United States Patent

[11] **3,604,483**

[72] Inventor **Richard Bent Nissen**
8870 Langa, Denmark

[21] Appl. No. **821,286**
[22] Filed **May 2, 1969**
[45] Patented **Sept. 14, 1971**
[32] Priority **May 3, 1968, May 3, 1968**
[33] **Denmark**
[31] **2054/68 and 2055/68**

[54] **MACHINE FOR AUTOMATICALLY PRODUCING FRAMELIKE STRUCTURES**
9 Claims, 16 Drawing Figs.

[52] **U.S. Cl.** **144/3,** 144/134
[51] **Int. Cl.** **B27m 3/00**
[50] **Field of Search** 144/2, 3, 134, 136, 90; 29/455; 269/87.2; 143/6; 156/510, 535

[56] **References Cited**
UNITED STATES PATENTS

1,151,892	8/1915	Madsen	144/3 X
3,336,177	8/1967	Beck	144/3 X

Primary Examiner—Donald R. Schran
Attorney—Parrott, Bell, Seltzer, Park & Gibson

ABSTRACT: A machine for automatically producing rectangular frames or the like from previously cut to size frame components. The machine includes a number of adjustably positioned units corresponding in number to the number of frame components, and each unit carries a pair of slideably mounted clamping members disposed at an angle with each other and adapted to engage the ends of adjacent frame components. A finger cutter is also carried on each unit and is slideably mounted to move in a path which bisects the paths of the two clamping members. A hydraulic system is provided for selectively displacing the clamping members and finger cutter such that interengaging fingers are cut in the adjacent component ends as the components are displaced toward each other to form the completed frame. Means may also be provided for positioning a panel such as a glass windowpane intermediate the components such that the panel may be mounted in precut grooves in the components during the assembly operation.

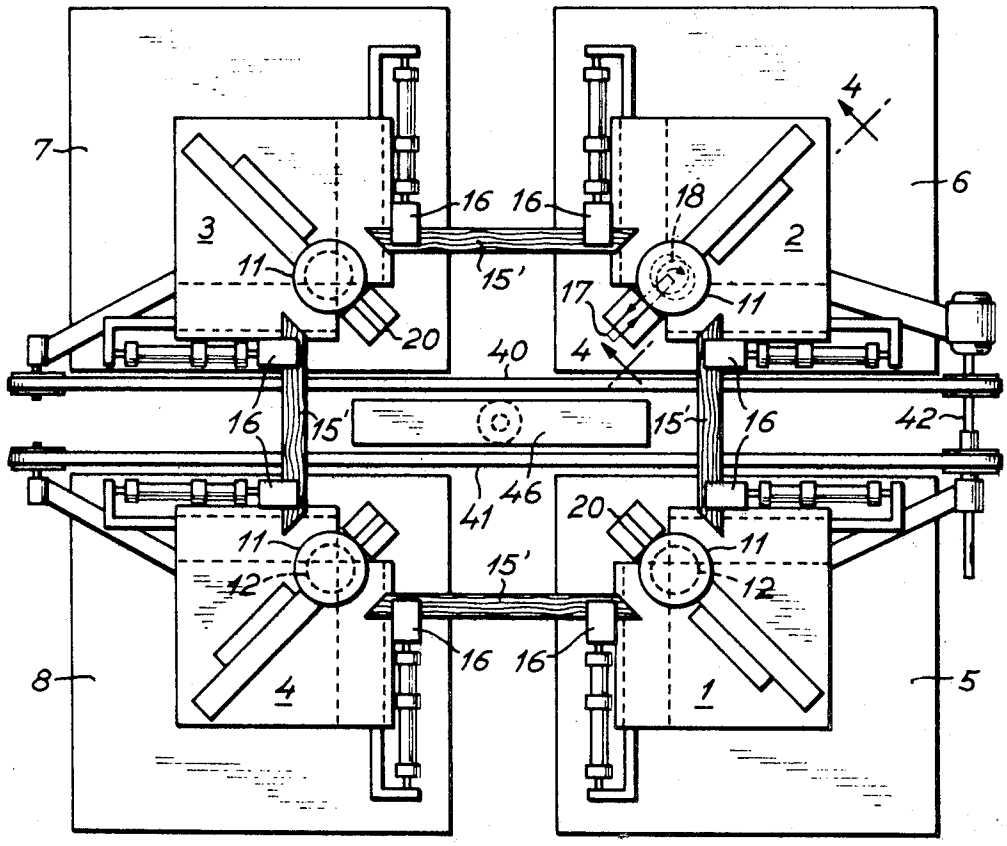


Fig. 1.

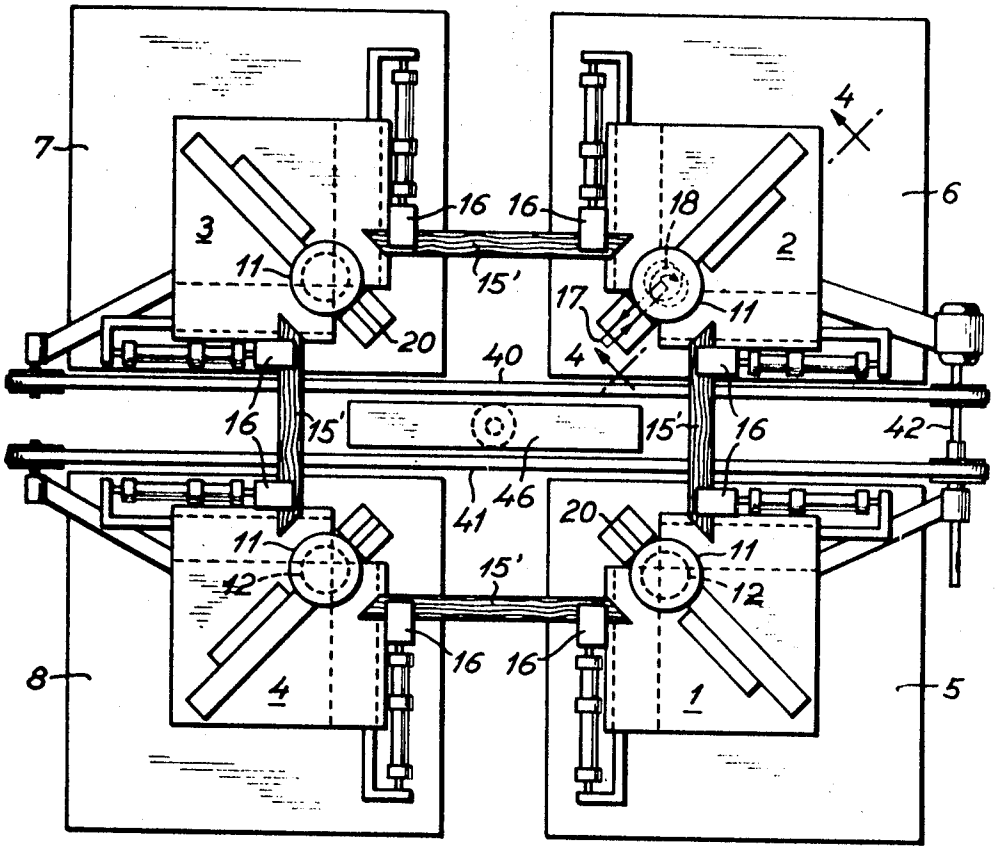
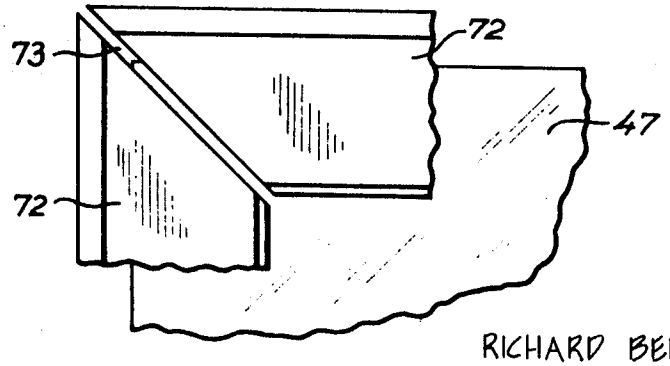


Fig. 9.



