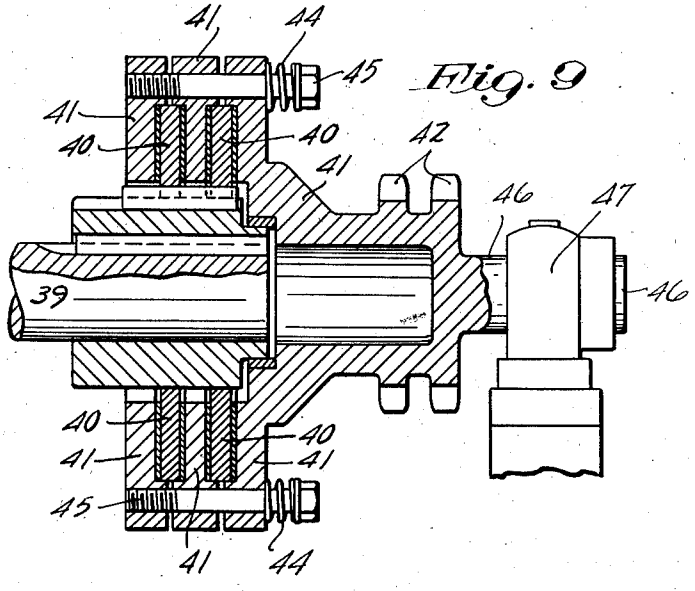


Fig. 9



Inventor
Oscar S. Bolling
By his Attorneys
Mueller & Muellard

Jan. 2, 1945. O. S. BOLLING 2,366.588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 8

Fig. 10

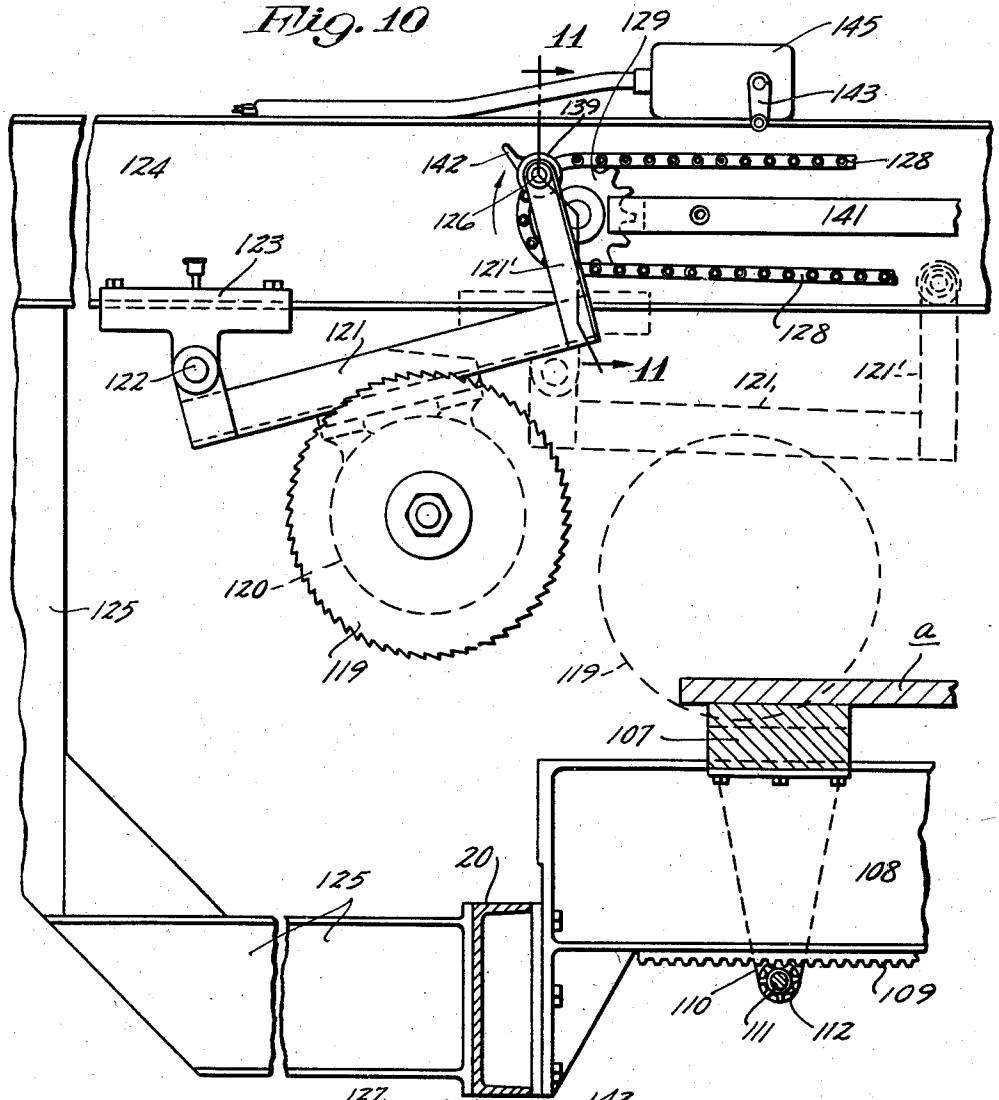
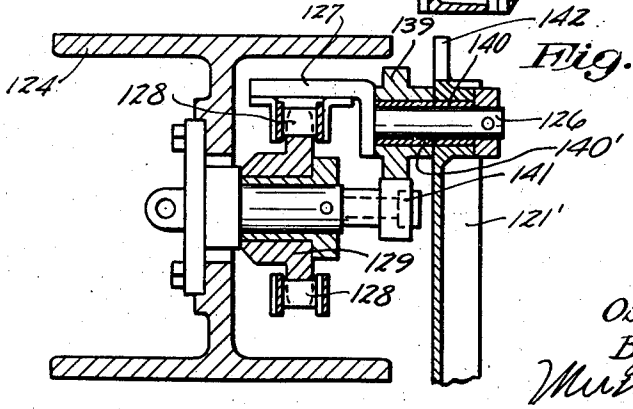


