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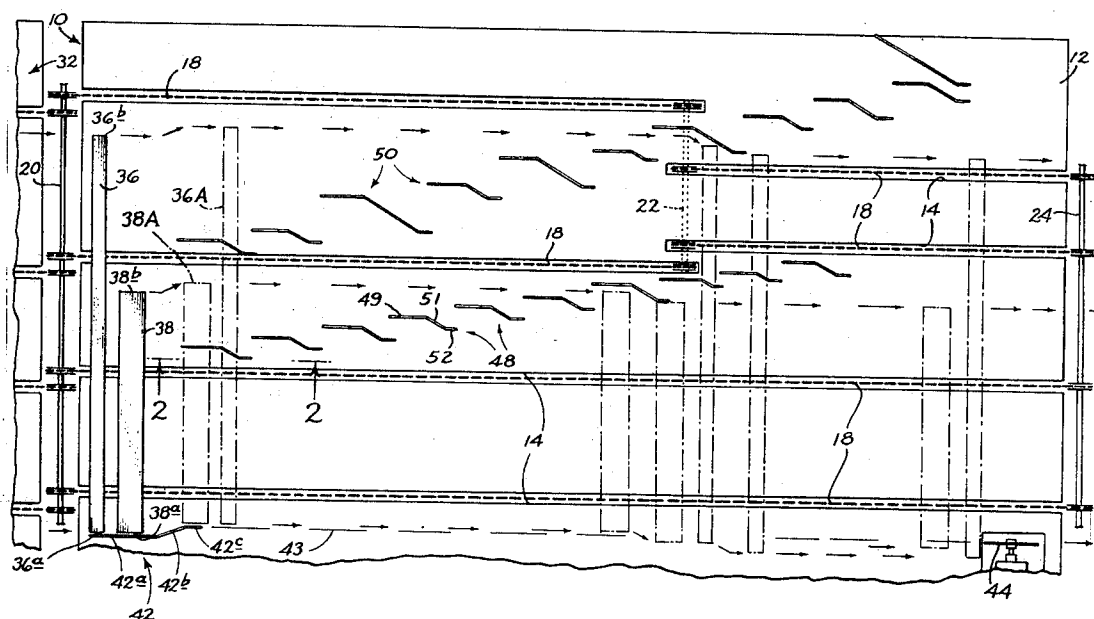
[54] **METHOD AND APPARATUS FOR TRIMMING
 BOARDS**
3 Claims, 9 Drawing Figs.

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 144/242, 144/312, 83/438
 [51] Int. Cl. **B27b 5/00**
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 242(1), 242(4), 242(5), 245, 245(1), 309, 312,
 321, 323, 326; 83/438

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ABSTRACT: Board-trimming apparatus including a conveyor for moving boards along a path, with the boards extending transversely of such path, and a guide for aligning one end of each board with a reference line adjacent one side of such path. A saw for making a cut along a cutting line adjacent said one side of the path downstream from the guide is provided. Multiple indexing plates are distributed in laterally spaced relation across the path intermediate the guide and saw. Each plate is operable to select a board of a specific length range from boards of random lengths moved past the plates, and, on selecting such a board, occupies a position in the path immediately adjacent the end of the board opposite the one end aligned by the guide. Positioning means is included for shifting a board selected by an indexing plate laterally of the path into a predetermined position with respect to the indexing plate that has selected it. A terminal portion adjacent the end which has been aligned then extends across the cutting line and in the path of the saw.