INVENTOR:
RICHARD BENT NISSEN

By Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

Fig. 2.

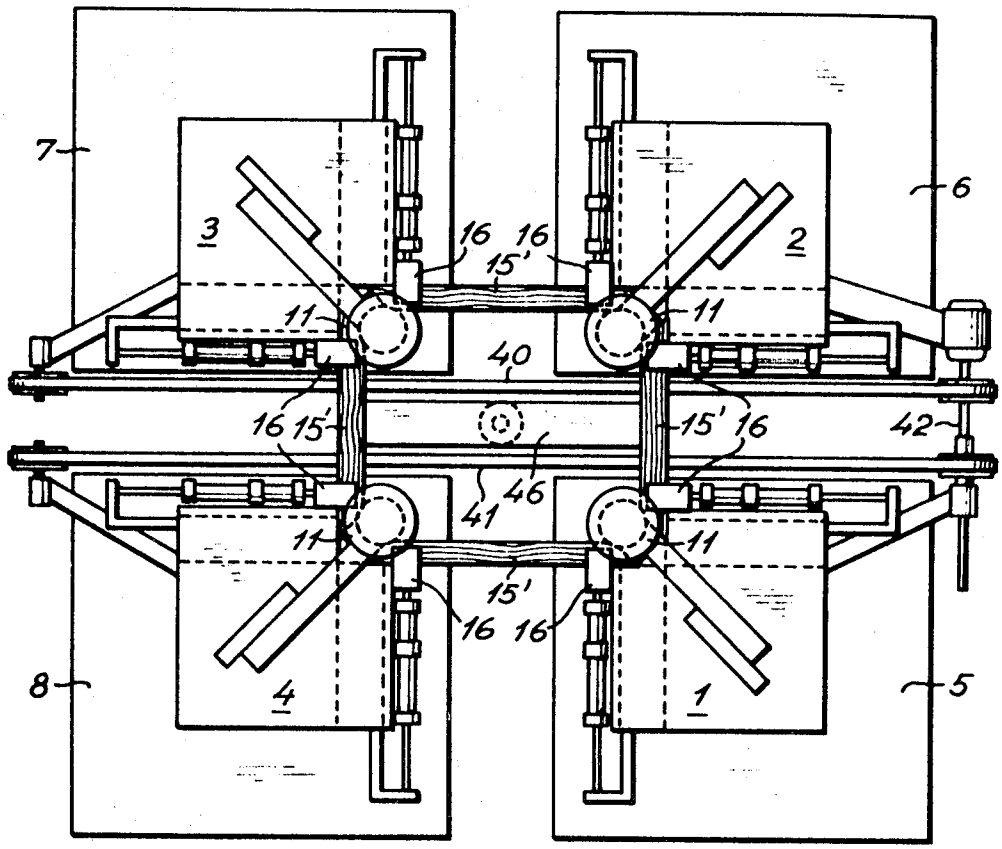
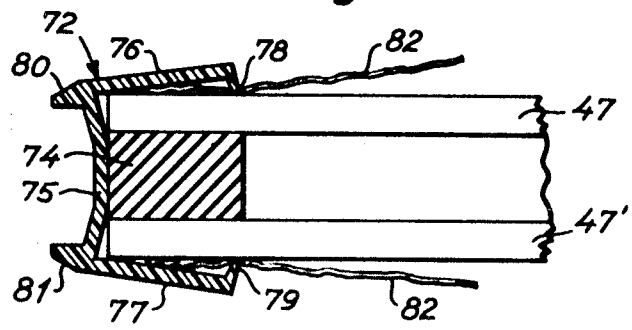


Fig. 10.



INVENTOR:
RICHARD BENT NISSEN
BY Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

Fig. 3.

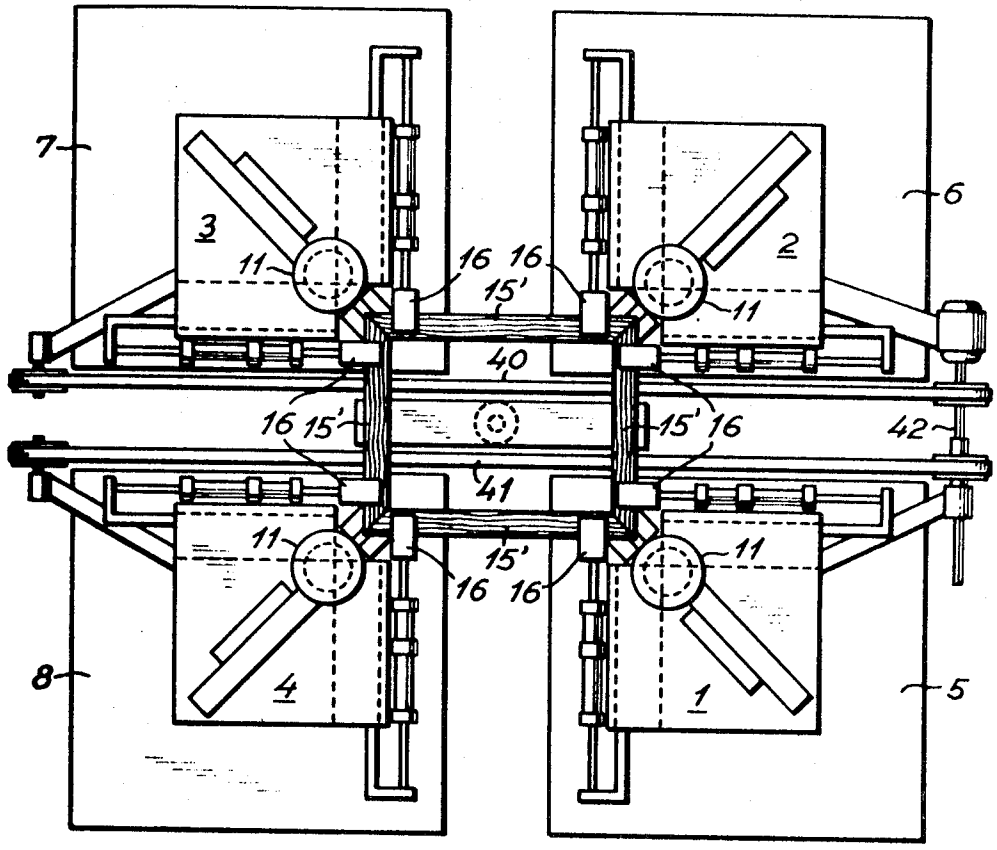
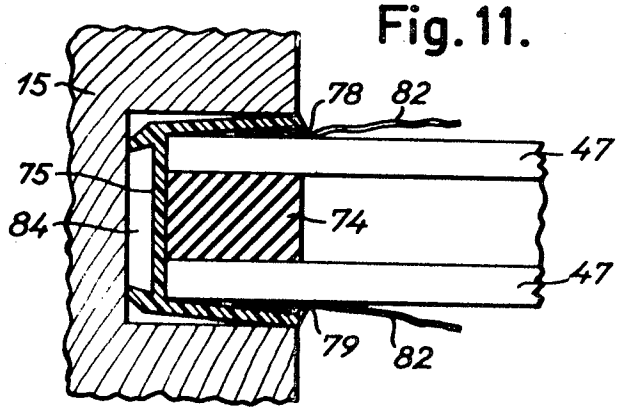


Fig. 11.



INVENTOR:
RICHARD BENT NISSEN

By Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

Fig. 4.