Fig. 11



Inventor
Oscar S. Bolling
By his Attorneys
Muirhead & Muirhead

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 9

Fig. 12

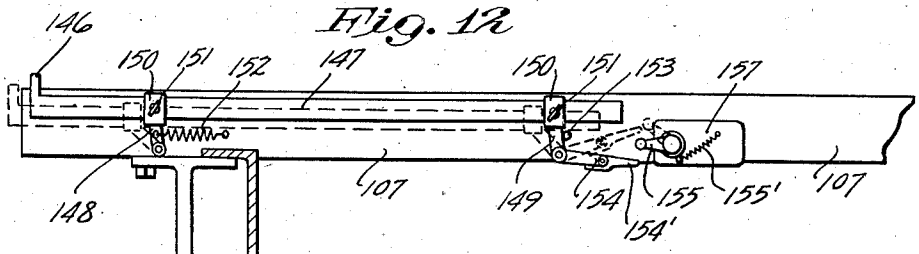


Fig. 13

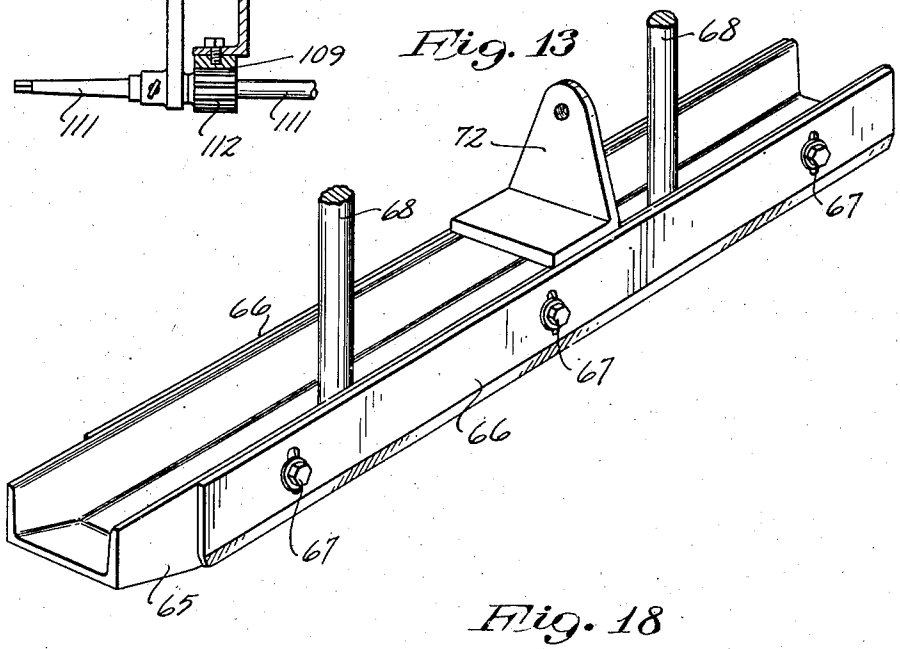
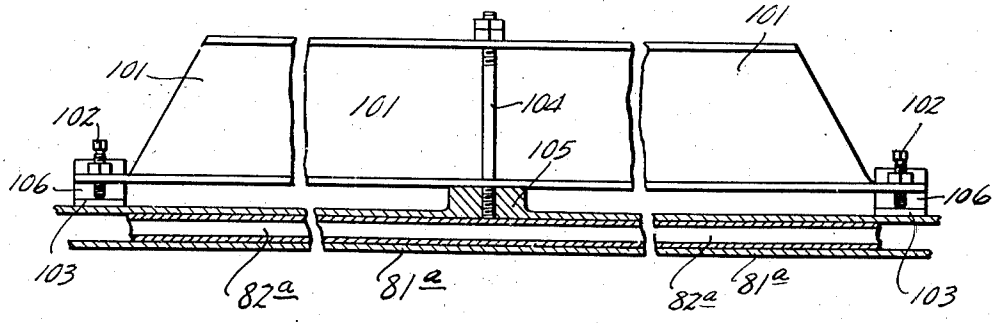


Fig. 18



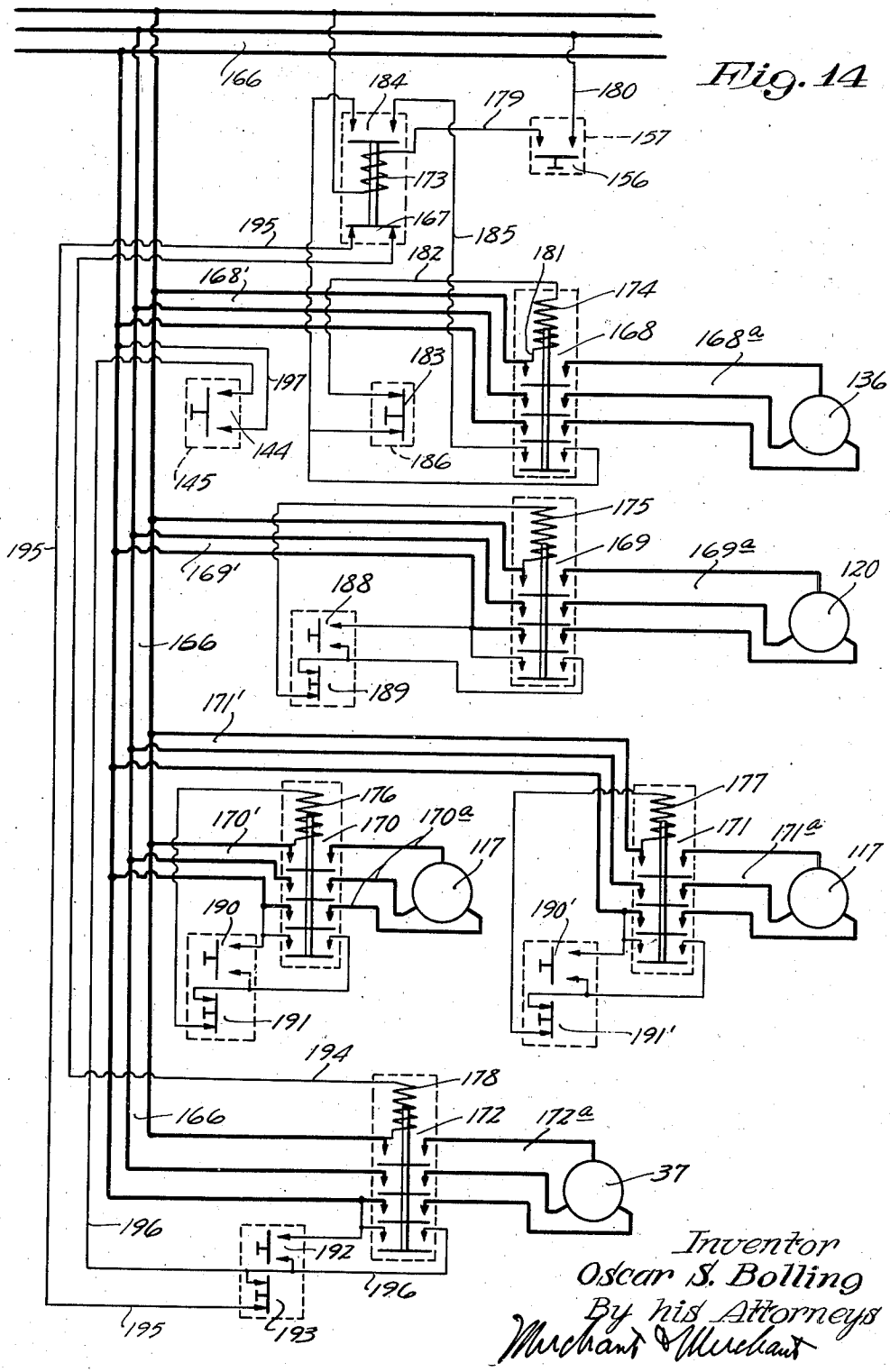
Inventor
Oscar S. Bolling
By his Attorneys
Murchant Murchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 10

