Jan. 14, 1969 R. S. CLIFFORD 3,421,556

DOOR DIVIDING MACHINE

Filed Oct. 24, 1966 Sheet 1 of 5

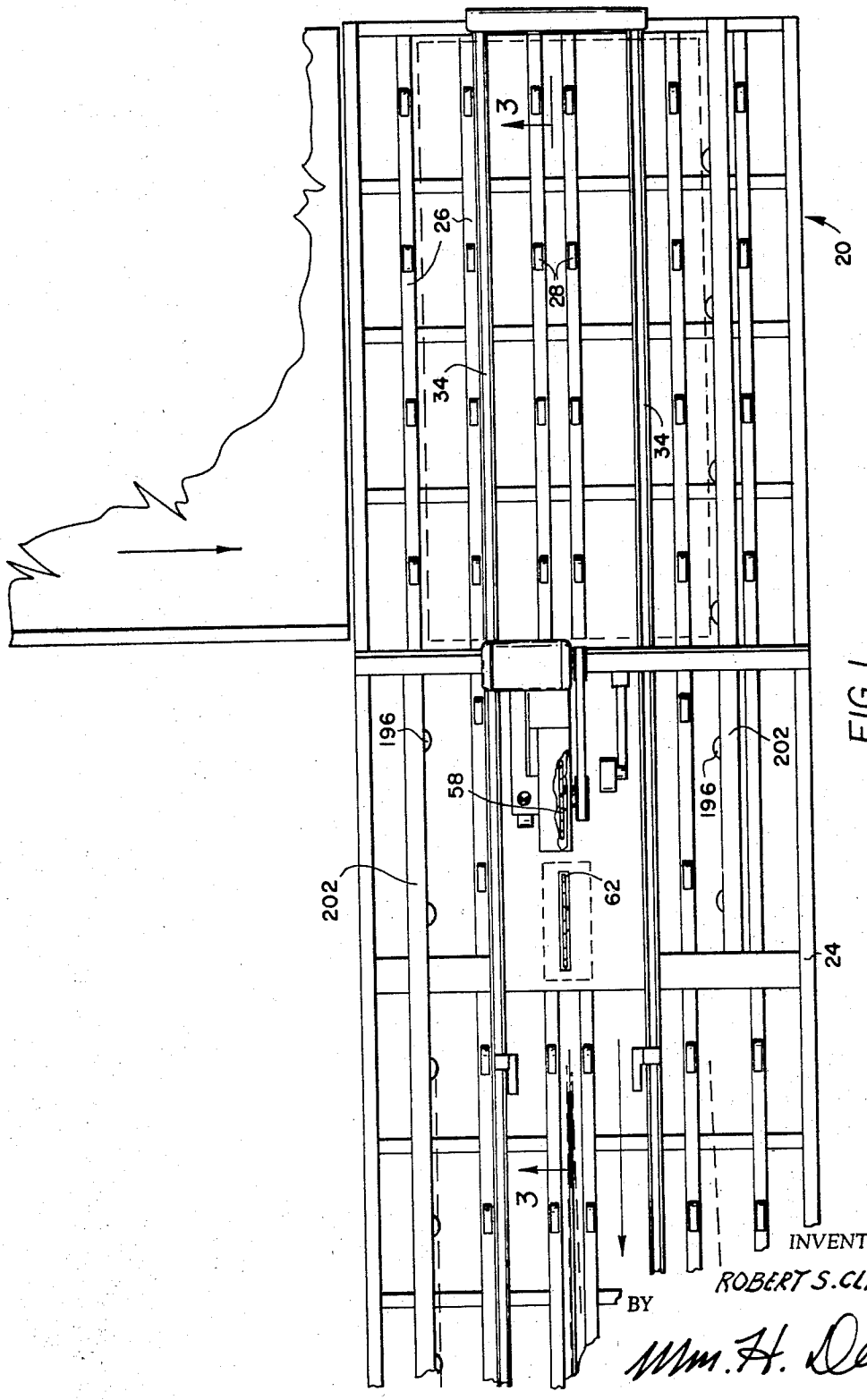


FIG. 1

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DOOR DIVIDING MACHINE