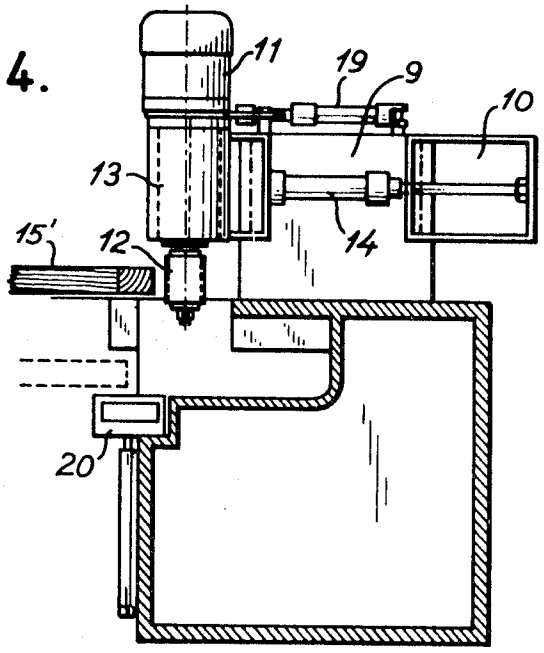


Fig. 13.

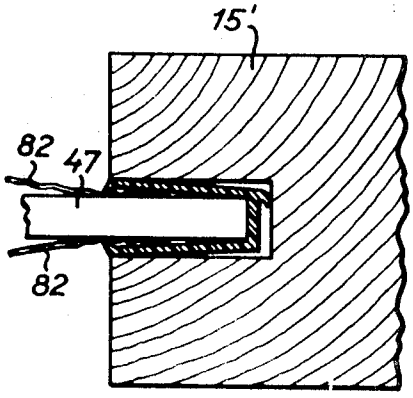
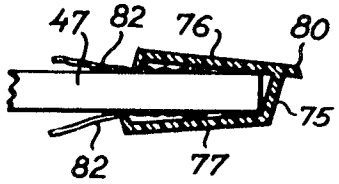
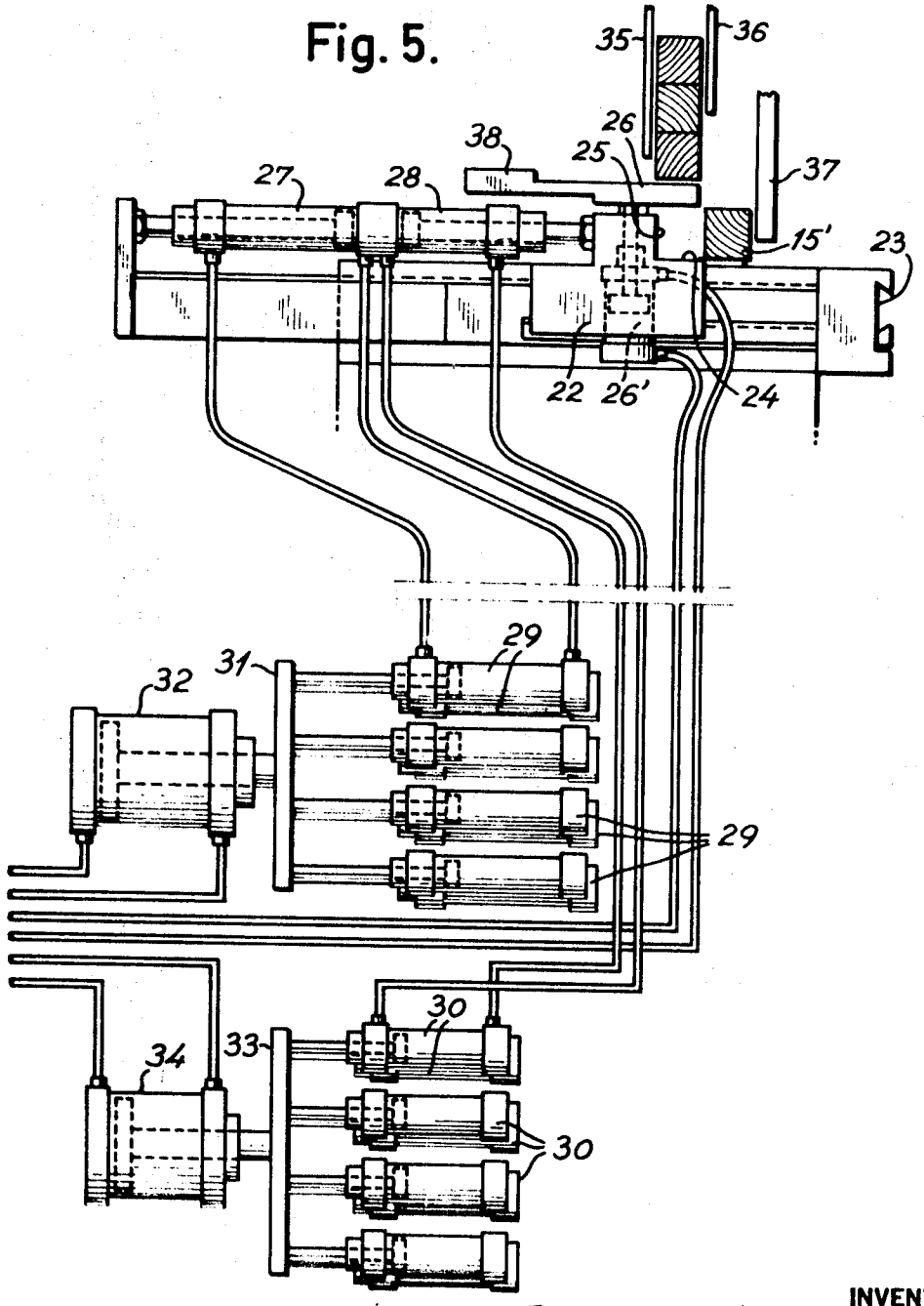


Fig. 12.



INVENTOR:
RICHARD BENT NISSEN
BY Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

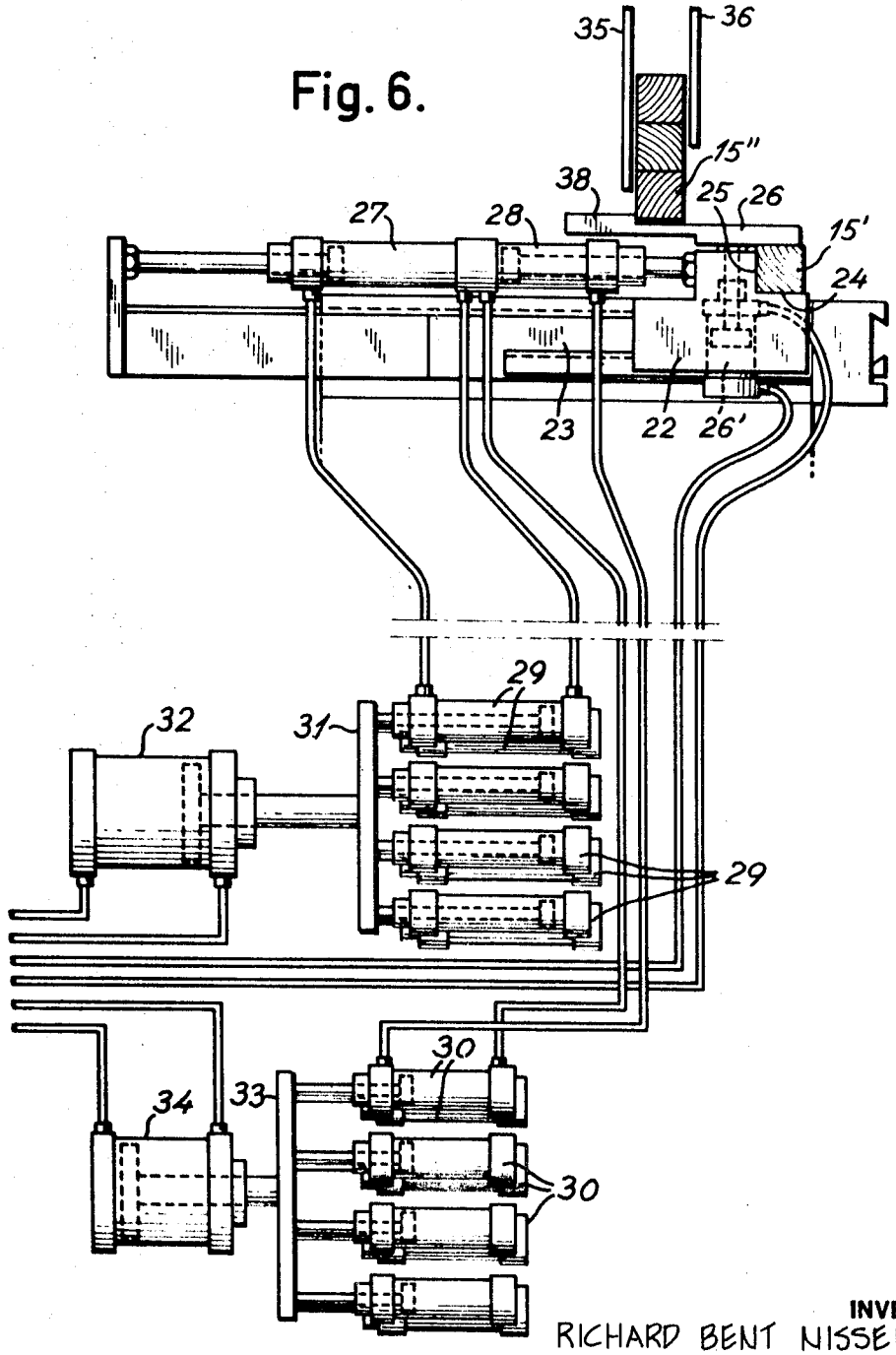
Fig. 5.