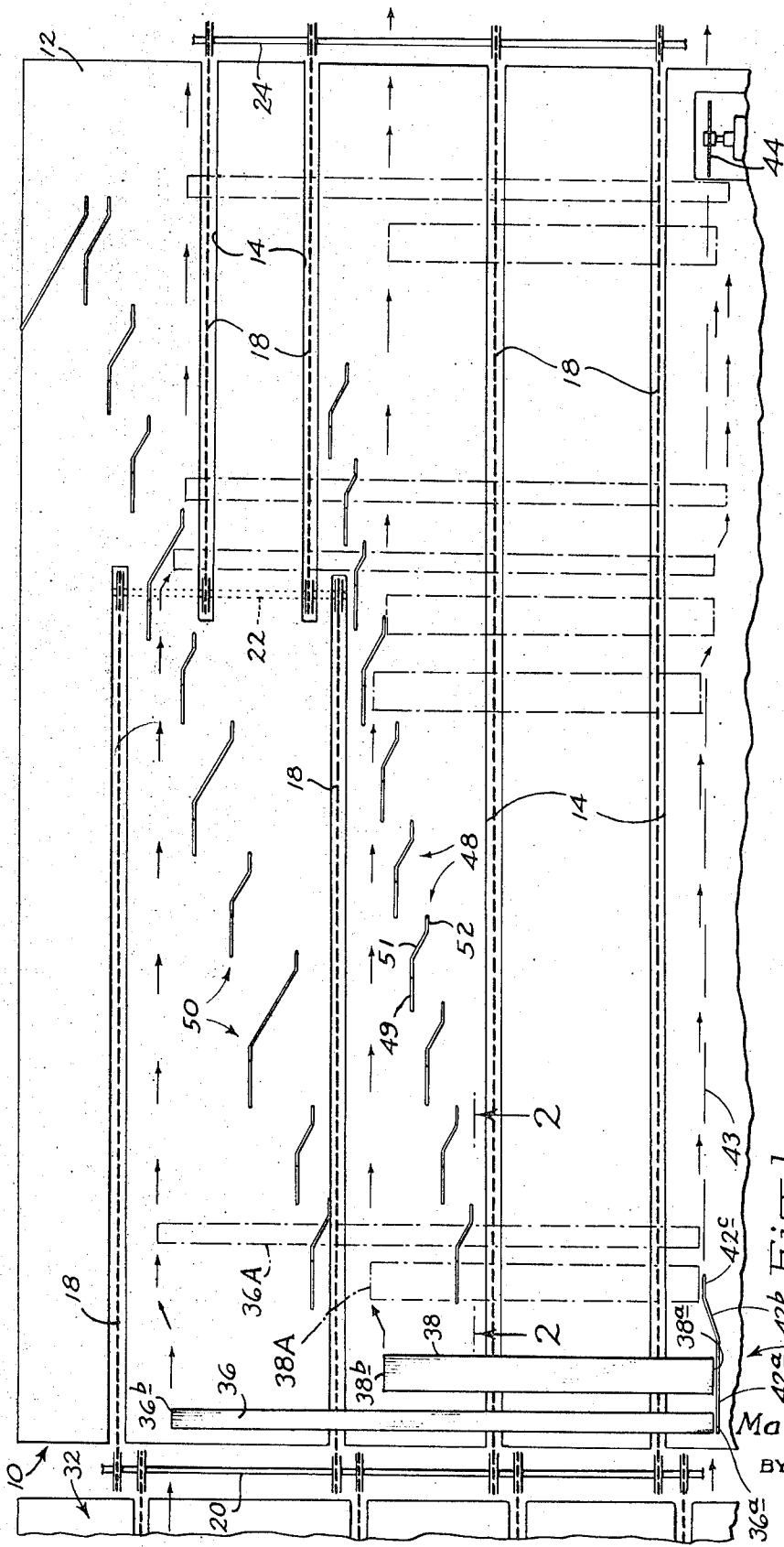


Fig. 1.

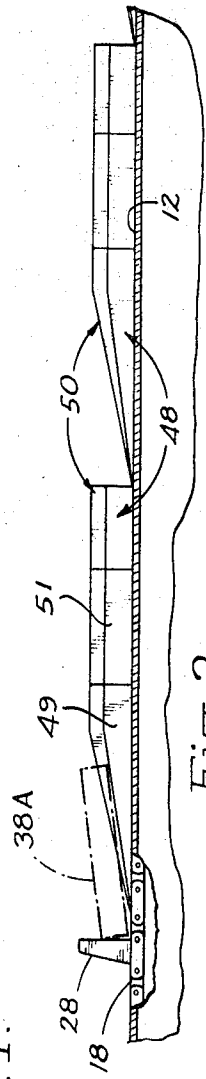


Fig. 2.

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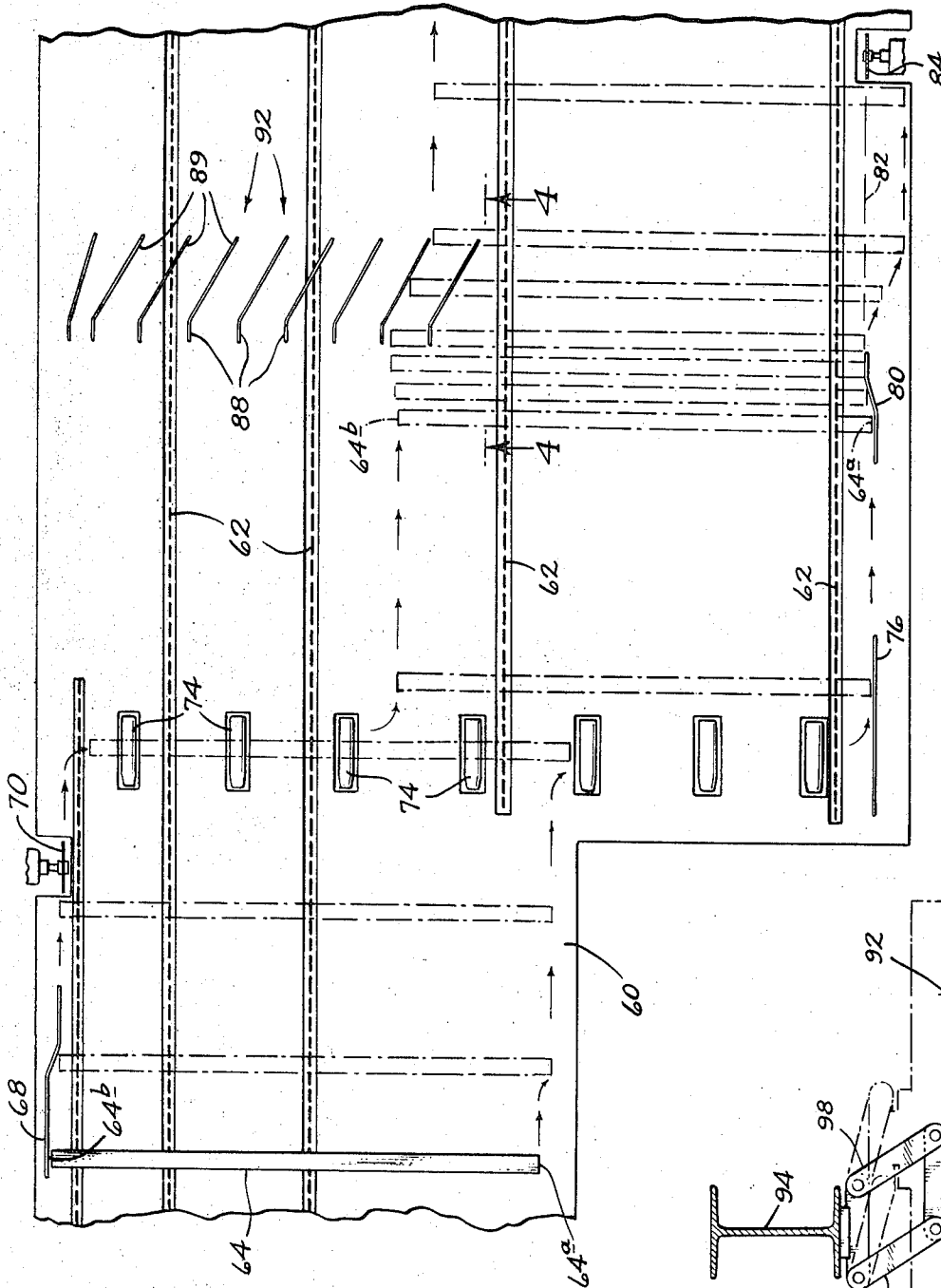