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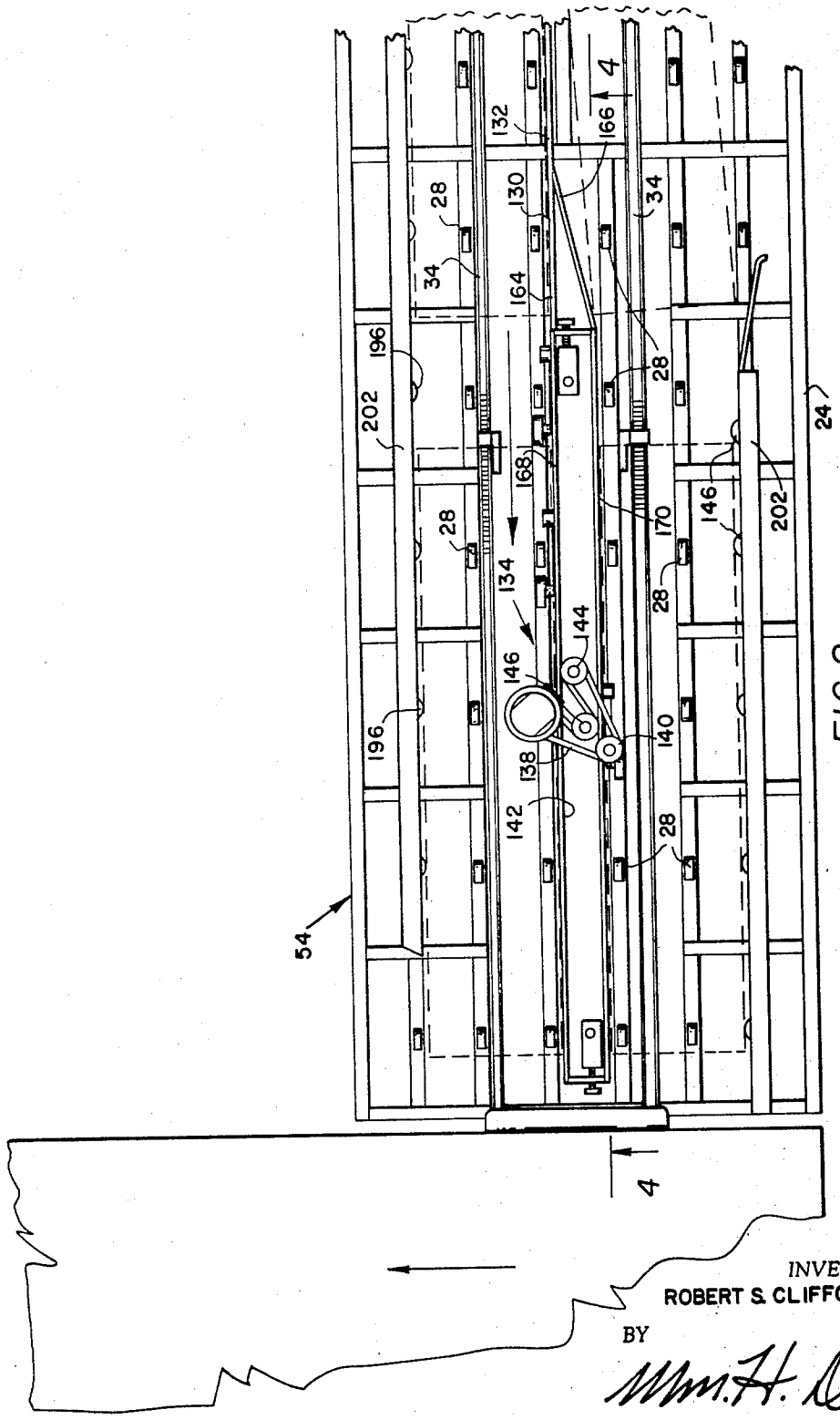


FIG. 2

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DOOR DIVIDING MACHINE

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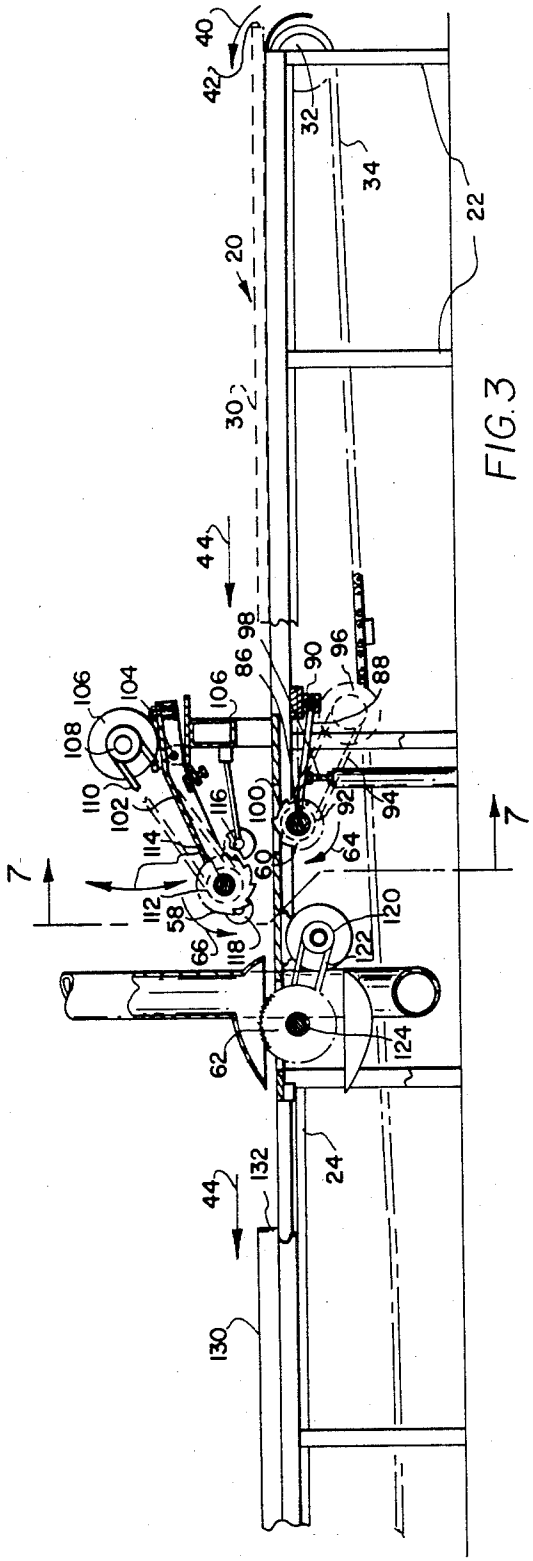