INVENTOR:
RICHARD BENT NISSEN

By Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

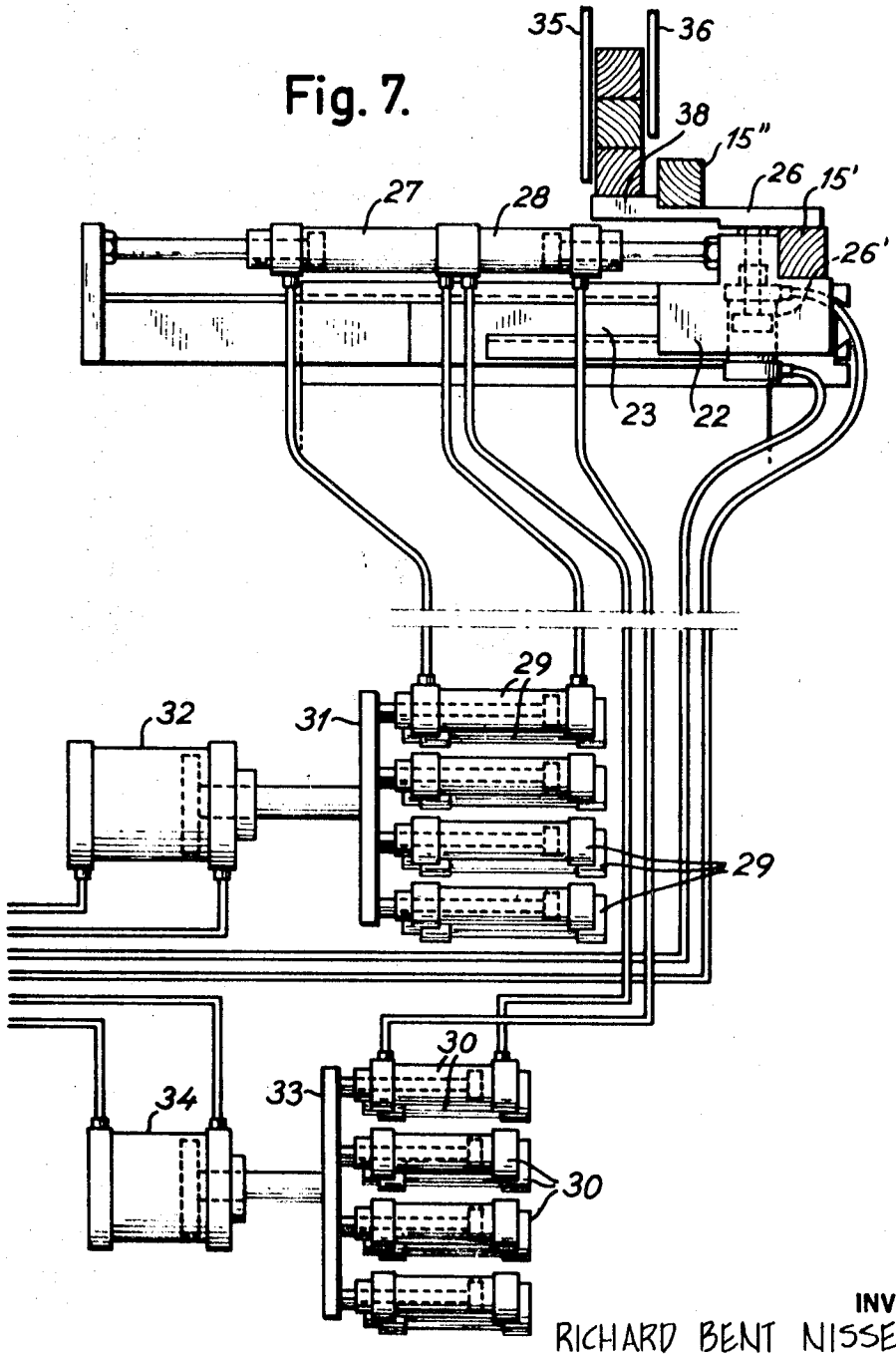
Fig. 6.



INVENTOR:
RICHARD BENT NISSEN

BY Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

Fig. 7.



INVENTOR:
RICHARD BENT NISSEN
By Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

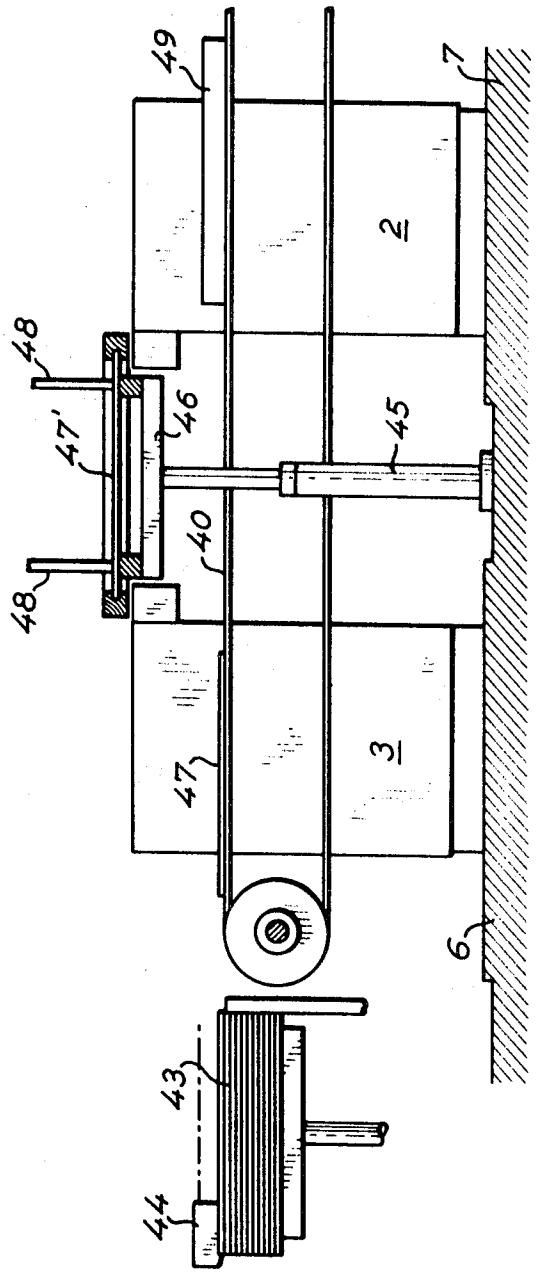


Fig. 8.