Fig. 14



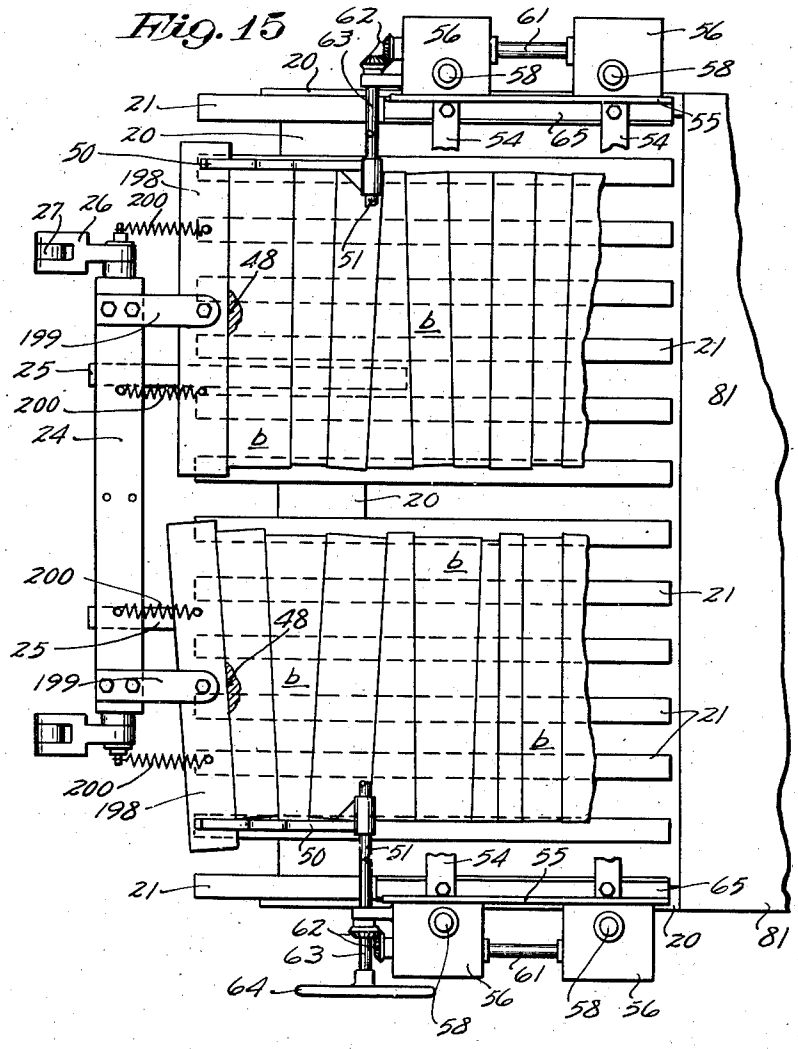
Inventor
Oscar S. Bolling
By his Attorneys
Merchant & Merchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 11

Fig. 15



Inventor
Oscar S. Bolling
By his Attorneys
Muchant & Muchant

Jan. 2, 1945. O. S. BOLLING 2,366,588

PLYWOOD CORE MACHINE

Filed Aug. 16, 1941 12 Sheets-Sheet 12

Fig. 16

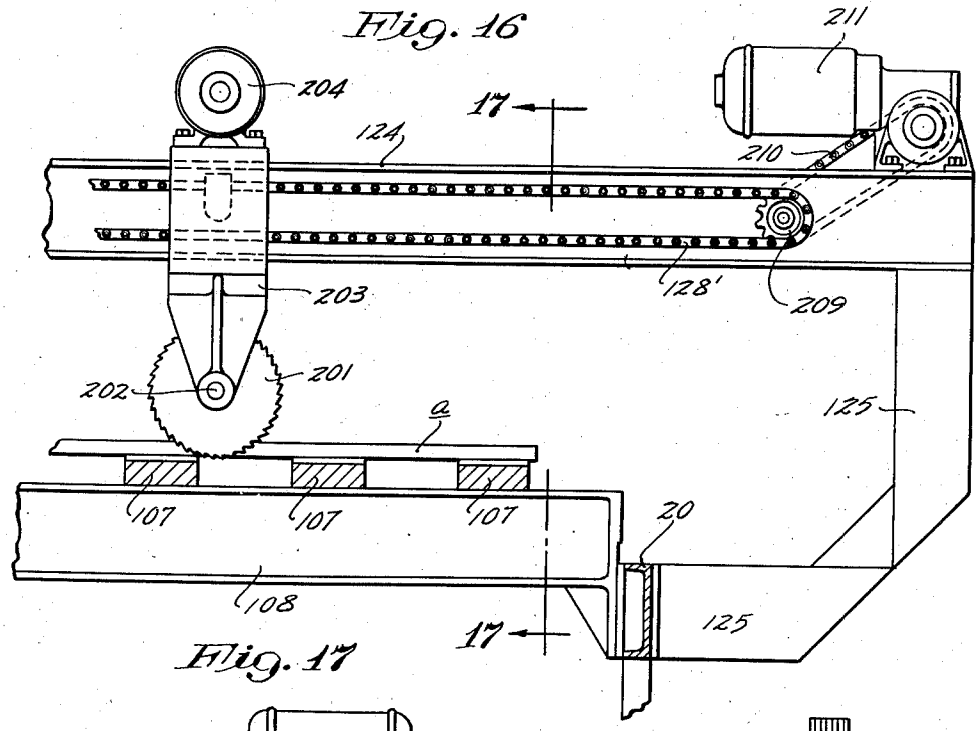
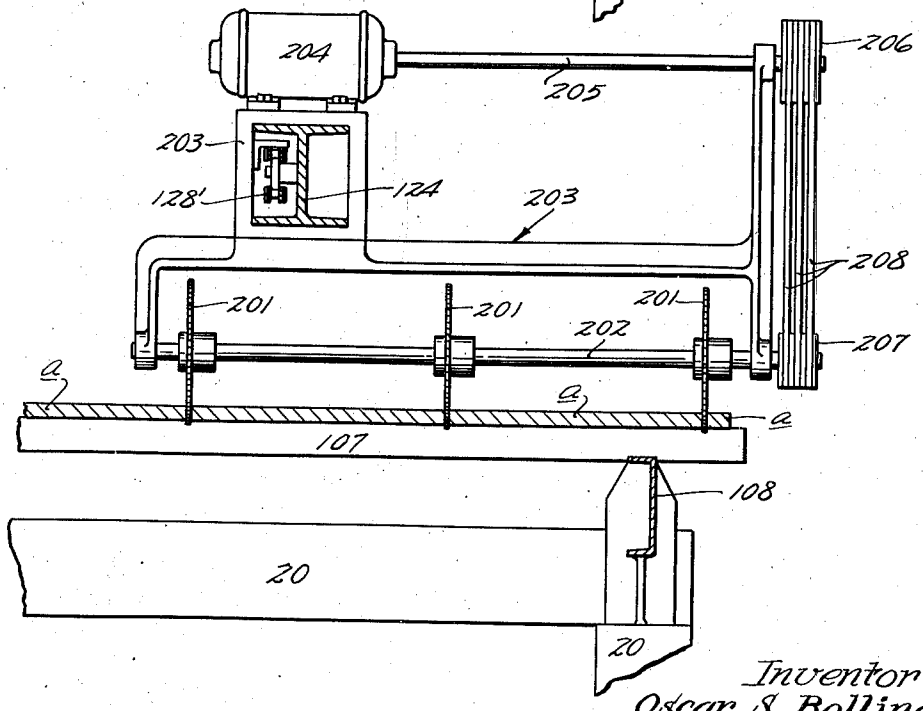


Fig. 17



Inventor
Oscar S. Bolling
By his Attorneys
Murchant & Murchant

Patented Jan. 2, 1945 2,366,588

UNITED STATES PATENT OFFICE

2,366,588

PLYWOOD CORE MACHINE

Oscar S. Bolling, Minneapolis, Minn., assignor to Mereen-Johnson Machine Company, Minneapolis, Minn., a corporation of Minnesota

Application August 16, 1941, Serial No. 407,147

9 Claims. (Cl. 144—279)

My present invention provides an improved and highly efficient machine for making sheets from relatively narrow strips, slats or blocks of wood or the like.

The function of this machine is to assemble and secure together, in glued condition, wooden strips, slats, blocks, or the like, to produce composite wood panels that are suitable for various commercial uses, such as for plywood cores. In the production of plywood, the composite panels produced by this machine will be secured between wooden veneer sheets, but these further operations are intended to be performed by other or additional machines or devices.

In this improved machine, the wooden slats, blocks, or strips, to which glue has been applied to one edge (and before the glue is set) will be placed on the receiving table of the machine and by improved feed device will be forced between table-forming rails and overlying hold-down or pressure bars that operate on the slats with sufficient friction to hold them in tight and compact assembly while the initial setting of the glue is taking place.