FIG. 3

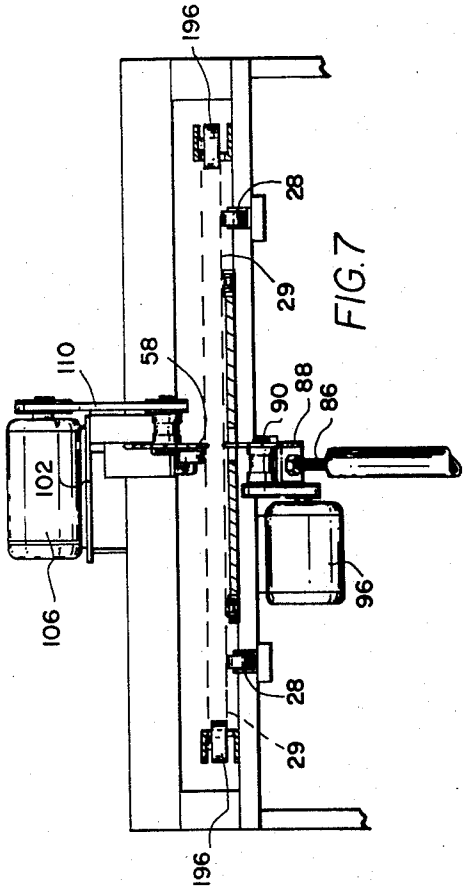


FIG. 7

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DOOR DIVIDING MACHINE

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FIG. 4

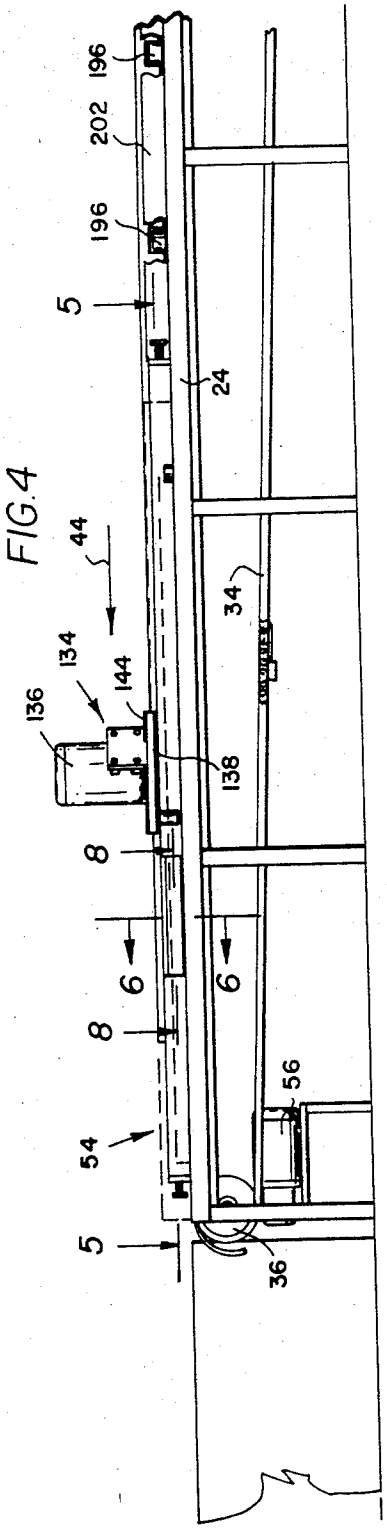


FIG. 5

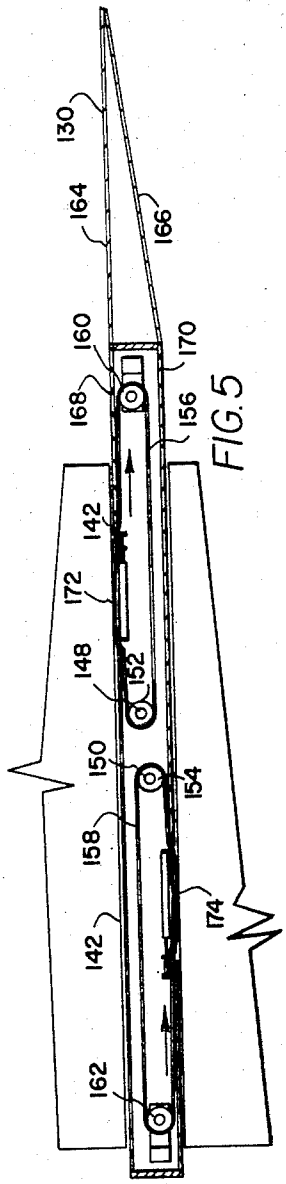
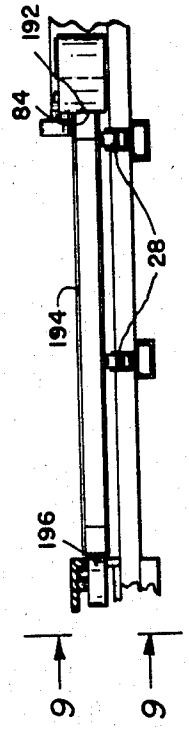


FIG. 6



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DOOR DIVIDING MACHINE

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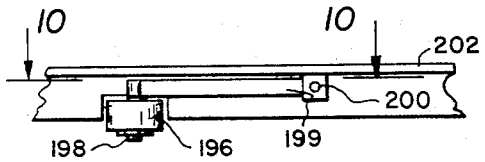


FIG. 9

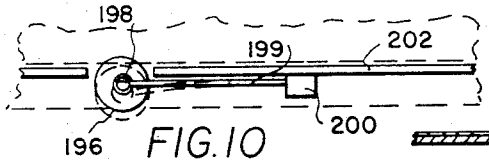


FIG. 10

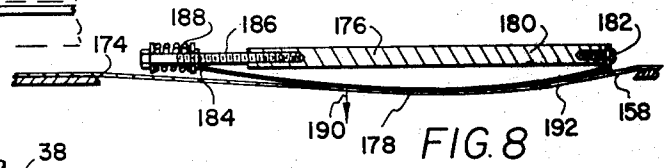


FIG. 8

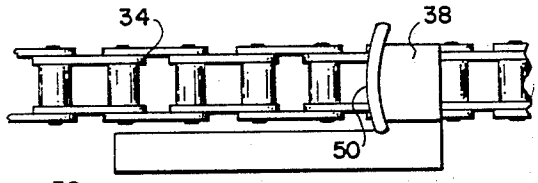


FIG. 11

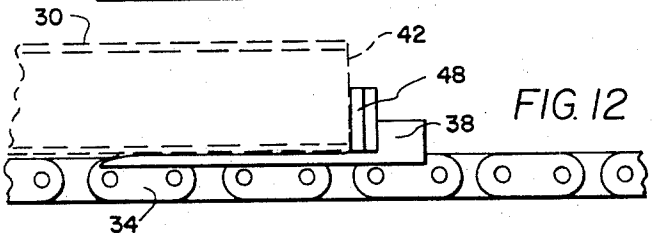


FIG. 12

FIG. 14

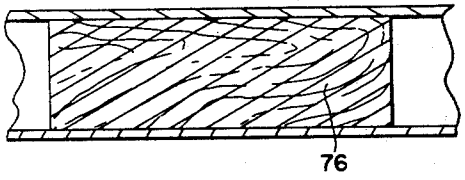