INVENTOR:
RICHARD BENT NISSEN
By Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

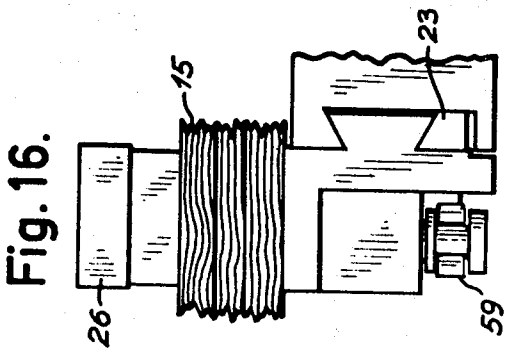


Fig. 16.

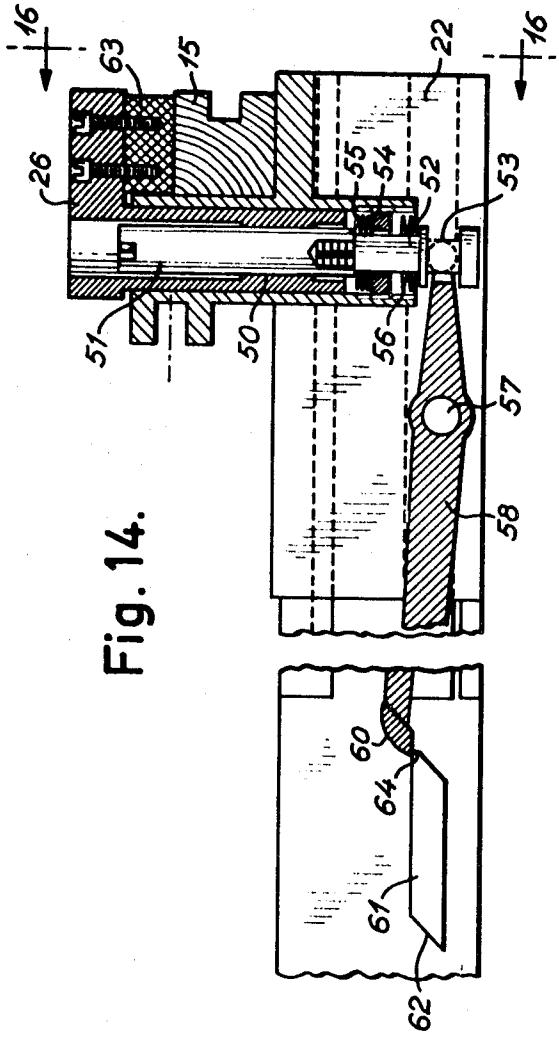


Fig. 14.

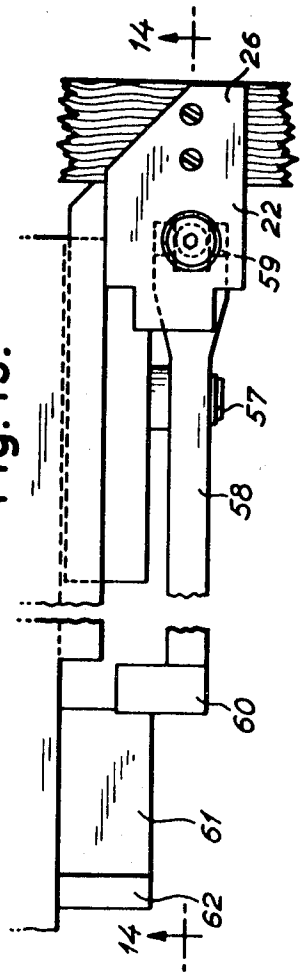


Fig. 15.

INVENTOR:
RICHARD BENT NISSEN

By Parrott, Bell, Seltzer, Park & Gibson
ATTORNEYS

MACHINE FOR AUTOMATICALLY PRODUCING FRAMELIKE STRUCTURES

The present invention relates to a machine for automatically producing framelike structures having mitered finger joints and using fingers of very small size, i.e., with a finger height of less than ⅜ inch and preferably between 1/16 inch and ¼ inch.

It is the primary object of the present invention to provide an improved machine of the kind referred to which will be suitable for continuous high speed automatic finger joining of frame components which are cut to size and supplied to the machine to fabricate a frame or framelike structure and which may be rearranged to produce frames or framelike structures of different sizes.

It is a further object of the invention to provide a machine of the kind referred to which is capable of simultaneously with the assembling of the framelike structure to include in the same a panel or the like which is held in grooves or notches in the frame or framelike structure.

It is a further object of the invention to provide a machine of the kind referred to which is capable of automatic production of window frames which are permanently joined along the windowpane.

A further object of the invention is to provide for sealing strips to be placed on the edges of a windowpane before its introduction in the machine of the kind referred to and which are formed so as to ensure a proper introduction of the said pane in grooves or notches in the frame components during assembly of the same in the machine.

Still another object of the invention is to provide for a protective covering to be placed at least on one side of the glass pane to protect the same during its handling in the machine.

It will be understood that although the invention for the sake of simplicity is described in connection with the production of frame or framelike structures of wood, the machine according to the invention may be applicable for handling of any other materials which may be joined by glueing and which are suitable for cutting out fingers.

These and other features and objects of the invention will become more fully apparent from the following description in conjunction with the accompanying drawing wherein:

FIG. 1 is a plan view diagrammatically showing a preferred embodiment of a machine according to the invention provided for the manufacturing of rectangular frames and with its moving parts in a first position,

FIGS. 2 and 3 are plan views of the same in a second and third position,

FIG. 4 is a vertical section through a part of the machine taken substantially along the line IV—IV of FIG. 1,

FIG. 5 shows schematically a part of the hydraulic system of the machine connected with one of the machine clamping devices shown in the first position,

FIGS. 6 and 7 show the same clamping devices shown in the second and third position,

FIG. 8 is an elevation schematically showing a part of the machine conveyor means,

FIG. 9 is a part of a panel or windowpane with sealing strips for introducing into the machine,

FIG. 10 is a section through a part of a spaced double panes of glass provided with sealing strip and protective covering in section,

FIG. 11 shows in section the same inserted in the window frame,

FIG. 12 shows a part of a single glass pane with another embodiment of the sealing strip and protective cover in section,

FIG. 13 shows a section of the same inserted in the window frame,

FIG. 14 is an elevation partly in section of another embodiment of the clamping device taken along the line XIV—XIV of FIG. 15,

FIG. 15 is a plan view of the same, and

FIG. 16 is an end view taken from the plane XVI—XVI in FIG. 14.

In the drawing like numerals refer to like parts throughout.

A preferred embodiment of the machine of the invention which is shown in FIG. 1–3 is adapted for the manufacture of rectangular frames and comprises four identical units 1, 2, 3 and 4 which will be more fully described below. It will be understood that for the manufacture of polygonal frames with another number of corners the number of units of the machine may vary correspondingly.

To enable the machine to be rearranged for the production of frames of different sizes each of the units 1, 2, 3 and 4 is placed on a plain table resp. 5, 6, 7 and 8 which may be built into the floor and provided with a grinded upper surface so as to ensure exact position of the four units. To facilitate the displacement of the units on their respective tables by rearrangement of the machine the well-known air cushion effect may be used in the units having provisions for supply of pressure air to beneath their undersurface which is surrounded by appropriate sealing means. When the units have been placed exactly in the positions required for the production of a frame of the desired size, they are firmly secured to the respective tables by appropriate fastening means which are also well known in the art and should therefore not be described in detail. Each unit comprises a frame preferably made as a casing with a nearby quadratic horizontal cross section and which on two adjacent sides is provided with guides for slides carrying clamping means indicated generally by the numeral 16 and which are going to be more fully described below. The guides are so arranged that the two slides of a unit can be moved horizontally in rectilinear paths which are perpendicular to each other.