Fig. 3.

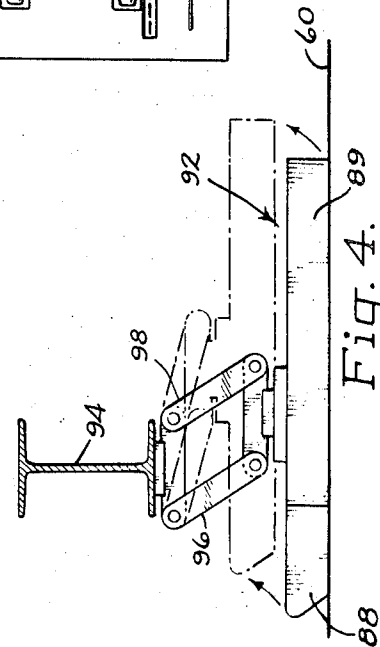
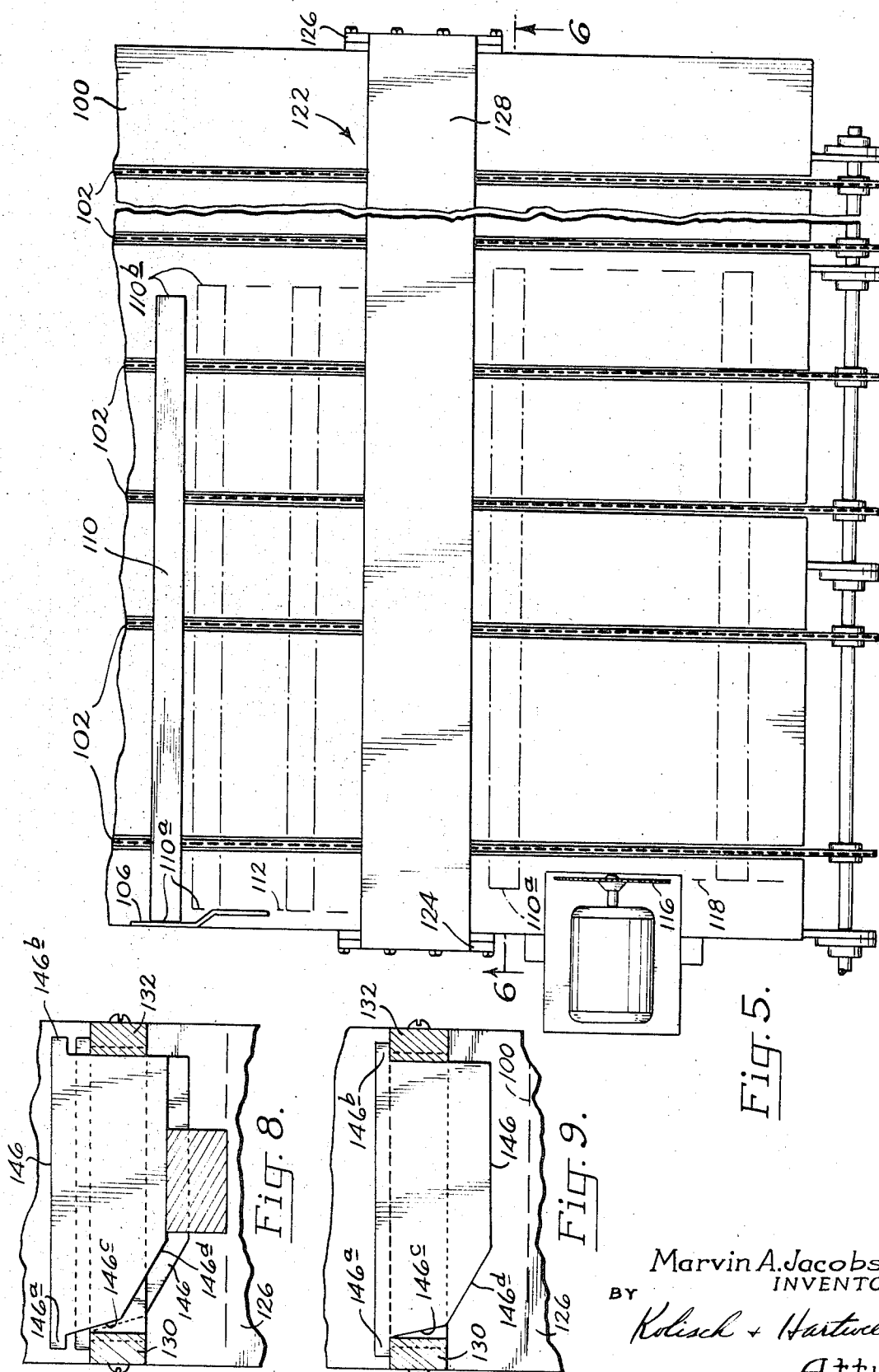