FIG. 16

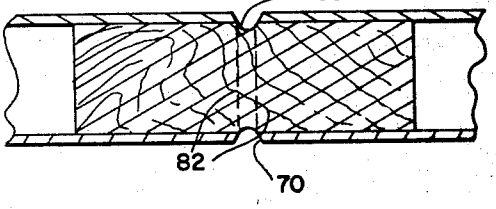


FIG. 15

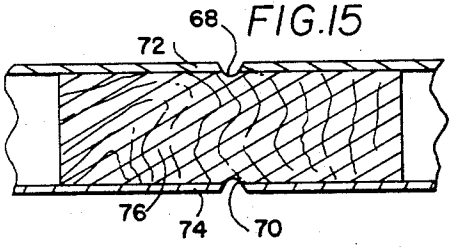
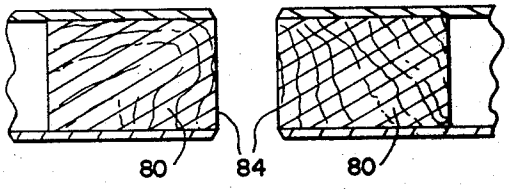


FIG. 17



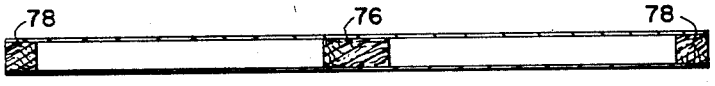


FIG. 13

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United States Patent Office 3,421,556 Patented Jan. 14, 1969

3,421,556

DOOR DIVIDING MACHINE

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Filed Oct. 24, 1966, Ser. No. 589,054
U.S. Cl. 144—3 8 Claims
Int. Cl. B27c 9/00

This invention relates to a door dividing machine, and more particularly, to a door dividing machine adapted for use in dividing wide doors into relatively narrow doors, whereby standard wide doors may be divided, such that they can be used for small closet doors, or the like.