From the primary feed table and overlying pressure bars the assembled slats are forced between upper and lower hot plates which hasten and insure the drying of the glue and thereby the permanent union of the slats in the form of a continuous sheet.

After the core-forming sheet, made up of the connected slats, has passed from between the hot plates, the edge or edges of the sheet will be trimmed off and the sheet given the proper predetermined width. After the edges of the sheets have thus been trimmed, and under automatic action, the core-forming sheet will be transversely sawed or cut so that core-forming sheets or panels of the desired length, with respect to the direction of feed, will be delivered as a product of the machine.

Among the objects and accomplishments of my invention are as follows: The provision of an improved push feed mechanism; the arrangement for feeding the strips or stock in single or multiple rows; the improved form of hold-down or pressure bars with sharp blades or edges to prevent endwise shifting transversely of the machine of the stock strips; an improved arrangement whereby the motor-driven cut-off saw will, after it has made its cross-cut, be raised above its operative position while being returned; an improved arrangement of and relation between the hold-down or pressure bars and the push feed mechanism, whereby buckling of the moving composite sheet, under the action of the push feed mechanism, will be eliminated; simple and efficient arrangement for yieldingly supporting and adjusting the upper hot plates; and electromagnetic means for automatically controlling the above indicated functions of the machine. These features will all more clearly appear in the description of the commercial machine illustrated in the drawings.

In carrying out these briefly indicated operations, I employ various novel and important instrumentalities, the preferred arrangement of which is illustrated in the accompanying drawings which illustrate the commercial form of the machine and in which drawings like characters indicate like parts throughout the several views.

Referring to the drawings:

Fig. 1 is a view in perspective showing the complete machine looking at the same from the front or receiving end;

Fig. 2 is a view in perspective looking at the machine from the rear or delivery end;

Figs. 3 and 3*a* are supplemental plan views, the said two views, when united on the broken line marked *x*, making a complete plan view of the machine with some parts broken away;

Fig. 4 is a fragmentary vertical section taken on the line 4—4 of Fig. 3, the delivery end portion of the machine being broken away;

Fig. 5 is a transverse vertical section taken on the line 5—5 of Fig. 3, some parts being broken away;

Fig. 6 is a fragmentary transverse vertical section, some of the parts being sectioned on the irregular line 6—6 of Fig. 3 and various other parts being broken away, and some of the parts being arbitrarily sectioned on a line varying somewhat from the said line 6—6;

Fig. 7 is a transverse vertical section with various parts sectioned on the irregular line 7—7 of Fig. 3 and with parts broken away;

Fig. 8 is a detail or fragmentary view taken in section on the line 8—8 of Fig. 1 showing parts of the feed mechanism, various parts being broken away;

Fig. 9 is a detail in section taken on the line 9—9 of Fig. 8;

Fig. 10 is a vertical section taken on the line 10—10 of Fig. 3*a*;

Fig. 11 is a fragmentary section taken on the line 11—11 of Fig. 10;

Fig. 12 is a fragmentary vertical section taken on the line 12—12 of Fig. 3*a*;

Fig. 13 is a view in perspective showing in detail a pressure bar or so-called hold-down shoe;

Fig. 14 is a diagram showing the electric wiring of the electro-magnetic operating mechanism of the machine;

Fig. 15 is a fragmentary plan view showing the front or receiving end of the machine but illustrating a somewhat modified arrangement;

Fig. 16 is a view in side elevation but partly in vertical section taken transversely of the delivery end of the machine, but illustrating a modified structure or arrangement;

Fig. 17 is a vertical section taken on the line 17—17 of Fig. 16; and

Fig. 18 is a fragmentary section taken approximately on the line 18—18 of Fig. 3, some parts being omitted.

The complete machine, illustrated in Figs. 1 to 14, inclusive, will first be described. All of the parts of this machine are mounted directly or indirectly on a heavy, rigid, substantially rectangular framework preferably made up of commercial rolled steel and comprising side frames, cross connecting bars and vertical posts, all of which are rigidly connected. This complete framework is indicated as an entirety by the numeral 20.

In the drawings, see particularly Figs. 3, 3a, 4 and 5, the so-called "core," which is made up of the wooden strips or slats, is indicated by the character a. The slats that form this core will, as already indicated, be coated with glue on one edge and placed by hand or otherwise on a feed table, preferably, and as shown, made up of skid rails 21 rigidly secured to cross members on the top of the frame 20. These strips will be placed on the feed table 21 with their glue-coated edges forward and just in front of an edgewise reciprocating feed bar or blade 22. This feed bar 22 is intermediately pivoted to a projection 23 of a bar-like feed head 24 that is arranged to slide on the projecting ends of guide rails 25 which, like the table-forming bars 21, are rigidly secured to the top of the framework 20 but project beyond the receiving ends of the latter. The ends of the bar-like feed head 24 are pivotally connected to short links 26 which, in turn, are pivoted to the upper ends of a pair of levers 27, the lower ends of which latter are pivoted to brackets 28 fixed on the base of the framework 20.

By connecting rods 29, see particularly Fig. 4, the levers 27 are intermediately connected to cranks 30 carried by a transverse shaft 31 journaled in suitable bearings 32 on upright portions of the frame 20. The numeral 33 indicates a wheel in the form of a sprocket which is mounted on crank shaft 31. If it is desired that the feed device run continuously, then said sprocket 33 could be rigid on shaft 31; but if intermittent action is desired, a trip clutch, generally indicated at 34 on Fig. 8, may be employed. This trip clutch 34 is preferably of well-known structure and, if used, would be manually operated through a connecting link 35 extended from a foot treadle 36.

Power to drive the feed device through sprocket 33 and crank arms 30 is preferably supplied from an electric motor 37 shown as supported from the main frame 20 by a hanger bracket 38. The rotor shaft of motor 37, through worm gear transmission, of usual or well-known arrangement but including shaft 39, see particularly Figs. 4, 8 and 9, and intermediate transmission mechanism, drives sprocket 33, and hence, the crank shaft 31. The said intermediate transmission mechanism, see particularly Fig. 9, includes an overload-slip clutch of the disc type wherein the discs 40 are keyed to shaft 39 and are clamped between friction plates 41 of a hub equipped with a sprocket 42 (shown as a double sprocket). A sprocket chain 43 runs over the sprockets 33 and 42. The frictional engagement between clutch disc 40 and the flanges of the hub member 41 may be varied by springs 44 applied around and subject to tension of screw bolts 45. Sprocket equipped hub 41 is shown as provided with a trunnion 46 journaled in a bearing 47 secured on framework 20. The purpose of the frictional clutch described is to prevent breakage of parts but the clutch of course should be set with sufficient tension to transmit all the power necessary for normal operations.

At this place attention may be further called to the fact that the feed bar or blade 22, at its central portion, is provided with a barb 48 that will be pressed into the engaged strip and positively prevent endwise slipping thereof while it is being forced into place. Also, it is important to note that this feed bar is capable of oscillation to adapt itself to the surface of core-forming strips that are tapered. The feed bar, however, is yieldingly held in a position at right angles to the direction of longitudinal feed movement, by means of quite loose coiled springs 49 attached thereto and to the ends of the feed head 24.

As a means for aligning the ends of the core-forming slats or strips, I have shown arm-like aligning gauges 50 mounted on a transverse rod 51, see Figs. 1, 4 and 5. At its ends rod 51 is anchored in brackets 52 supported as presently to be described. The edge gauges 50 are pivotally mounted on rod 51 and held down by gravity, but are laterally adjustable by means of set-screw-equipped collars 53.