Fig. 4.

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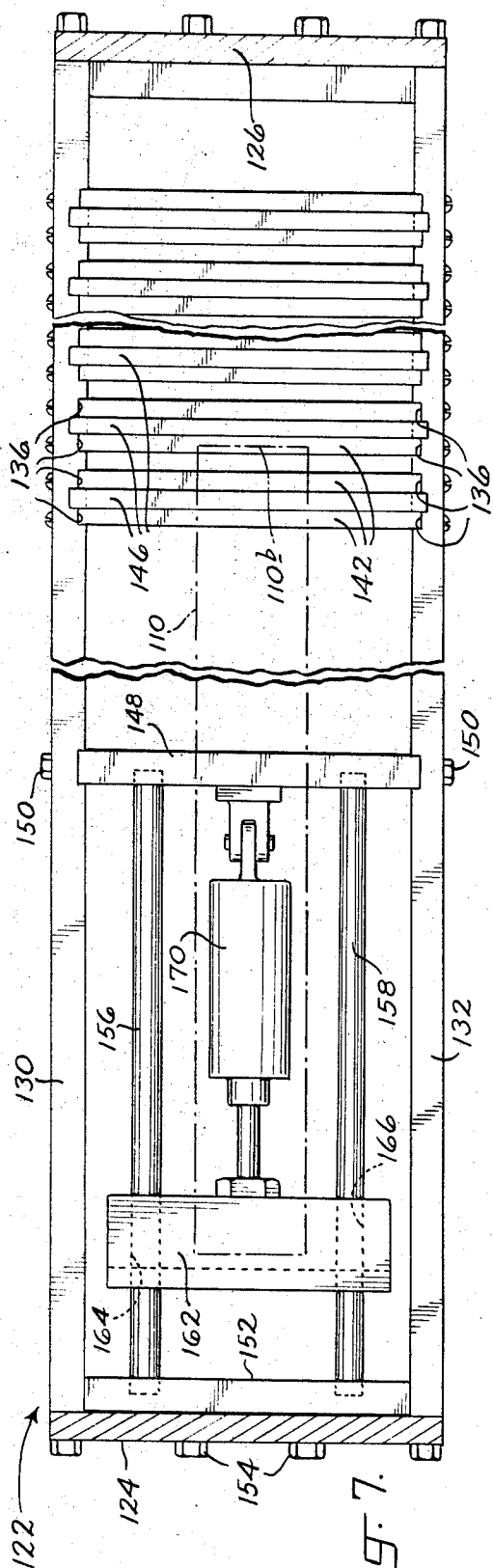


Fig. 7.