In the manufacture of doors, lattice frame are generally provided with veneer skin structure on opposite sides thereof and in many instances, such doors are constructed with the lattice frames so arranged, that an intermediate or middle frame member is sufficiently wide to permit the division of a door from a wide door to a pair of relatively narrow doors. With the use of standard wide doors having wide internal frame lattice structure, it is possible to divide the door in the middle of the intermediate wide frame portion, however, it has been a problem to attain high production of narrow doors from wide doors due to various problems of dividing and finishing these doors, especially when thin veneer skin structure is disposed at opposite sides of the intermediate internal frame structure of the door. Circular saws tend to splinter the surfaces of veneer structures and, accordingly, such wide doors, hereinbefore mentioned, cannot be simply sawed and thereby divided into a pair of relatively narrow doors. Furthermore, when a side door is separated into a pair of relatively narrow doors, by the usual sawing operation, the adjacent edges of the narrow doors are rough and of necessity, must be finished to remove the roughness of the saw cuts.

The foregoing operations, if performed manually, are prohibitive in cost and therefore, such production of a pair of relatively narrow doors from a standard wide door have posed several difficult problems.

Accordingly, it is an object of the present invention to provide a door dividing machine, which will produce a pair of relatively narrow doors from a standard wide door and whereby the wide door is accurately and efficiently divided into a pair of relatively narrow doors with a minimum amount of labor.

Another object of the invention is to provide a door dividing machine which permits a large door to be divided, such that a pair of doors are produced and the pair being split from a single door, thus, have matching face veneer grain.

Another object of the invention is to provide a door dividing machine having a novel combination of grooving cutters and a door dividing saw all aligned with each other, such that the grooving cutters provide grooves in upper and lower sides of doors, whereupon the saw aligned with the grooves and within the confines thereof, may completely divide a standard door into two relatively narrow doors without splintering the exterior veneer skin of the door and whereby the adjacent edges sawed apart may be finished with a minimum amount of work and may be finished substantially flush with the edges of the grooves cut in the upper and lower surfaces of the original door.

Another object of the present invention is to provide a novel door dividing machine having a common conveyor which conveys a standard door through a dividing area and a finishing area in proper sequence to cut a standard wide door into two separate relatively narrow doors and to finish the adjacent edges of the narrow doors to precise standards.

Another object of the invention is to provide a novel combination of mechanisms for cutting a wide door into two pieces and a novel combination of mechanisms for finishing the adjacent cut edges of the relatively narrow doors, all combined with a single frame and conveyor arranged in production line disposition.

Another object of the present invention is to provide a very economical, efficient and durable door dividing machine.

Further objects and advantages of the present invention will be apparent from the following specification, appended claims and accompanying drawings, in which:

FIG. 1 is a fragmentary top or plan view of a door receiving end of a door dividing machine, in accordance with the present invention;

FIG. 2 is a fragmentary plan sectional view of a door delivery end of a door dividing machine, in accordance with the present invention and showing a continuation of the structure illustrated in FIG. 1;

FIG. 3 is a fragmentary vertical sectional view of the machine of the invention, taken from the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary vertical sectional view of the machine of the invention, taken from the line 4—4 of FIG. 2;

FIG. 5 is a fragmentary plan sectional view of the door edge finishing mechanism of the machine of the invention, taken from the line 5—5 of FIG. 4;

FIG. 6 is an enlarged transverse fragmentary sectional view taken from the line 6—6 of FIG. 4;

FIG. 7 is an enlarged fragmentary transverse sectional view taken from the line 7—7 of FIG. 3;

FIG. 8 is an enlarged fragmentary plan sectional view taken from the line 8—8 of FIG. 4;

FIG. 9 is an enlarged fragmentary elevational view taken from the line 9—9 of FIG. 6;

FIG. 10 is a sectional view taken from the line 10—10 of FIG. 9;

FIG. 11 is an enlarged fragmentary plan view of a section of the conveyor of the invention, showing door edge engaging means thereon;

FIG. 12 is a fragmentary side elevational view of the structure, shown in FIG. 11, showing a door by broken lines and being engaged by door engaging means of the conveyor of the invention;

FIG. 13 is a cross sectional view of a wide door, showing a wide intermediate frame section therein and illustrating the conventional veneer skin structure on opposite sides of the door;

FIG. 14 is a sectional view of the intermediate portion of the door, shown in FIG. 13;

FIG. 15 is a view similar to FIG. 14, but showing upper and lower surfaces of the door grooved by grooving means of the invention, to permit sawing the intermediate frame section apart without splintering the veneer skin structure on opposite sides of the door;

FIG. 16 is a view similar to FIG. 15, but showing by broken lines, the confines of a saw cut communicating with the grooves in the upper and lower portions of the door during dividing operations by the machine of the invention; and

FIG. 17 is a cross sectional view of the structure, shown in FIG. 16, but showing the standard door divided into relatively narrow doors at the intermediate section of the original standard wide door.