Located above the feed table, made up of the skid rails 21 and extended transversely of the machine, is a pair of heavy bridge-forming channel beams 54 which, at their ends, are rigidly secured to tie-plates 55, as best shown in Figs. 3, 4 and 5.

Gear boxes 56—56 are rigidly secured to the outer faces of the plates 55. Rotatively mounted in the gear boxes 56 are nut-acting worm gears 57 that work with threaded engagement on the threaded upper ends of supporting posts 58, see particularly Fig. 6. The lower ends of the supporting posts, of which there are four in the arrangement illustrated, are mounted in sleeve-like bearings 59 that are rigidly secured on the side frame forming beams of the framework 20. The nut-acting worm gears 57 are engaged by worms 60 secured in tandem on shafts 61 located one on each side of the machine. These shafts 61, at one end, are shown as connected by miter gears 62 to a transverse adjusting shaft 63 shown in Fig. 3 as equipped at one end with a hand wheel 64.

The bridge beams 54 afford a firm but adjustable support for the hold-down or pressure bars. The preferred form of these pressure bars is shown in detail in Fig. 13 and, as preferably designed, involve channel-shaped main body portions 65 provided at their sides with runner-acting edge blades 66, the knife sharp lower edge of which projects slightly below said main body portions and engaging the work strips to hold the same down and prevent lateral shifting thereof. These blades 66 are rigidly secured to the side flanges of the body 65 by means of slot and screw connections 67. The front ends of the body 65 are preferably upwardly beveled so as to facilitate the entry of the slats or core-forming strips under the same; and for the same reason the front ends of the sharp edges of the blades 66 are slightly rounded. The channel-shaped

bodies 65 are rigidly secured to the lower ends of plungers or rods 68 that are passed upward through the flanges of the bridge beams 54. Nuts 69 on the upper ends of the plungers 68 limit the downward movements of said plungers and the pressure bars carried thereby. Coiled springs 70 on the plungers are compressed between nuts 71 adjustable on the plungers, and the upper flanges of the bridge beams 54.

The hold-down or pressure bars 65—66 are preferably set parallel to and immediately over underlying members of the table-forming skid rails 21.

As best shown in Fig. 4, thrust brackets 72 are secured on top of the body portions 65 of the pressure bars and these brackets are provided with adjustable stops in the form of screws 73 that engage the rear bridge beams 54 and resist endwise movements of the pressure bars rearward under the frictional action thereon produced when the core sheets are forced over the feed table and under the said pressure bars.

Means has already been described for imparting accurate vertical adjustments of the pressure bars in respect to the table-forming skid rails. However, it is sometimes desired to quickly move all of the pressure bars vertically into inoperative positions; and means for accomplishing this action is illustrated in Fig. 6 wherein the lower portions of the plungers 58 are provided with rack teeth engaged by pinions 74 mounted in the bearings 59 and having projecting arms 75. The pinions 74 and arms 75 are secured on short shafts 76, see particularly Figs. 1 and 6. One of the arms 75 projects upward and the other downward and these are connected by a link 77, as shown in Fig. 6. A latch-equipped lever 78 is applied to a projecting end of one of the shafts 76. Lever 78 will normally stand as shown in Fig. 6 with stop collars 79 thereof resting on the upper ends of the bearings 59 and limiting the downward movement of the said posts 58, the bridge beams 54 and the pressure bars carried by the latter. When, however, lever 78 is moved to dotted line position, the said posts and parts supported thereby, including the pressure bars, will be raised well above operative positions.

It is important to note, see particularly Fig. 3, that some of the hold-down or pressure bars 65—66 project at their receiving ends farther than others. With this arrangement the strips will be first forced under about one-half of the pressure bars before they are passed under the other pressure bars and before they come into engagement with and are subject to high resistance to rearward movement of the composite sheet. This is, of course, the result of extending at least some of the hold-down bars far toward the front of the machine and providing such a relatively long stroke in the push feed mechanism that the feed bar and fed in slats or strips will be moved fully under the hold-down bars before they engage the resistance of the main sheet, and it is this feature which entirely eliminates any possibility of buckling up of the assembled sheet-forming slats at the infeed end of the machine, especially when two or more strips are fed in at a time.

When the core, made up of the slats, is forced from between the lower skid rails 21 and the overlying hold-down or pressure bars 65—66, it will be forced between lower and upper hot plates 80 and 81. These hot plates, as shown, are of thin sheet metal and they are formed hollow and are arranged to be heated by steam delivered through coils or pipes 82, which latter are, of course, connected to a source of steam. Preferably, the complete hot plate structure is made up of two sets, the one just noted, to wit: 80 and 81, and a second or similar set of hot plates 80*a* and 81*a*. The plates 81 and 81*a* are in line or tandem and the plates 80 and 80*a* are in line or tandem. Steam pipes or coils 82*a* are placed in the hollow hot plates 80*a* and 81*a*. For this structure see particularly Figs. 3, 4 and 7. The lower plates 80 and 80*a* rest upon and are directly and rigidly secured on the upper longitudinal beams or beams of the main frame 20, as best shown in Fig. 7. When the lower plates are very wide, they are trussed to prevent sagging at the transversely central portions by suitable means such as truss members 83, the central portions of which bear against contact lugs 84 on the bottoms of said plates. The reduced ends of the truss members 83 are shown as hung on nuts 85 of studs 86 that depend from bosses 87 on the bottoms of said plates near the supported side edges thereof.

Rigidly secured to the sides of the lower hollow hot plates, two on each side thereof, are outstanding stop brackets or flanges 88 through holes in each of which are extended elevating screw rods 89 equipped with stop nuts 90. The upper ends of each of the four elevator screws 89 extend upward into gear boxes 91, as best shown in Fig. 7, and said screw rods are provided with collars 92 that directly or indirectly support the said co-operating gear boxes. The two laterally spaced front boxes 91 are bolted or otherwise rigidly secured to the front corners of the upper hot plate 81 and the two rear boxes 91 are rigidly secured to the rear corners of the hot plate 81*a*.

With the arrangement above noted, the upper hot plates 81 and 81*a* are normally supported at a level just below the upper plane of the stock to be fed therethrough. In the normal or lower position of the upper hot plates, the stop nuts 90 rest upon the stop brackets 88. However, when the core sheet stock is being passed between the upper and lower hot plates, the upper hot plates float on and exert their full weight upon the moving core sheet. In this floating or raised position of the upper hot plates, the stop nuts 90 are raised from the stop brackets 88, as shown in Fig. 7.

To guide the upper hot plates for true vertical movements and to hold the same against shifting horizontally, either forward or rearward or laterally, I provide as simple means for that purpose vertically extended relatively long guide bars 93 rigidly secured to the side members of the frame 20. These guide bars work between spaced lugs or straps 94 on the side edges of the upper hot plates or pans 81 and 81*a*. For this last noted structure see particularly Figs. 1 and 3.

To prevent sagging of the upper hot plates, I provide truss devices, such as best shown in Figs. 3, 4 and 7, and which truss devices involve as follows: the numeral 95 indicates horizontal truss beams which, at their central portions, have aligning surfaces 96 that lap the joints between the hot plates 81 and 81*a*. These aligning surfaces are clamped together by bolts 97 applied through the flanges of beam 95 and, as shown, screwed into bosses 98 on the abutting ends of the said upper plates. The truss beams 95, at their ends, are provided with depending contact screws 99 that bear against contact pieces 100 secured on the tops of the plates 81 and 81*a*. When the screws 99 are tightened, they raise the truss

beams 95 and cause the latter to lift upward on the central portion of the composite upper hot plate, thereby preventing sagging thereof or at the joint between the plates 81 and 81a.