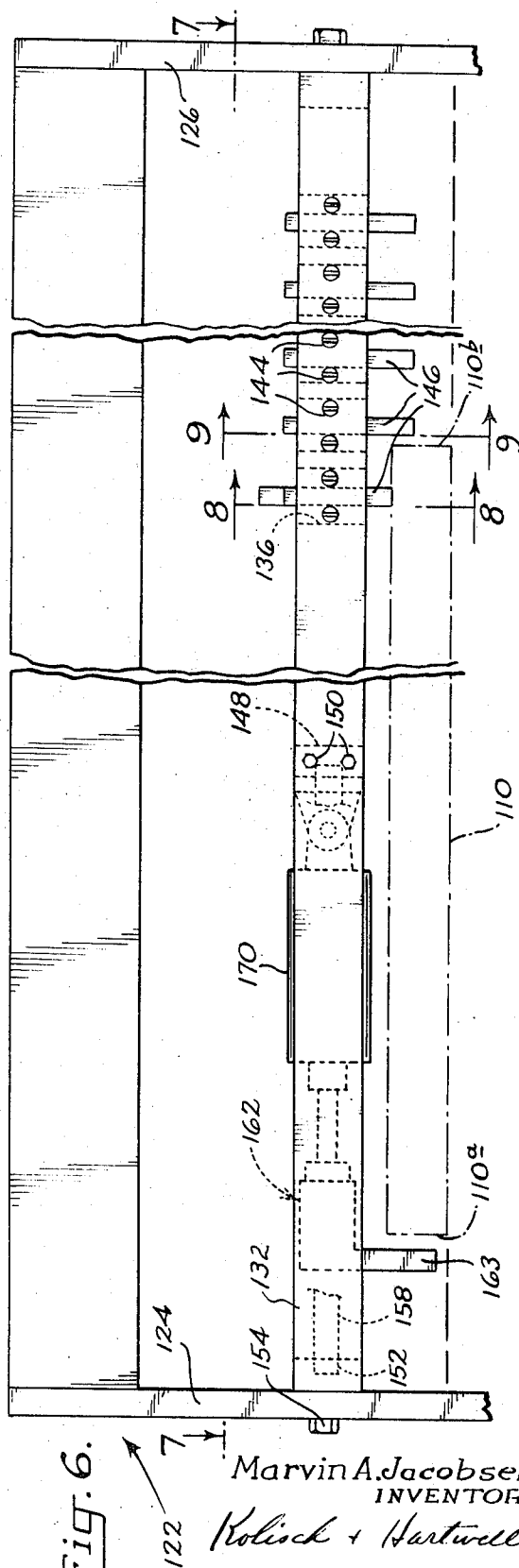


Fig. 6.

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METHOD AND APPARATUS FOR TRIMMING BOARDS

This invention relates to a method and apparatus for trimming boards of random lengths to desired modular lengths.

In the production of lumber, boards of random and irregular lengths are produced initially and end portions must be trimmed therefrom to bring the boards to standard lengths. To produce the greatest quantity of standard length lumber from boards of random length, a considerable number of length classifications should be provided, to reduce the amount of waste involved in trimming to length. This required, with past approaches, complex apparatus with numerous saws, and saw shifters for raising and lowering each saw to place it in a cutting or a noncutting position. Because of the complexity of the equipment, and the number of saws involved, the apparatus has been expensive, and maintenance costs are high.

A general object of this invention is to provide novel apparatus for trimming boards of random lengths to desired modular lengths which is simple and economically constructed.

A further object is to provide such novel board-trimming apparatus in which only one saw is needed to trim boards of random lengths to modular lengths.

Another object is to provide a novel method for trimming boards of random length to modular length, wherein the boards are moved successively along a path with the boards extending transversely of the path, one end of each board is aligned with a reference line adjacent one side of the path, and subsequently each board is shifted laterally of the path to have its opposite end aligned with one of multiple position lines, the particular position line depending upon the length of the board involved.

These and other objects and advantages are attained by the invention and the same is described hereinbelow in conjunction with the accompanying drawings wherein:

FIG. 1 is a top plan view of board-trimming apparatus constructed in accordance with one embodiment of the invention, the apparatus including a conveyor, multiple laterally spaced-apart indexing plates, and a positioner associated with each plate for shifting boards toward a side of the conveyor;

FIG. 2 is a cross-sectional, side elevation view, taken generally along the line 2-2 in FIG. 1, and slightly enlarged, further illustrating indexing plates and positioners in the apparatus;

FIG. 3 is a top plan view of a modified form of the board-trimming apparatus;

FIG. 4 is a cross-sectional, side elevation view, taken along the line 4-4 in FIG. 3, showing a movable indexing plate and positioner which is featured in the modified form of the invention;

FIG. 5 is a top plan view of yet another modified form of the board-trimming apparatus;

FIG. 6 is an end elevation view, taken along the line 6-6 in FIG. 5, and somewhat enlarged, showing a bank of indexing plates, and a positioner for shifting boards on the conveyor which is common for all the plates in the particular modification of the invention shown;

FIG. 7 is a top plan view taken generally along the line 7-7 in FIG. 6;

FIG. 8 is a side elevation view of an indexing plate, and showing a board thereunder, the FIG. being taken generally along the line 8-8 in FIG. 6; and

FIG. 9 is a side elevation view of an indexing plate, taken generally along the line 9-9 in FIG. 6, the plate having the position that it occupies when no board is under it.

Referring now to the drawings, and first more particularly to FIG. 1, at 10 is indicated generally board-trimming apparatus constructed in accordance with one form of the invention. The apparatus comprises an elongated table 12 which has a series of slots 14 defined therein, each slot extending longitudinally of the table. Slots 14 receive endless conveyor chains 18, which are supported in the apparatus by shaft and sprocket assemblies 20, 22, 24. Upper reaches of the conveyor chains extend longitudinally of the table adjacent the upper surface of the table.

Referring to FIG. 2, each conveyor chain has a number of lugs 28, which are spaced apart along the conveyor chain and project upwardly from the upper reach of each chain and above the upper surface of table 12. The conveyor chains are suitably driven under power, whereby the upper reaches of all of the conveyor chains are caused to move in a coordinated manner and to the right in FIG. 1. Lugs 28 are so positioned on the conveyor chains that each of the lugs on a conveyor chain is aligned, in a transverse direction, with a corresponding lug on each of the other conveyor chains. In FIG. 1, the conveyor chains are shown simply as dotted lines, for reasons of clarity. The table and conveyor chains collectively constitute a conveyor means herein.