As shown in FIGS. 1 and 2, the machine comprises a door receiving end and a door delivery end, respectively. The structure shown in the right hand end of FIG. 2, being a continuation of the structure shown in the left hand end of FIG. 1, such that FIGS. 1 and 2 combined, illustrate a substantially complete plan view of the dividing machine of the invention.

Likewise, FIGS. 3 and 4 are vertical sectional view of the machine of the invention, showing respective receiving and delivery ends of the machine. Reference is therefore made now to FIGS. 1 and 3, in which is illustrated generally the receiving end portion **20** of the machine. This portion **20** comprises a section **22** of a main frame **24**. This section **22** includes a plurality of longitudinal members **26** on which rollers **28** are rotatably mounted on horizontal axes. These rollers **28** are also shown in FIG. 7. The upper peripheries of the rollers **28** are adapted to engage and support a lower surface of a door, as indicated by broken lines **29** in FIG. 7 of the drawings. Thus, a substantially conventional wide door may be supported on the portion **20** of the machine, as indicated by broken lines **30** in FIG. 3 of the drawings. Disposed at the receiving end **20** of the machine are sprockets **32** engaging conveyor chains **34**. These conveyor chains **34** pass over sprockets **36** on opposite ends of the frame **24** and these chains **34** are endless chains having door engaging and driving clips **38**, which are shown in detail in FIGS. 11 and 12 of the drawings. These clips **38**, as they pass upward about the sprockets **32**, as indicated by an arrow **40** in FIG. 3 of the drawings, engage an end edge **42** of a door **30** and tend to move the door in the direction of an arrow **44** in FIG. 3 of the drawings.

Referring now to FIGS. 11 and 12, the detail of these door engaging clips **38** may be fully understood. Each clip **38** is provided with an upstanding portion **48** having a convex surface **50** directed in the same direction of the arrow **44**, such that the convex surface **50** engages the edge **42** of the door **30** for forcing the door from the receiving end **20** of the frame **24** to the delivery end **54**, shown in FIGS. 3 and 4, respectively.

The sprockets **32** operate as idlers, while the sprockets **36** are driven by a motor **56**, shown in FIG. 4 of the drawings. The conveyor chains **34**, as shown in FIGS. 1 and 2 of the drawing, are spaced apart horizontally and are substantially equidistant at opposite sides from upper and lower grooving cutters **58** and **60**, respectively, and with respect to a dividing saw **62**, all as shown best in FIGS. 1 and 3 of the drawings.

The grooving cutter **60** rotates in a direction of an arrow **64**, while the grooving cutter **54** rotates in the direction of an arrow **66**, such that the peripheries of the cutters are counter to the direction of movement of the door **30**, carried by the conveyor chains **34** in the direction of the arrow **44**.

The grooving cutters **58** and **60** are provided with peripheral cutter teeth adapted to cut grooves **68** and **70**, as shown in FIG. 15, in upper and lower sides of a door so as to cut through respective veneer skin sections **72** and **74**, all as shown in FIG. 15 of the drawings.

The cross-sectional shape of the cutter teeth of the grooving cutters **58** and **60** substantially conforms to the shape of the grooves **68** and **70**, shown in FIG. 15. These grooves **68** and **70** are sufficiently deep to slightly penetrate the intermediate frame section **76** of the door. This member **76** being substantially twice the width of opposite edge frame sections **78**, shown in FIG. 13, so that dividing the door in the center portion, as shown in FIG. 15 and in FIG. 16, provides for the manufacture of a pair of individual relatively narrow doors having uniform opposite edge frame core portions **80**, which are substantially equal to the member **78**, shown in FIG. 13, the sections **80** being illustrated in FIG. 17, wherein the wide door is shown divided into a pair of relatively narrow individual doors.

The width of the saw **62** is substantially illustrated by broken lines **82** in relation to the grooves **68** and **70**. Thus, the saw **62** is sufficiently wide to almost span the width of the grooves **68** and **70**, but since the saw **62** is slightly narrower than the grooves **68** and **70**, a sufficient amount of material is left for edge finishing operations to remove the saw cutter marks and to provide relatively smooth adjacent edges **84** of the pair of relatively narrow doors, shown in FIG. 17, all as will be hereinafter described in detail.

The grooving cutter **60** is rotatably mounted on a shaft **86** carried by an arm **88**, which is pivoted at **90** to the frame **24**. A pulley **92** secured to the shaft **86** is driven by a belt **94**, which is driven by a motor **96**.

The arm **88** is adjusted as to elevation by an adjusting mount screw **98**, such that the upper periphery **100** of the grooving cutter **60** is disposed slightly above the elevation of the upper peripheries of the rollers **28** in order to project sufficiently above the lower surface of the door, as shown in FIG. 15, to form the groove **70**, as the door is moved in the direction of the arrow **44** by the clips **38** on the conveyor chains **34**.