Each unit has at its top a guide 9 for a slide 10 carrying a cutter assembly, the guide 9 being so arranged that the slide 10 can perform a rectilinear movement in a direction which intersects the angle between the direction of movement of the two clamping means 16. The movement of the slide 10 in the guide 9 is accomplished by a double-acting hydraulic cylinder 14 placed inside the guide 9 and having the end of its piston rod secured to the slide 10.

The cutter assembly comprising a motor 11 with a vertical shaft carrying on its lower end a cutter 12 provided with blades for cutting, tapering fingers and preferably also blades for trimming the tips of the fingers.

The cutter assembly is mounted on a cylindrical support the axis of which is parallel with but slightly eccentric with the axis of rotation of the cutter and the motor. This support is mounted rotatably and axially displaceable in a bearing 13 secured to the one end of the slide 10. Thus by turning the cutter assembly about 180° in the bearing 13, the cutter 12 for a purpose which will be described below can be displaced horizontally a short distance perpendicular to a direction of movement of the slide 10 in the guide 9.

This turning of the cutter assembly is accomplished by a double-acting hydraulic cylinder 19 the piston rod of which is acting on a gear sector, meshing with a gear provided on the cutter assembly cylindrical support which is further provided with a short thread or helical groove cooperating with a thread or pin in the bearing 13 in such a way that the cutter assembly concurrently with the said turning over about 150° will be displaced in axial direction a short distance which corresponds to half the width of the fingers to be cut in the frame elements, for a purpose which will be explained below.

The clamping means 16 will now be more fully described with reference to FIGS. 1–3 and 5–7. Each of the clamping means 16 comprises a slide 22 movable in a guide 23 fixed to the sidewall of the casing of the unit. This slide is provided with a horizontal supporting surface 24 and an adjacent vertical abutment surface 25 to ensure an exact positioning of the components which in general are indicated by the numeral 15. It will be understood that these surfaces may be formed in another way to accommodate special profiles of the frame components or mouldings.

The slide 22 carries at its upper part a claw which in general is indicated by 26 and which by means of a hydraulic cylinder 26' is moved in a vertical direction so as to clamp with its under surface a frame component which is placed on the slide in abutment with the surfaces 24 and 25.

The movement of the slide 22 is controlled by a hydraulic system which will appear especially from FIGS. 5–7. This hydraulic system comprises a double-acting hydraulic cylinder 27 with a piston and a piston rod the end of which is secured to a protruding part of the casing of the unit. A further double-acting hydraulic cylinder 28 is placed in continuation of the cylinder 27 and is provided with a piston and a piston rod the end of which is secured to the slide 22. Each end of the cylinder 27 communicates through a flexible tube with corresponding ends of a control cylinder 29 and each end of the cylinder 28 communicates over flexible tubes with corresponding ends of a control cylinder 30.

By the machine shown having four units and thus eight clamping means 16, the control cylinders 29 and 30 will each form part of an aggregate consisting of eight control cylinders 29 and 30 respectively. The ends of the piston rods of the eight control cylinders 29 are connected to a common yoke 31 which is acted upon by a double-acting hydraulic power cylinder 32. In the same way the piston rods of the eight control cylinders 30 are connected to a common yoke 33 acted upon by a double-acting hydraulic cylinder 34. Thus the hydraulic cylinders 27 and 28 of the machine's eight clamping devices are acted upon simultaneously by the said aggregate of control cylinders and power cylinders, which for the sake of clearness are not shown in FIGS. 1–3 and which are placed on a convenient place so that connecting flexible tubes between all the cylinders will have nearby equal lengths so as to minimize deviations in the movement of the working cylinders owing to elastic deformation of the flexible tubes when subjected to the hydraulic pressure.

Thus the movement of the pistons in the cylinders 27 and 28 will correspond exactly to the movement of the pistons in the cylinders 29 and 30 respectively.

The power cylinders 32 and 34 are connected to a common source of hydraulic pressure fluid which also feeds the other hydraulic cylinders of the machine, and a supply of hydraulic pressure fluid is governed by appropriate hydraulic control means well known in the art.

The mechanism described above works in the following way:

By the machine shown the frame components are supplied from four magazines which are placed over the spaces between the units so that they may be continuously filled up from the floor over the machine through apertures in the floor. The lower end of one of the magazines is indicated in FIGS. 5–7 by two guiding rails 35 and 36 between which the frame components 15 are moving downward successively and where the lowest component is resting on the upper surface of the claw 26.

FIG. 5 shows the slide 22 in its most retracted position where a frame component 15' guided by a retractable rail 37 in a way which will be described below has fallen down to the position shown in front of the claw 26.

During a first operational step pressure fluid is supplied to the power cylinder 32 to move the pistons in the eight control cylinders 29 whereby the piston rod of the hydraulic cylinder 27 will be pressed out to move the slide 22 forward against the position shown in FIG. 6. During this movement the frame component 15' will under the influence of the rail 36 be brought into abutment with the surfaces 24 and 25 whereafter pressure fluid is supplied to the hydraulic cylinder 26' so as to lower the claw 26 to effectively clamp the frame component 15'. When the piston in the power cylinder 32 has reached the end of its stroke which may be determined by an adjustable stop, all the slides 22 of the machine will simultaneously have reached a first working position shown in FIG. 6 and 2.

When the clamping means 16 has arrived at this position the hydraulic cylinders 14 of the four units are simultaneously activated to simultaneously move the respective slides 10 from their retracted position shown in FIG. 1 to a forward position shown in FIG. 2. During this movement the cutter 12 running continuously in the direction indicated by the arrow 18 in FIG. 1 will cut out joining fingers in the one end of the respective frame elements 15' which is protruding from the clamping means 16 at the right side relatively to its direction of movement. When this is done and the cutter assembly has reached the position shown in FIG. 2, the hydraulic cylinder 19 is activated to turn the cutter assembly about 180° about the vertical axis of the bearing 13. Owing to the eccentricity of this axis in relation to the axis of the cutter this will result in displacement of the cutter transversely to the direction of its forward movement. When this is accomplished the hydraulic cylinder 14 is activated in the opposite direction whereby the slide 10 with the cutter assembly is retracted whereby the cutter during this movement will cut out fingers in the other end of the respective frame components 15'. Thus the axis of the cutter will follow the path indicated by the dot-and-dash line 17 in FIG. 1. During the said turning of the cutter assembly this will also as mentioned above be displaced in vertical direction a distance corresponding to half the width of the fingers. This means that the two sets of fingers cut in the respective ends of the frame components to be joined will be in a staggered relationship so that they will intermesh when the frame components in a following operational step are brought together by forwarding in the same horizontal plane.

Each of the units is provided with a glue-applying apparatus shown schematically by 20 and which may be of any suitable construction well known in the art. When the cutter assembly has finished its operation as described above the glue applying apparatuses of the four units are activated for applying glue to the fingers just cut in the ends of the frame components. This is done by activating a hydraulic cylinder to raise glue applying implements which are submerged in glue containers so as to pass the end surfaces of the frame components to which the glue is to be applied.

When the glue has been applied as above described or partly in connection with this operation the power cylinder 34 is activated for simultaneously displacing the pistons in the control cylinders 30 whereby the hydraulic cylinders 28 simultaneously will push the eight clamping means 16 forward to a second position shown in FIG. 3 and FIG. 7, thus bringing the fingers on the ends of the respective frame components into mutual engagement. Hereby the frame components are firmly pressed together and to ensure an even distribution of the glue during this last part of the operation, a vibrating pressure may be applied as described in my copending Pat. application Ser. No. 764,463.

During this movement of the slides 22 from the position shown in FIG. 6 to the position shown in FIG. 7 a raised part 38 of the upper surface of the claw 26 will push the lowest frame component in the magazine to the position 15'', FIG. 7.