An infeed conveyor system, part of which is illustrated at 32, supplies boards, such as those indicated at 36, 38, to the infeed end of the trimming apparatus. The boards are deposited on the table with one set of ends (36a, 38a) adjacent one side of the table (the lower side of the table in FIG. 1), and their other set of ends (36b, 38b) adjacent the other side of the table. Movement of conveyor chains 18 brings a set of transversely aligned lugs 28 into contact with the rear longitudinal edge of each board, as illustrated in FIG. 2 with the board indicated in dash-dot outline at 38A. On continued movement of the conveyor chains, the board is moved along a path in the direction of movement of the conveyor chains, with the board disposed transversely of the path. It will be noted that boards 36, 38 have different lengths.

An aligning means, or guide, 42 is secured to and projects upwardly from table 12 adjacent the upstream end of the apparatus and adjacent one side of the path along which the boards are moved. Means 42, which may be a bar, has an upstream portion 42a which parallels the path of movement of the boards, a deflecting portion 42b which extends at an angle toward the other side of the table (progressing in a downstream direction), and a reference portion 42c which also parallels the path of movement of the boards. The reference portion lies along a reference line 43 disposed adjacent the lower side of the table in FIG. 1. On a board being moved in a downstream direction by the conveyor chains, its lower end in FIG. 1 comes into contact with portion 42b of the aligning bar, and on continued movement of the board in a downstream direction, the board is shifted upwardly in FIG. 1, or toward the opposite side of the table, to align its lower end with reference line 43. The position of board 36 after passing guide means 42 is shown at 36A in FIG. 1.

A power-driven circular saw 44 projecting above the plane of the table is mounted adjacent the downstream end of the apparatus. The saw occupies a vertical plane, and produces a cut in a cutting line, which, in the illustrated form of the invention, coincides with reference line 43.

Located generally downstream of the aligning bar and upstream of saw 44 are a first bank of longitudinally and laterally spaced-apart board engaging elements 48, and a second bank of similarly distributed board engaging elements 50. All are secured in positions whereby upper regions of the elements project vertically upwardly from table 12, as perhaps is best illustrated in FIG. 2.

The various board-engaging elements in the banks of elements indicated have a somewhat similar construction. Referring to FIG. 2, and with reference to the element 48 therein shown, each includes at the end thereof which is nearest the feed end of the apparatus an indexing plate portion given the reference numeral 49. This indexing plate portion generally parallels the conveyor chains and path of movement of the boards. Downstream from this indexing plate portion is a deflector portion 51, also referred to herein as a positioning means, which, viewing the top of the apparatus as seen in FIG. 1, inclines toward the lower side of the conveyor table progressing in a downstream direction. Terminating each board-engaging element is a portion 52 which also substantially parallels the conveyor chain.

The lead end of each board-engaging element, i.e., the upstream extremity of the indexing plate portion, slopes upwardly from the plane of the conveyor table progressing in a

downstream direction as best illustrated in FIG. 2. This is to enable a board to slide up and over the element if such happens to extend across it on moving down the conveyor. It should also be noted, as illustrated in FIG. 2, that the board-engaging elements 50 in the second-mentioned bank of elements extend to a slightly higher elevation than do the elements 48 of the first-mentioned bank.

In each bank of board-engaging elements successive elements are positioned at increasing distances from the lower side of the conveyor table in FIG. 1, progressing in a downstream direction. Further, the board-engaging element 50 which is closest to the lower side of the table in FIG. 1 is spaced farther from this lower side than the element 48 which is farthest from the lower side of the table.

Portions 52 of the various load-engaging elements define multiple position lines for the ends of boards, which position lines parallel reference line 43 in the cutting line. Because of the disposition of the elements these various position lines are set at regular modular distances from the cutting line.

Explaining how a board such as board 38 is cut to a modular length on its movement through the apparatus, initially the lower end of the board or end 38a is first aligned with reference line 43 by movement against guide 42. Board 38 has a length which exceeds the distances spacing the indexing plate portions of the first six board-engaging elements from reference line 43 in FIG. 1. As a consequence, on moving down the conveyor it slides up and over these first six board-engaging elements. The indexing plate portion of the next following board-engaging element, however, is spaced closer to the upper side of the conveyor table than end 38b of the board, so that on reaching this element the board will move along the conveyor table while occupying substantially the plane of the conveyor table. Deflector portion 51 of this element extends into the path of end 38b of the board and, as a result, on moving by the deflector portion, end 38b of the board becomes aligned with the position line defined by portion 52 in the board-engaging element. In this way, the board is shifted laterally of the path of travel to align its end 38b with one of multiple spaced-apart position lines in the apparatus. Indexing plate portion 49 of the particular board-engaging element has selected a board of a specific length range from boards of random length moved past it and it will be noted that such indexing plate portion on selecting the board occupies a position in the path of travel for the board which is immediately adjacent end 38b. The board after being shifted by the positioning plate portion, or means, has its terminal portion which includes end 38a in FIG. 1 projecting across the reference line 43 (which is the same as the cutting line of the saw). As a consequence, when the board is moved by the conveyor means past the saw, a portion of the board including its end 38a is severed by the saw and a board is produced of a specific modular length.