The grooving cutter **58** is mounted on a platform **102** which is pivoted at **104** on a bridge frame portion **106** of the frame **24**. This bridge frame portion overlies the conveyor chains **34** and the door **30**, as it passes thereunder.

Carried on the pivoted frame **102** is a motor **106** having a pulley **108** driving a belt **110**, which drives a pulley **112** on a shaft **114**, which carries the grooving cutter **58**. Thus, the grooving cutter **58** is power rotated, while the door **30** passes thereunder.

A spring loaded roller **116** is adapted to bear downward on the upper surface of the door **30** to hold it downwardly against the rollers **28** and toward the grooving cutter **60**, while the grooving cuter **58** is spaced relative to the upper surface of the door by means of a depth gauge roller **118**, which bears on the upper surface of the door, the lower periphery of this roller **118** is slightly above the periphery of the cutter **58**, so as to permit this cutter **58** to penetrate the upper surface of the door and cut the grooves **68**, as shown in FIG. 15. Thus, the adjusting screw mount **98** may be utilized to set the upward depth of the groove **70**, as shown in FIG. 15, while the roller **118** may be used to gauge the downward depth of the groove **68** cut by the grooving cutter **58**.

The upward periphery of the saw **62** is extended sufficiently above the upper peripheries of the rollers **28**, so as to permit the saw to cut, as illustrated by broken lines, completely between the grooves **68** and **70** to separate the central frame portion of the door into two sections, all as indicated by broken lines in FIG. 16.

The saw **62** is power operated by a motor **102** driving a belt **122**, which passes over a pulley on the shaft **124**, which carries the rotary saw blade **62**.

After the upper and lower surfaces of the door have been grooved at **68** and **70**, as hereinbefore described, the door passes onward in the direction of the arrow **44** and is forced in such direction by means of the conveyor chains **34** and the clip **38** carried thereby.

As the adjacent edges **84**, as shown in FIG. 17, of a relatively narrow door pass toward the delivery end **54** of the machine, these doors reach a wedge structure **130** having its leading edge **132** so disposed, that adjacent saw cut edges **84**, as shown in FIG. 17, pass on opposite sides of the wedge structure **130** and continue in the direction of the arrows **44** toward door edge finishing

mechanism, generally indicated at **134** in FIGS. 2 and 4 of the drawings.

Attention is now directed to FIGS. 2, 4 and 5, wherein this door edge finishing mechanism is illustrated in detail.

A motor **136** drives a belt **138**, which passes over an idler **140** carried by a door finishing mechanism frame **142**, as will be hereinafter described. The belt **138** passses over the pulley **140** and also pulleys **144** and **146**. These pulleys **144** and **146** are connected to shafts **148** and **150**, respectively, shown in FIG. 5, carried by the shafts **148** and **150** are belt supporting rollers **152** and **154** on which sanding belt **156** and **158** are mounted. These are endless belts and they are also mounted on respective spaced rollers **160** and **162**, all as shown best in FIG. 5 of the drawings.

As shown in FIG. 5, the wedge structure **130** is provided with opposite diverging sides **164** and **166**, which communicate and align with opposite sides **168** and **170** of the door finishing mechanism frame **142**.

Said opposite sides **168** and **170** are provided with slotted openings **172** and **174** exposing surfaces of the belts **156** and **158**, respectively. These openings **172** and **174** and the respective exposed surfaces of the belts **156** and **158** are arranged to finish the adjacent edge portions **84** of the relatively narrow doors, as shown in FIG. 17, and as will be hereinafter described in detail.

As shown in FIG. 8, a belt backing plate structure **176** is disposed behind each of the openings **172** and **174**, as hereinbefore described, and disposed to hold the respective belt **156** or **158** outwardly toward one of the respective edges or surface **84**, shown in FIG. 17.

Referring now to FIG. 8, it will be seen that the belt backing structure is provided with a resilient plate **178**, fixed to a relatively rigid mounting plate **180** by a screw **182** at one end and the opposite end **184** of the resilient plate is adjustably mounted on a screw threaded bolt **186** and is spring loaded by a coil spring **188** so as to cause the resilient plate spring **178** to bow outward in a direction of an arrow **190** to prevent a convex surface to the inner side of the respective belt **156** or **158** so that the convex surface of the belt **158** is, thus, resiliently held outward relative to the opening **174** in order to project the surface of the belt outwardly slightly beyond the respective side **170** of the finishing mechanism frame **142**.

Referring now to FIG. 6 of the drawings, it will be seen that the belt **158** at its outward convex surface **192**, as shown in FIG. 8 of the drawings, engages and finishes a respective edge **84** of one of the narrow door sections, indicated at **194** in FIG. 6 of the drawings.

An edge of the narrow door **194** opposite the edge **84** being finished, is engaged by a plurality of spring loaded rollers **196** for forcing the edge **84** of the door **194** against the portion of the sanding belt slidably moving over the resilient convex plate **178**, indicated in FIG. 8 of the drawings.