Experience has shown that owing to the use of finger joints the frame thus produced will have sufficiently rigidity so that it although the glue may not yet have set immediately can be removed from the machine. Thus after a short period of pressing together the components of the frame the pressure may be relieved whereafter the supply of pressure fluid to the hydraulic cylinders 26' is reversed whereby the claw 26 is raised. Simultaneously a table 46 in the central part of the machine, FIGS. 1–3 and 8, is raised by means of a hydraulic cylinder 45 until it supports the joint frame. Thereafter the supply of pressure oil to the power cylinders 32 and 34 is reversed so that their pistons together with the pistons in the control cylinders 29 and 30 will be removed to their original position shown in FIG. 5. By corresponding movements of the pistons in the cylinders 27 and 28, the machines' eight slides 22 will simultaneously be retracted to their starting position shown in FIGS. 1 and 5. As a consequence of this retraction the frame component resting on the upper surface of the claws 26 in the position shown by 15'' in FIG. 7 will fall down to the position shown by 15' in FIG. 5 thus being ready for repeating the operations.

During or after the retraction of the clamping means **16** the table **46** is lowered by releasing of the pressure in the hydraulic cylinder **45** until the frame has come to rest on a conveyor comprising two endless belts **40** and **41** supported by rollers attached to the respective units in such a way as to accommodate mutual displacement of the units by rearranging the machine for production of frames of another dimension. To ensure a synchronized run of the belts, they are driven by the same motor and their respective driving rollers being interconnected by a telescopic shaft **42**.

When the frame has been placed on the belts **40** and **41** the conveyor which has been stopped during the lowering of the frame is started to remove the frame from the machine in a gentle way to a place where it is stored carefully until the glue has set.

According to a further aspect of the invention it will be possible with the machine above described concurrently with the joining of the frame components to insert a panel or windowpane into the frame provided that the said components on the inner side are provided with a suitable groove. This can be done in a mechanical way as shown in FIG. **8**.

From a stack **43** of said panels or windowpanes the uppermost panel or pane is at the right moment pushed unto the conveyor belts **40, 41** by reciprocating member **44** whereafter this panel or pane in FIG. **8** indicated by **47** by the conveyor belts and appropriate guides not shown in the drawing is brought to an exact position over the table **46** which at this moment is in its lower position. Then the conveyor is stopped and the table **46** is raised by means of the hydraulic cylinder **45** until the panel or windowpane has reached the position **47'** exactly in level with the grooves in the frame components in which it is going to be inserted. This position is ensured by abutments **48** depending from a frame not shown which is built up over the machine.

It will be understood that the said raising of the table **46** is performed during the period in which the clamping means **16** are in their retracted position shown in FIG. **1** or FIG. **2**. The joining of the frame elements **15** is performed as described above around the panel or pane **47'** whereafter the completed structure is lowered and placed on the conveyor belts by lowering the table **46** whereafter the conveyor is started and simultaneously will bring the completed structure **49** out of the machine and the next pane **47** in position into the machine.

In the case where a glass pane is to be inserted in the frame by the automatic production of windows it is advisable for the proper working of the machine and for other reasons that the glass panes be exactly cut to size before they are introduced in the machine and provided with sealing strips along their edges. Beyond their sealing action these strips have the important purpose of eliminating small inaccuracies between the glass panes and the frame components and especially by their tapering profile to ensure a proper insertion in the grooves of the frame components by the automatic joining of the same as otherwise the pane inevitably would be crushed causing wasteful interruptions of the continuous manufacturing process.

The sealing strips adapted for this purpose are shown in FIG. **9–13**. FIG. **9** shows a corner of a windowpane **47** on the edges of which are mounted sealing strips **72** of resilient material. The strips are cut to lengths to form a mitre joint at the corners but with a narrow gap **73** between adjacent strips.

FIGS. **10** and **11** show a double-pane window with two glass panes **47** and **47'** which along their periphery are hermetically sealed by **74**. The sealing strip **72** placed on the edge of the pane has a generally U-shaped cross section with two legs **76** and **77** and a bottom **75**. In the relatively unstressed condition when the strip is just placed on the edge of the pane as shown in FIG. **10**, the bottom **75** will show a somewhat arcuate profile so that it will bend away from the edge of the pane. The legs **76** and **77** have at their free ends inturning lips **78** and **79**, resp. which will cause the legs also to diverge from the surface of the pane. The legs **76** and **77** further have at their ends joining the bottom **75** extensions which at least with the outer surfaces **80** and **81**, resp. are tapering outwards against the median plane of the pane. This will greatly facilitate and ensure proper introduction of the pane in the groove **84** in the frame member **15** by the assembly of the frame in the machine. Further these extensions will in the assembled window by being bent inwardly together with deformation of the bottom **75** which will be straightened out as shown in FIG. **11** ensure that the pane in the assembled window will be elastically clamped to a certain extent and compensate for small inaccuracies in the dimensions of the pane and the frame members.

In order to protect the glass panes to a certain extent during their handling in the machine, at least one side of the pane and preferably both sides of the pane are covered with a thin sheet or film **82** preferably of plastic. This covering which for the sake of clearness in the drawings is shown in some distance from the pane will in practice lie adjacent the surfaces of the pane and may be of a semiadhering type which will facilitate applying of the covering to the pane in a highly mechanized manufacturing process.

By the embodiment shown in the drawing the covering **82** is placed inside the sealing strips **72** but it may also be placed around the sealing strips and thereby assist in keeping the sealing strips on place during the handling of the glass panes in the machine.

When the windows are going to be taken into use the covering may easily be removed and discarded by cutting it along the edges of the sealing strips or frame members. The part of the covering which is hidden inside the grooves **84** is harmless and may be left in place.

It will be understood that the covering **82** also substantially will facilitate subsequent treatment of the windows such as painting or staining as well as protecting the pane during transportation and handling.

A simplified modification of the sealing strip is shown in FIGS. **12** and **13**. By this embodiment only the one leg **76** of the U-formed strip is extended over the bottom **75** which only diverges from the pane **47** at its one end. The elastic deformation of the sealing strip by inserting in the groove of the frame member **15** will appear from FIG. **13**.

In a modified form of the machine according to the invention which is going to be described below with reference to the FIGS. **14–16** it will be possible to dispense with the hydraulic cylinder **26'** and the associated control devices. In FIGS. **14–16** which only show relevant parts of one of the clamping means **16** the claw **26** is provided with a depending bushing **50** guided for vertical movement in a corresponding bore in the slide **22**. The bushing **50** has an internal thread into which a threaded spindle **51** is screwed. The spindle **51** is at its upper end provided with a hexagonal aperture for insertion of a key, whereby the spindle may be turned to adjust the height of the claw **26** in accordance with the height of the frame component **15** to be handled by the machine.

At its lower end the spindle **51** is extended by a threaded bolt **52** screwed into the spindle and the diameter of which is less than the diameter of the spindle **51**. The bolt **52** is provided with a circumferential groove **52**.

The lower part of the bore in the slide **22** has an internal thread in which a disc **54** is screwed in and locked, the disc serving as abutment for spring means **55**, for instance disc springs, which at their other end abut against the spindle **51**. Similar spring means **56** are inserted between a collar forming the upper confinement of the peripherical groove **53** and the disc **54**.

On the slide **22** a lever **58** is mounted journaled about a pin **57**. The one end **59** of the lever **58** is forked so as to be engaged in the circumferential groove **53** and the other end of the lever has a cam follower **60** with a special profile as shown in FIG. **14** and adapted for cooperation with a fixed cam **61** secured to the casing of the unit. By the forward movement of the slide **22** towards its first working position shown in FIG. **6**, the cam follower **60** by engaging an inclined surface **62** of the cam **61** will be forced to slide over the cam **61**. In doing so the lever **58** will turn in the direction of the sun and thereby through the bolt **52** and the spindle **51** is urged downward

whereby a block **63** of hard rubber or the like material with corresponding elastic properties will be forced against the frame member **15**. It should be noted that the dimensions of the frame members can be maintained with such small tolerances that the elasticity of the block **63** will be sufficient to ensure the necessary clamping pressure on the frame member **15**.