To prevent transverse sagging of the composite or complete upper hot plates, I provide a transverse truss bar or member 101 which, as shown, is much like the lower truss member 83 but is reversed with respect thereto. The reduced ends of this beam 101 are equipped with adjusting screws 102 that bear against contact plates 103 on the tops of the upper hot plates 81 and 81a. Hanger rods 104 anchored to the central portions of the transverse truss beams 101 are screwed into bosses 105 on the tops of the transversely central portions of the said upper hot plates 81 and 81a. When the screws 102 are tightened, truss beam 101 will be raised and will pull upward on the hanger rods 104 and on the central portions of the upper hot plates and thereby prevent sagging thereof. Contact lugs 106 on the tops of the plates 81 and 81a engage the ends of the truss bars 101 and prevent turning thereof on the hanger bolts 104.

After the core, made up of the connected strips or slats, has passed from between the hot plates, they are forced between the secondary feed table and overlying secondary pressure hold-down or pressure bars. These secondary devices are substantially duplications of the primary feed table and primary pressure bars, except that the pressure bars are all of the same length. The means for supporting and operating these devices are and may be considered as duplicates of the supports and operating devices for the primary feed table and pressure bars already fully described in detail, and hence, the corresponding parts are indicated by the same characters with the added prime marks. If, in reading the description of the said primary table-forming and pressure or hold-down devices they are read with the added prime marks, they will fully describe said secondary feed table and pressure devices. However, the function of these secondary devices is to hold the assembled core-forming strips tightly pressed together after the glue has been well heated and while the strips are cooling and the glue firmly setting. Also, as will presently appear, these secondary devices hold the core sheet firm while the edges of the core are being trimmed off by the power-driven saws.

When the core sheet passes off from the lower secondary table-forming skid bars 21' and from under the secondary hold-down or pressure bars 65', it passes onto the final skid bars 107 that are mounted to slide laterally on the upper flanges of transverse guide beams 108 that are rigidly secured to the rear portion of the main frame 20. On their under flanges the beams 108 are provided with racks 109. Each skid rail 107 has depending brackets 110 in the depending ends of which is journaled a shaft 111 equipped with pinions 112 that engage the racks 109 of the several guide beams 108. Each shaft 111 is shown as provided with a squared end or shank to which an operating crank 113 may be applied to adjust the several skid rails 107 laterally to correspond more or less closely to the width of the core sheet after it has been trimmed by means next to be described.

Extended over and above the skid rails 107 is a heavy bridge beam 114, the ends of which are rigidly secured to upright posts or portions of the framework 20, see particularly Figs. 1, 2 and 3a. Mounted for lateral sliding movements or adjustments on the bridge beam 114 are carrier frames or members 115. In the arrangement illustrated saws are provided for trimming both edges of the core sheet. These trimming saws, which are circular saws 116, are carried by the rotors of electric motors 117 that are supported by and adjustable with the carrier frames 115. By the usual or any suitable well-known means, these motors and saws are mounted for both vertical and lateral adjustments on the bridge beam 114.

The core sheet, as it is moved onto the skid rails 107, moves under and is pressed downward by leaf-like pressure springs 118 that are anchored on and depend from the bridge beam 114. When the core sheet has been fed the proper distance for the desired length of core section, the sheet will be transversely cut or severed by a cut-off saw which will be automatically actuated and moved to produce the cutting action, at a time when the feed movement of the sheet has been stopped. This cut-off saw 119 is a circle saw carried by the rotor of an electric motor 120. The frame of motor 120 is mounted on a vertically movable support 121 that is pivoted at 122 to a carriage 123 mounted to travel on the lower flange of a heavy transverse bridge beam 124, the ends of which are rigidly connected to the side members of the main frame 20 by heavy offset brackets 125, see particularly Figs. 1, 2, 3a and 10.

The pivoted lever-acting support 121 for the saw 119 and its motor, as preferably formed, is provided with an upwardly extended arm 121', see particularly Figs. 10 and 11. The arm 121', at its upper end, is pivoted on a stud 126 of a bracket or coupling element 127 that is firmly attached to one of the links of an endless chain 128, of the link belt type. This carrier chain is arranged to run in the channel of the transverse bridge beam 124 and to run over guide wheels 129 and 130 that are in the form of sprockets, see particularly Figs. 1 and 10. The sprocket 130, see Fig. 3a, is the driving sprocket for chain 128 and it is secured on a shaft 131 that extends through the web of bridge bar 124 and is journaled in a bearing 132 secured on said web. At its other end shaft 131 is provided with a sprocket 133. Sprocket 133 is aligned with a sprocket 134 on the extended end of a shaft 135 that is driven from the rotor of a motor 136, the casing of which is rigidly mounted on top of the bridge beam 124. Shaft 135 is driven from the rotor of motor 136 through reducing gears of well-known commercial form or any suitable form, not shown in detail but contained within a casing 137. A belt or sprocket chain 138 runs over the sprockets 133 and 134.

A guide roller 139 is loosely journaled on the stud 126. As shown in Fig. 11, a sleeve-like bushing 140 is applied around the stud 126. This bushing 140 is preferably rigidly secured to the arm 121' and the stud 126 is journaled therein while the roller 139 is journaled on said stud through the medium of a bushing 140'.

This roller 139 is adapted to run both over and under a guide rail 141 that is rigidly secured to the web of the bridge beam 124 in such position that the roller 139 will run over the same on its return movement of the saw, but will run under said rail 141 and upon the lower flange of said bridge beam under the saw cutting movement, all of which will more fully appear in the description of the operation. For an important purpose, which will hereinafter appear, the upper end of arm 121' is provided with a trip lug or projection 142 that is engageable with the free end

of the arm 143 of a switch 144, which latter is diagrammatically indicated in Fig. 14 and is illustrated as contained within a casing 145 in Fig. 10. At this point it is only advisable to state that when the trip lug 142 engages said switch arm 143, the feed motor 37 will be started. The feed belt 128 is driven in the direction of the arrows marked adjacent thereto in Figs. 1 and 10. With this arrangement, it is evident that the saw 119 will be lowered at the limit of its travel toward the right, in respect to Figs. 1 and 10, and will be raised when it reaches the limit of its travel toward the left, in respect to said views.

When the core sheet has reached the limit of its rearward movement and carried the predetermined desired portion of the sheet past the transverse cutting line of saw 119, it will engage the upstanding lug 146 of a trip bar 147 that is supported for endwise movements by a pair of parallel links 148 and 149 which, as best shown in Figs. 2, 3a and 12, are, at their lower ends, pivoted to one of the rear skid rails 107. To make the trip bar 147 adjustable for different widths of core sections to be cut off, said bar is shown as provided with slidable heads 150 clamped thereto by thumb-screws 151. The upper ends of the links 148 and 149 are, in this preferred arrangement, pivoted directly to the respective heads 150. Trip bar 147 is yieldingly pulled forward by a suitable means such as a spring 152. A fixed stop pin 153 engages the link 149 to limit forward movement of bar 147. The link 149 is secured to and moves with an arm 154 so that the said elements 149 and 154 constitute, in effect, a bell-crank lever. Arm 154 is engageable with an arm 155 of a limit switch 156, which latter is shown in diagram only in Fig. 14. In Fig. 12 switch 156 is assumed to be in a casing 157 secured on one of the rails 107. This switch 156 is normally open and is yieldingly biased toward its open position by a spring 155'. At this point it is desirable only to further state that when trip bar 147 is pressed rearward by the core sheet, arm 154 will be raised from its lower position, shown by full lines in Fig. 12, to its upper position shown by dotted lines in Fig. 12. Under this upward movement of the arm 154 of the bell-crank, the switch arm 155 is engaged by the free end of arm 154 and moved from its lower switch open position, shown by full lines in Fig. 12, to its upper switch closed position, shown by dotted lines in Fig. 12. By reference to the dotted line positions of Fig. 12, it will be seen that the free end of bell-crank arm 154 disengages the free end of the switch arm 155 before the bell-crank arm 154 reaches its uppermost position and therefore permits immediate return of the switch arm 155 to its lower position and consequent immediate reopening of switch 156. As soon as the cut-off length of core sheet is removed, the trip bar 147 will be returned by spring 152 to its normal position, which will, in turn, cause the arm 154 to return to its lower normal position. In this connection it is important to note that the bell-crank arm 154 is made up of two parts pivotally connected at 154', so that the free end of the arm 154 is free to move pivotally in an upward direction to thereby clear the free end of the switch arm 155 and assume its normal position below the free end of switch arm 155 under return movements of the arm 154.