Referring now to FIGS. 9 and 10 of the drawings, it will be seen that the rollers **196** are mounted on shafts **198** carried by plate spring arms **199** fixed at **200** to a longitudinal member **202** of the frame **24**. These rollers **196** are thus resiliently urged toward the respective belts **156** and **158** and their respective exposure openings **172** and **174** for forcing the edge portions **84**, as shown in FIG. 17, into engagement with the sanding belts for finishing these edge portions to remove the saw cut marks therefrom and to finish the edges substantially flush with the extremities of the grooves **68** and **70**, as hereinbefore described.

As shown in FIG. 7, it will be seen that pairs of the rollers **196** engage opposite edges of the standard wide door before it is divided and at the approach of said door to the grooving cutters **58** and **60** and the saw **62**.

After the standard wide door has been divided, as hereinbefore described, and has passed the separating wedge structure **130**, the edges **84**, as shown in FIG. 17, are sanded smooth adjacent to the openings **172** and **174** through which the sanding portions of the belts are projected and held by the resilient plates **178**. As the door passes beyond these areas, the two relatively narrow door portions are completely finished at their edge portions **84** and are thus ready for further operations, which are no part of the present invention.

It will be obvious to those skilled in the art that various modifications of the present invention may be resorted to in a manner limited only by a just interpretation of the following claims.

I claim:

1. In a door dividing machine the combination of: a frame; a conveyor on said frame comprising a single door receiving end and a double door delivery end; said conveyor having means engageable with doors for forcing said doors from said receiving end to said delivery end; a pair of power driven grooving cutters rotatably mounted on said frame and disposed in a substantially common vertical plane to cut grooves in upper and lower sides of doors when moved from said receiving end toward said delivery end; a saw aligned with said cutters and spaced from said cutters toward said delivery end whereby said saw, saws through a door within the confines of the upper and lower grooves in a door formed by said cutters, and whereby a wide door is thus divided into a pair of relatively narrow doors; wedge means on said frame and disposed in space relation from said saw and in a direction toward said delivery end, said wedge means disposed to separate said pair of relatively narrow doors as they are moved by said conveyor relative to said frame; said wedge means having opposite sides diverging toward said delivery end; a second frame means having opposite sides extending from said opposite sides of said wedge means; door edge finishing means exposed at opposite sides of said second frame means; and spring loaded rollers disposed to engage first edges of said relatively narrow doors and tending to force opposite edges thereof against said door finishing means; and third means for driving said door edge finishing means.

2. The invention, as defined in claim **1**, wherein: said door edge finishing means comprises endless sanding belts.

3. The invention, as defined in claim **1**, wherein: door supporting rollers are mounted on said frame on horizontal axes to support doors being moved thereon by said conveyor, said groove cutter disposed to cut a lower side of the door be vertically adjustable relative to said frame.

4. The invention, as defined in claim **3**, wherein: said cutter which is disposed to cut an upper side of a door is movably mounted to move upwardly relative to a door thereunder; and a door contacting roller connected to said last mentioned cutter, said door contacting roller having a periphery spaced upwardly a slight distance above the lower periphery of said last mentioned cutter and adapted to support said cutter in grooving position relative to the upper surface of a door.

5. The invention, defined in claim **1**, wherein: said conveyor comprises a plurality of endless chains; and clips connected to said chains and extending thereabove, said clips having convex shoe portions disposed to engage end portions of doors for moving them relative to said frame.

6. The invention, as defined in claim **2**, wherein: backing plates are disposed behind said sanding belts; said sanding belts slidably disposed relative to said backing plates, said backing plates slightly convex adjacent said belt for holding them outwardly against said opposite edges of said relatively narrow doors.

7. The invention, as defined in claim **2**, wherein: each of such sanding belts is supported on a pair of rollers spaced longitudinally relative to said conveyor such that a sanding surface of each belt is disposed at one of the opposite sides of said second frame means; a common drive means for said belts comprising a motor; a belt driven by said motor;

pulleys coupled to adjacent rollers on which said belts are mounted; and an idler pulley mounted on said second frame such that said belt driven by said motor passes over said idler pulley and said pulleys coupled to the rollers supporting said belts.

8. In a door dividing machine the combination of: a frame; a conveyor on said frame comprising a wide single door receiving end and a double door delivery end; said conveyor having means engagable with doors for forcing said doors from said receiving end to said delivery end; power driven means for grooving upper and lower sides of doors when moved from said receiving end toward said delivery end and disposed to cut grooves in upper and lower sides of a door such that the grooves are substantially vertically aligned with each other; means aligned with said grooving and within the confines of the grooves in the upper and lower portions of the door, whereby a wide door is divided into a pair of relatively narrow doors; and means supported on said frame and operable between the divided pair of relatively narrow doors for finishing adjacent edges thereof during movement of said relatively narrow doors on said conveyor toward said delivery end.

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DONALD R. SCHRAN, *Primary Examiner.*

U.S. Cl. X.R.

144—39