By the said downward movement of the spindle **51**, the spring means **55** are compressed. Immediately before the slide **22** during the assembly of the frame has reached its end position, the cam follower **60** will pass over the forward edge of the cam **61** thereby releasing the lever **58** so that the same by the compressed spring **55** will be turned in the direction against the sun, will be raised and release the frame member **15**. During the subsequent returning movement of the slide **22**, the cam follower **60** having a rounded upper surface will by engaging an inclined forward surface of the cam **61** move under the cam **61** whereby the spring means **56** are compressed against the undersurface of the disc **54**. Thus when the cam follower **60** during the return movement has passed the backward end of the cam **61** it will be raised enough to ensure engagement with the inclined surface **62** at the next forward movement of the slide **22**.

It will be understood that all the operations of the machine performed by the hydraulic system described above are controlled by an automatic control system of any appropriate kind well known in the art. As this system per se is well known and not forming a part of the present invention, it will not be described in detail.

From the foregoing it can be seen that the machine described once supplied with frame components cut to the sizes desired will be able in a fully automatic operation to produce frames or framelike structures with a considerable speed and also frames or framelike structures enclosing a panel. Especially the machine will be well suited for the production in one operational sequence of window frames with the glass pane inserted. It will further be seen that the machine may easily be rearranged for the production of frames or framelike structures of different dimensions.

Having illustrated and described preferred embodiments of my invention it should be apparent to those skilled in the art that the same permits a modification in details and arrangement. I claim as my invention all such modifications as come within the true spirit and scope of the appended claims.

1. A machine for automatically producing frames or framelike structures assembled by glued finger joints, said machine comprising a number of substantially identical units corresponding in number to the number of corners in the frame, means for supporting said units for selective displacement in a horizontal plane to permit rearrangement into desired mutual positions, means for locking the units in said desired positions, each unit comprising two slideably mounted clamping means positioned for displacement in a horizontal plane in rectilinear paths forming an angle with each other, a slideably mounted finger cutter positioned for displacement in a horizontal linear path bisecting the angle between the paths for the displacement of the clamping means, a glue-applying apparatus, and hydraulic means for simultaneously displacing the clamping means and finger cutter respectively, means for supplying cut to size frame components to the machine, and means for removing assembled frames from the machine.

2. A machine for automatically producing frames or framelike structures assembled by glued finger joints, said machine comprising a number of substantially identical units corresponding in number to the number of corners in the frame, means for supporting said units for selective displacement in a horizontal plane to permit rearrangement into desired mutual positions, means for locking the units in said desired positions, each unit comprising two slideably mounted clamping means positioned for displacement in a horizontal plane in rectilinear paths forming an angle with each other, a slideably mounted finger cutter mounted for rotation about a vertical axis and positioned for displacement in a horizontal linear path bisecting the angle between the paths for the displacement of the clamping means, said finger cutter being mounted on a cylindrical support having an axis parallel with and slightly eccentric with the vertical axis of the finger cutter, a bearing carried by said finger cutter, means mounting said cylindrical support in said bearing for rotational and axial movement therebetween and including power means for reciprocal turning of the support about 180° and helical guiding means for axially moving the cutter assembly during said turning a distance corresponding to half the width of the finger to be cut, a glue-applying apparatus, and hydraulic means for simultaneously displacing the clamping means and finger cutter respectively, means for supplying cut to size frame components to the machine, and means for removing assembled frames from the machine.

3. A machine for automatically producing frames or framelike structures assembled by glued finger joints, said machine comprising a number of substantially identical units corresponding in number to the number of corners in the frame, means for supporting said units for selective displacement in a horizontal plane to permit rearrangement into desired mutual positions, means for locking the units in said desired positions, each unit comprising two slideably mounted clamping means positioned for displacement in a horizontal plane in rectilinear paths forming an angle with each other, a slideably mounted finger cutter positioned for displacement in a horizontal linear path bisecting the angle between the paths for the displacement of the clamping means, a glue-applying apparatus, and hydraulic means for simultaneously displacing the clamping means and finger cutter respectively, means for supplying cut to size frame components to the machine, means for removing assembled frames from the machine comprising two horizontal endless conveyor belts arranged between two pairs of rollers below the working level of the clamping means and driven by a common motor, said two belts being interconnected by a telescoping shaft, a table placed in the central part of the machine between the belts, and hydraulic cylinder means for vertically displacing said table between the level of the conveyor belts and the working level of the clamping means.

4. A machine for automatically producing frames or framelike structures assembled by glued finger joints, said machine comprising a number of substantially identical units corresponding in number to the number of corners in the frame, means for supporting said units for selective displacement in a horizontal plane to permit rearrangement into desired mutual positions, means for locking the units in said desired positions, each unit comprising two slideably mounted clamping means positioned for displacement in a horizontal plane in rectilinear paths forming an angle with each other, a slideably mounted finger cutter positioned for displacement in a horizontal linear path bisecting the angle between the paths for the displacement of the clamping means, a glue-applying apparatus, and hydraulic means for simultaneously displacing the clamping means and finger cutter respectively, means for supplying cut to size frame components to the machine, means for removing assembled frames from the machine comprising two horizontal endless conveyor belts arranged between two pairs of rollers below the working level of the clamping means and driven by a common motor, said two belts being interconnected by a telescoping shaft, a table placed in the central part of the machine between the belts, hydraulic cylinder means for vertically displacing said table between the level of the conveyor belts and the working level of the clamping means, means for successively forwarding panels onto the forward end of the conveyor belts, and guide means for adjusting the position of said panels in relation to said table such that the panels are lifted from the belts by the table to the level of the frame components held by the clamping means.

5. The machine as defined in claim **4** wherein said panels each comprise a glass pane having a U-shaped sealing strip attached to its edges, the outer surfaces of said strips being tapering outwardly from the median plane of the glass pane.

6. The machine as defined in claim 5 wherein the glass pane further includes a thin sheetlike protective covering carried at least on one side thereof.

7. A machine for automatically producing frames or framelike structures assembled by glued finger joints, said machine comprising a number of substantially identical units corresponding in number to the number of corners in the frame, means for supporting said units for selective displacement in a horizontal plane to permit rearrangement into desired mutual positions, means for locking the units in said desired positions, each unit comprising two slideably mounted clamping means positioned for displacement in a horizontal plane in rectilinear paths forming an angle with each other, means for displacing each of said clamping means along said paths comprising a first and a second double-acting hydraulic cylinder arranged in continuation of each other, each of said first and second cylinders communicating over flexible tubing with a double-acting hydraulic control cylinder, the piston rods of said control cylinders associated with all of said first cylinders being connected to a common yoke acted upon by a first double-acting hydraulic power cylinder, and the piston rods of said control cylinders associated with all of said second cylinders being connected to a common yoke acted upon by a second double-acting power cylinder, a slideably mounted finger cutter positioned for displacement in a horizontal linear path bisecting the angle between the paths for the displacement of the clamping means, means including a double-acting hydraulic cylinder for displacing said finger cutter along said linear path, a glue-applying apparatus, means for supplying cut to size frame components to the machine, and means for removing assembled frames from the machine.

8. The machine as defined in claim 7 wherein each clamping means further comprises an upper claw, and means including a double-acting hydraulic cylinder for vertically displacing said upper claw.

9. The machine as defined in claim 7 wherein each clamping means comprises an upper claw and a double-acting lever, one end of said lever being connected to the upper claw and the other end of said lever carrying a cam follower adapted to cooperate with a fixed cam so as to exert a clamping force on said upper claw during forward movement of the clamping means and to release the clamping force during the return movement of the clamping means.