As previously noted, the upper hot plates are supported for vertical adjustments by the four elevator screw rods 89 and their collars 92. For imparting like and simultaneous rotary movements to the said four screw rods 89, they are provided, at their upper ends within the boxes 91, with miter gears 158 that mesh with miter gears 159 on transverse shafts 160. Shafts 160 are journaled in bearings on the boxes 91 and at their outer ends are provided with bevel gears 161, see Figs. 3 and 7. To impart simultaneous and like rotary movements to the two shafts 160, bevel gears 161 mesh with bevel pinions 162 on a shaft 163. Shaft 163 is shown as journaled in brackets 164 on the boxes 91 and is provided with a hand wheel 165 for rotation of said shaft 163 to manually transmit vertical adjustments to the upper hot plates 81 and 81a.

General statement of operation

In this improved machine, as present designed for commercial purposes, the several operating motors described will be cut into and out of action by electro-magnetic controlling mechanism which will presently be described, but before tracing in detail this electro-magnetic control mechanism, it is thought desirable to state in advance the timing and order in which the several functions of the machine take place.

The core-forming strips, with applied glue, will, as already stated, be placed on the feed table, made up of the skid rails 21, one or more thereof at a time. Assuming that the motor 37 is in action, then through the clutch and transmission mechanism already described and particularly shown in Figs. 8 and 9, each time that the foot treadle 36 is depressed the feed bar 22 will be moved rearward and will force the slat or assembled slats under the pressure bars 65. Also, as already stated, the slat or slats when placed upon the feed table will be aligned at least at one end by one or the other of the aligning gauges 50.

Under repeated reciprocating movements of the feed bar 22 the assembled and aligned slats will be forced rearward between the upper and lower hot plates and past the edge trimming saws until the core sheet has reached the point where it is to be cut off by the transversely movable cut-off saw 119. At this point the rear edge of the core sheet will engage the lug 146 of the trip bar 147 and by forcing the latter rearward will close the limit switch 156 and this will simultaneously cut the feed motor 37 out of action and close the circuit through motor 136. The cut-off saw 119 may be and preferably is constantly driven.

Fig. 10 shows the cut-off saw in the position just after it has completed a transverse sawing movement but normally said saw will stand in a raised position at the other side of the machine so that when it is called into action to produce the next transverse sawing of the core, it will only move slightly downward and will then be caused to travel on its lower course across the core. In this movement the roller 139 will move under the rail 141 and thereby positively hold the saw with its lower cutting edge below the level of the core. The dotted line position of the saw 119 in Fig. 10 shows the said saw in its lowered position.

When the saw has completed one cutting movement and starts back to its starting point, the lug 142, by engagement with the switch lever 143, will close feed motor switch 144 and again start the feed motor 37 so that the feed bar will be again operated. When the cut-off motor carriage 123 brings the cut-off saw back to normal or starting position, it will be cut out of action by electromagnetic switch elements presently to be more fully described.

As already indicated, the cut off section of the core sheet must be removed from the rear skid bars 107 before the cut off saw feed motor 136 can be again started into action. Of course, when the cut off section of the core sheet has been removed, the lug 146 of the bar 147 will be released so that said bar 147 and its bell-crank, consisting of levers 149 and 154, will be returned to their normal positions by spring 152, in the manner previously described. However, if the cut off section of the core sheet is not removed, the push feed mechanism will continue to operate and, providing that additional slats or strips are fed into the machine, the core sheet will continue to move rearwardly, which will cause lug 146 and bar 147 to be carried rearwardly and downwardly to a position wherein the top of lug 146 is below the rearwardly progressing core sheet. This will result in the feeding of a continuous ribbon of core sheet as long as the feed mechanism continues to operate. In other words, the cut off section of core sheet must be removed to render the cut-off saw feed motor 136 automatically operative at predetermined intervals.

Electro-magnetic control system

In the diagrammatic view, Fig. 14, the stock feed motor 37, the trimmer saw motor 117, the cut-off saw motor 120, and the cut-off saw carrier feed motor 136 are diagrammatically shown, and these are all arranged to be driven by three-phase alternating current delivered from a three-phase power line 166. In this diagram 167 indicates a double-throw relay switch; and the numerals 168, 169, 170, 171, 172 indicate multiple contact magnetic switches. The contacts on one side of said switches 168, 169, 170, 171 and 172 are, by multiple leads 168', 169', 170', 171' and 172' connected across the supply lead 166; and the contacts on the opposite sides of said switches 168, 169, 170, 171 and 172 connected by multiple leads 168*a*, 169*a*, 170*a*, 171*a*, and 172*a* to the motors 136, 120, 117 and 37.

For action on the movable plunger-like elements of the switches 167, 168, 169, 170, 171 and 172, said switches, respectively, include coils 173, 174, 175, 176, 177 and 178. Coil 173, by a lead 179, is connected from one of the power line wires 166 to one side of the limit switch 156, the other side of which switch 156 is connected by a lead 180 to another one of the wires of the power line. Switch 156 is normally opened but adapted to be closed by sliding movement of the heretofore described trip bar 147.

One terminal of coil 174, by a lead 181, is connected to one of the leads of the power line and the other side by a lead 182 is connected to one side of a cut-off switch 183, the opposite side of which switch is connected to one of the right-hand contacts, and to the left-hand contacts 184 of said switch 167. The other contact 184 is connected by a lead 185 to one of the left-hand contacts of switch 168. Switch 183 diagrammatically shown in Fig. 14 is in Figs. 1, 2 and 3 contained in a housing 186 and its movable element is provided with an arm 187 that will be engaged to open said switch 183 when the lug 142 on the carrier chain 128 engages said arm at a time when the cut-off saw has about reached its normal return position said switch 183 may be assumed to be a yieldingly closed switch.

In Fig. 14 the numeral 188 indicates a normally open push button switch and the numeral 189 indicates a normally closed push button switch. One of the contacts for switch 188 is connected to one of the left-hand contacts of switch 169 and one of the contacts of switch 189 is connected to another of the left-hand contacts of switch 169 through coil 175. The other contacts of the two switches 188 and 189 are connected to one of the right-hand contacts of switch 169.

The numerals 190 and 191 indicate other push button switches that are similar to the said switches 188 and 189. Switch 190 is normally open and switch 191 is normally closed. One contact of switch 190 is connected to one of the right-hand contacts of switch 170 and to one of the supply leads 166. One contact of switch 191 is connected to another of the left-hand contacts of switch 170 through coil 176. The other contacts of switches 190 and 191 are connected to one of the right-hand contacts of switch 170. By reference to Fig. 14 it will be noted that in connection with the relay switch 171 push button switches 190' and 191' are cooperatively applied to switch 171 in the same relation that the switches 190 and 191 are applied to relay switch 170.