With a longer board such as board 36 the board-engaging elements 50 perform the indexing and positioning function just described. On moving down the conveyor the longer board is supported between its ends by elements 48 at an elevation disposed slightly above the top of the table. With elements 50 projecting a somewhat greater distance above the top of the table, the fact that a longer board may be elevated slightly from the table by elements 48 does not prevent elements 50 from operating to index and position boards as just described.

Referring now to FIGS. 3 and 4, here another modification of the invention is shown that includes a table 60, and a series of power-driven conveyor chains 62 similar to chains 18, which chains have lugs (not shown) similar to lugs 28 described for chains 18.

In this modification of the invention, a first aligning bar, or means, 68 aligns ends 64b of board 64, so that a small terminal portion may be trimmed from this end of the board by a saw 70 located on one side of the apparatus, to square this end of the board. As the conveyor chains move the board downstream, a series of power-driven rollers 74, positioned to

revolve about axes parallel to the path of movement of the conveyor chains, operate to move the board transversely of the conveyor chains toward the opposite side of the table (toward the bottom of the table in FIG. 3). The board is stopped by a stop bar 76 adjacent this opposite side, and then continues to be moved in a downstream direction by the conveyor chains. A second aligning bar, or means 80, constructed and operating similarly to aligning bar 42 in FIG. 1, is secured to table 60 and projects upwardly therefrom. This bar aligns end 64a of the board with a reference line 82. A power-driven saw 84 is disposed downstream from aligning bar 80, and occupies a vertical plane which coincides with reference line 82.

Positioned between aligning bar 80 and saw 84 is a bank of multiple board-engaging elements 92. These elements are aligned in a direction extending transversely of the path of the conveyor. Each board-engaging element includes an indexing plate portion 88 which generally parallels the conveyor chains and a deflector portion, also referred to herein as positioning means, 89 which extends at an incline to the chains as best shown in FIG. 3. The indexing plate portion of each element also has an underside that slopes downwardly toward the table, progressing in a downstream direction, as best illustrated in FIG. 4.

Explaining how the apparatus shown in FIGS. 3 and 4 operates, and considering a board having a length typified by board 64, as best seen in FIG. 3, once a board 64 has its end 64a aligned with reference line 82, its opposite end, or end 64b, extends beyond the board-engaging element which is closest to reference line 82 and falls slightly short of the next adjacent board-engaging element. With the board moved into the bank of elements, all of the elements but the one closest to the reference line remain resting on the table. The element closest to the reference line, however, rides up and over the board to be swung, in a manner of speaking, out of an operative position. With further movement of the board down the path defined for it by the conveyor chains, its end 64b contacts the deflecting portion 89 of the element which is immediately adjacent end 64b, and the board is then caused to be moved lengthwise by deflecting portion 89, whereby its end 64a is moved across reference line 82. That portion of the board which extends across the reference line is trimmed off by saw 84, on the board passing the saw. In this way the board is cut to modular length, and the modular length of the board produced is a length equaling the lateral distance between the cutting line and the downstream end of the deflecting portion 89. With boards of other lengths, other engaging elements come into play with a similar operation taking place.

Referring now to FIGS. 5 through 9, here a second modification of the invention is shown which, as best shown in FIG. 5, includes a table 100, and a series of power-driven conveyor chains 102 similar to chains 18, which chains have lugs (not shown) similar to lugs 28 described for chains 18. In FIG. 5, the flow path is downwardly in the drawing.

In this modification of the invention an aligning bar, or means, 106, constructed and operating similarly to aligning bar 42 in FIG. 1, is secured to table 100 and projects upwardly therefrom. This bar aligns end 110a of a board 110 with a reference line 112. A power driven saw 116 is disposed downstream from aligning bar 106, and occupies a vertical plane along a cutting line 118 which is spaced somewhat laterally inwardly on the table from reference line 112.

Positioned between aligning bar 106 and saw 116 in FIG. 5 is an assembly 122 including an elongated hood 128 which extends generally transversely of the conveyor chains, and beneath the hood, as best shown in FIGS. 6 and 7, a pair of laterally spaced support bars 130, 132, also extend generally transversely of the conveyor chains. The hood and support bars are mounted in an elevated position over the table and chains by opposed upright support members 124, 126 on each side of the table.

Support bars 130, 132 have a series of vertical grooves 136 defined in their opposed vertical sides, as is best seen in FIGS. 6 and 7. Multiple, laterally spaced-apart, separating plates 142

extend between support bars 130,132. These generally parallel the conveyor chains, and have their opposite sets of ends fitted within opposing grooves 136. Screws 144, seen in FIG. 6, extend through accommodating bores in the support bars, and into threaded bores in the ends of the separating plates, to hold the separating plates in place.

Multiple laterally spaced indexing plates 146 are disposed in a row extending across the path of the conveyors. Each indexing plate rests between a pair of separating plates 142, and substantially parallels the path of the conveyors. Viewed from the side, as illustrated in FIGS. 8 and 9, each plate has opposed shoulders 146a,146b projecting outwardly from an upper part of the plate. These shoulders rest on support bars 130,132 to support the indexing plate in the system when the plate is in a lowered position (see FIG. 9). Each plate sits loosely between a pair of separating plates that provides lateral support.