In connection with relay switch 172, there is also provided a normally open push button switch 192 and a normally closed push button switch 193. These switches 192 and 193 in cooperation with the relay magnet 172 control the operation of the stock feed motor 37. One terminal of coil 178 is connected to one of the left-hand contacts of switch 172 and to one of the supply leads 166; and the other terminal of said coil, by a lead 194, is connected to one of the lower contacts of switch 167.

The other lower or left-hand contact of switch 167, by a lead 195, is connected to one of the contacts of switch 193, the other contact of which, by a lead 196, is connected to one of the right-hand contacts of relay switch 172 and to one of the contacts of the switch 144, the other contact of said switch 144 being connected by a lead 197 to one of the supply leads 166.

As the initial step in starting the machine into action, push button 192 is closed thereby through relay switch 172 starting the feed motor 37 into action. Next, push button 190 is closed thereby through relay switch 170 starting the left-hand trimming saw motor 117; and if push button 190' be also closed, then through right-hand relay switch 171 the right-hand motor 117 that actuates the right-hand trimming saw will also be started into action. The said left-hand trimming saw motor will be continuously driven until normally closed push button switch 191 is opened; and right-hand trimming saw motor will be continuously operated until normally closed push button switch 191' is opened. By pressing and closing push button switch 188 relay switch 169 will be caused to close the circuit through motor 120 that rotates the cut-off saw 119; and this saw will be continuously rotated until normally closed push button switch 189 is pressed and opened.

When switch 156 is closed as described by the action of the trip bar 147, the coil 173 is energized, thereby raising the core of switch 167, closing switch 184 and through relay switch 168 closing the circuit through motor 136 which imparts the traveling movements to the cut-off saw carriage 123.

The just above described raising of core of coil 173 which closed switch 184, opens switch 167 thereby breaking the circuit through coil 178 of relay switch 172 with the result that the core of

switch 178 will drop and thereby open the circuit to feed motor 37 cutting the latter out of action.

When the saw carriage with the cut-off saw has completed its operative travel at the lower position and has started its return movement, the severed section of the core should be removed which again allows the trip bar 147 to return to its normal position shown by full lines in Fig. 12, wherein the free end of bell-crank 149 is below the free end of switch arm 155. Under the continued return movement of the cut-off motor carriage, the lug 142 engages actuating lever 143 of switch 144 thereby closing switch 144 which again closes the circuit through coil 178 and through relay switch 172 and cuts feed motor 37 into action.

By still further continued return movement of the cut-off motor carriage 123 and when the latter has about reached its initial or starting position, the lug 142 will engage the actuating arm 187 of switch 183 and automatically opens said switch stopping the travel of the cut-off saw by cutting out motor 136 through the action of relay switch 168.

In connection with the preferred form of the machine already described, it is important to note that the feed bar 22 is connected by an intermediate pivot to the feed head or member 24 so that it will adapt itself to tapered slats or strips and produce equal pressure on the same at all points. In some cases it is desirable to feed the slats in two or more parallel series so as to simultaneously produce a plurality of core strips, and a modified form of the machine designed to accomplish this result is illustrated in Fig. 15 wherein the slats are indicated by the character *b*. In this modified form the machine structure is the same as that already described, except that instead of a single feed bar, two feed bars 198 are intermediately pivoted to lugs 199 on the ends of the bar-like feed head 24. Springs 200 yieldingly hold the feed bar 198 normally substantially parallel to the head 24. The other parts of this machine being identical with those first described are designated by the same characters that are applied thereto in the earlier described structure.

Figs. 16 and 17 illustrate certain modifications in which the main portions are identical with certain parts illustrated in the first instance and which are indicated by the same or original characters. In this modified arrangement there are three cut-off saws 201 on shaft 202 that are journaled in a frame 203 arranged to slide or travel upon the bridge beam 124. In this arrangement the cut-off saws are driven from an electric motor 204 mounted on the traveling frame 203 and having a rotor shaft 205 equipped at one end with a pulley 206 and over which pulleys and a pulley 207 on the end of shaft 202 runs a belt 208.

The carrier belt 128' which corresponds to the belt 128 runs over a sprocket 209 and another sprocket, not shown, and is driven through a sprocket chain 210 from a motor 211 shown as mounted on one end of bridge beam 124.

The commercial form of the machine and certain modifications thereof have been illustrated and described, but it will be understood that various other modifications as to details of construction, combinations and arrangement of parts may be made within the spirit of the invention herein disclosed and sought to be claimed.

While the continuous operation has been described as being obtained by depressing of the clutch controlling foot pedal 36 prior to each cycle of operation of the push feed mechanism, it should be understood that continuous uninterrupted operation of the feed bar can be and often is obtained by suitably locking or latching of the foot pedal in its depressed position.

What I claim is:

1. In a machine of the kind described, a feed table, pressure bars extended longitudinally of and overlying said table, means for feeding strips onto said table and under said pressure bars, said pressure bars comprising elongated main bodies and longitudinally extending runner-acting blades anchored to said main bodies, said runner-acting blades having sharp work-engaging edges that project below the bottoms of the main bodies of the pressure bars and serve to prevent work strips from shifting edgewise transversely of the machine.

2. The structure defined in claim 1 in which the runner-acting blades of said pressure bars are vertically adjustable on the main bodies thereof.

3. In a machine of the kind described, a horizontal feed table, pressure bars extended longitudinally of and overlying said table, means for feeding strips onto said table and under said pressure bars, and which feed means includes a reciprocating head and a feed bar that is vertically pivoted to the head for horizontal swinging movements over the table to adapt itself to tapered strips as well as strips with parallel edges.

4. In a machine of the kind described, a horizontal feed table, pressure bars extended longitudinally of and overlying said table, means for feeding strips onto said table and under said pressure bars, and which feed means includes a reciprocating head and a plurality of feed bars independently vertically pivoted to said head for horizontal swinging movements over the table to adapt themselves to tapered strips as well as strips with parallel edges, said plurality of feed bars being operative to simultaneously feed a plurality of strips over said feed table and under said pressure bars.

5. In a machine of the kind described, a feed table, a pressure bar overlying the feed table and extending longitudinally thereof, means for feeding edge-glued strips onto the table and under the pressure bar, said pressure bar comprising an elongated main body and an elongated runner-acting blade anchored to the main body, said runner-acting blade having a sharp work-engaging lower edge that projects below the bottom of the main body of the pressure bar and serves to prevent the work from shifting edgewise transversely of the machine.

6. The structure defined in claim 4, in which there are a pair of said runner-acting blades vertically adjustably anchored to opposite laterally spaced sides of the main body.

7. In a machine of the kind described, a feed table, laterally spaced pressure bars extending longitudinally of and overlying the feed table, each of said pressure bars having a longitudinally extended runner-acting portion with a sharp work-engaging edge, and feed mechanism for feeding strips onto the table and under said pressure bars, said feed mechanism comprising a reciprocating head and a feed bar that extends transversely of the line of feed and is pivoted for oscillatory movements to the reciprocating head to adapt itself to tapered strips as well as to strips with parallel edges.

8. The structure defined in claim 7, in which the work-engaging face of the pivoted pressure

bar is provided with a work-engaging barb which will cooperate with the runner-acting edges of the pressure bars to prevent lateral slippage of edge-glued strips.

9. In a machine of the kind described, a horizontal feed table, pressure mechanism longitudinally overlying the feed table, means for feeding strips onto the feed table and under said pressure mechanism, said feeding means comprising a reciprocating element and a feed bar vertically pivoted thereto for horizontal swinging movements over the table to adapt itself to tapered strips as well as to strips with parallel edges.

OSCAR S. BOLLING.