In FIGS. 8 and 9, the end extremities of the plates shown which face boards as they are advanced along the conveyor table are shown at the left of the FIGS. As shown in these FIGS., this end extremity below shoulder 146a is defined by a rather steeply beveled edge 146c and by a beveled edge 146d of considerably lesser incline. With an indexing plate loosely fitted between a pair of separating plates it is free to slide upwardly from the lowered position shown for a plate in FIG. 9. When a board moves under an indexing plate it produces such upward movement as is illustrated in FIG. 8, and inclined edge 146d is provided to enable a board to move under an indexing plate with wedging of the plate upwardly. Edge 146c is inclined to provide clearance between the indexing plate and the support bars.

Referring again specifically to FIGS. 6 and 7, an elongated bracing bar 148 positioned substantially parallel to the path of the conveyors, spans the distance between support bars 130,132, and is held in place between the support bars by a series of bolts 150. A similar elongated bracing bar 152 is secured to support member 124 by a pair of bolts 154. A pair of horizontal, laterally spaced-apart rods 156,158 paralleling support bars 130,132, are supported at their opposite sets of ends in bracing bars 148,152.

An elongated abutment member 162 is shown in FIGS. 6 and 7 which has a depending board-engaging portion, or flange 163. The top of the member has a pair of bores 164,166 defined therethrough adjacent its opposite ends, and these are employed in slidably mounting the member on rods 156,158. A hydraulic ram, or motor, 170 is connected at one end to bracing bar 148, and at its other end to abutment member 162. Extension and contraction of the ram causes the abutment member to move along rods 156,158. When at rest, the ram occupies an extended position and abutment member 162 is in a nonoperating position with flange 163 spaced laterally outwardly from reference line 112, on the opposite side of the reference line from the index plates. Control means is provided (not shown) for actuating the ram whereby it contracts.

Explaining how the apparatus shown in FIGS. 5 through 9 operates, a board on being fed into the apparatus first has an end aligned with reference line 112 by movement of the board along guide bar 106. Thus, and with reference to board 110 shown in FIG. 5, on moving down the conveyor, board end 110a is aligned by the bar with reference line 112. The board then is carried by the conveyor chains under the bank of indexing plates which are downstream from bar 106.

On moving under the bank of indexing plates, and with the usual board, some of the plates will ride upwardly over the board to permit passage of the board thereunder, whereas other plates located beyond the end of the board which is opposite the aligned end will remain resting in their lowered positions. Considering the particular board 110 shown in FIGS. 6 and 7, on first moving into assembly 122 its aligned end will slightly clear the depending flange 163 of the abut-

ment member. The board has such a length that it projects past the indexing plate at the left end of the bank of plates shown. Its end 110b, however, falls slightly short of reaching the next adjacent indexing plate. As a consequence, the indexing plate at the left end of the bank will be lifted upwardly by movement of the board thereunder, whereas the remaining plates in the bank will remain resting in their lowered positions. After the board has progressed about midway between the ends of the plates in the bank, ram 170 is actuated to cause contraction of the ram and movement of flange 163 against the end of the board adjacent the flange, or board end 110a. With flange 163 moved against the board end the board is moved endo, or laterally of the conveyor, until further movement is stopped by its opposite end contacting the lowered indexing plate which is immediately adjacent its opposite end. The flange and ram, therefore, constitute positioning means for shifting the board into a predetermined position with respect to such indexing plate.

On further movement of the board downstream along the table, the board advances into saw 116 to have a portion of the board trimmed off by the saw. The trimmed board produced has a predetermined modular length.

It will be seen, therefore, that boards of irregular and random lengths may be fed into the trimming apparatus is either modification of the invention, and will be automatically classified within one of multiple predetermined length ranges. By including a large number of length classifications, waste may be minimized in the trimming process. Also, it will be noted that only one saw is needed to trim each board to length.

While different modifications of the invention have been described, variations are possible without departing therefrom. It is desired to cover all such modifications and variations as would be apparent to one skilled in the art and that come within the scope of the appended claims.

I claim:

1. Apparatus for trimming boards of random lengths to modular lengths comprising:
 - conveyor means defining a path for the movement of boards with such board disposed transversely of said path;
 - aligning means for aligning one end of each board moved along said path with a reference line adjacent one side of said path;
 - a saw positioned in said path downstream from said aligning means for making a cut in successive boards along a cutting line which is disposed in the vicinity of said reference line;
 - a bank of multiple indexing plates distributed in laterally spaced relation across said path downstream from said aligning means and upstream from said saw, each of said plates operating to select a board of a specific length range from boards of random length moved past said bank and such plate on selecting such a board occupying a position in said path immediately adjacent the end of such board opposite such board's one end;
 - abutment means movably mounted adjacent said one side of the path having a board-engaging portion adapted to engage said one end of a board selected by a plate; and
 - a motor connected to said abutment means for moving the abutment means laterally of said path toward an indexing plate which has selected a board to shift the board whereby its opposite end contacts the indexing plate.
2. The apparatus of claim 1, wherein said cutting line is spaced laterally toward said indexing plates from the reference line, and said board-engaging portion of the abutment means is movable to a nonoperating position disposed laterally outwardly of the reference line defined by the aligning means.
3. The apparatus of claim 1, wherein said motor comprises fluid-operated arm.