United States Patent

[11] 3,601,301

[72] Inventor **Alfred J. Backus**
Oshkosh, Wis.

[21] Appl. No. **816,488**
[22] Filed **Apr. 16, 1969**
[45] Patented **Aug. 24, 1971**
[73] Assignee **Medalist Industries, Inc.**
Milwaukee, Wis.

[54] **FURNITURE PIECE FABRICATING MACHINE**
12 Claims, 12 Drawing Figs.

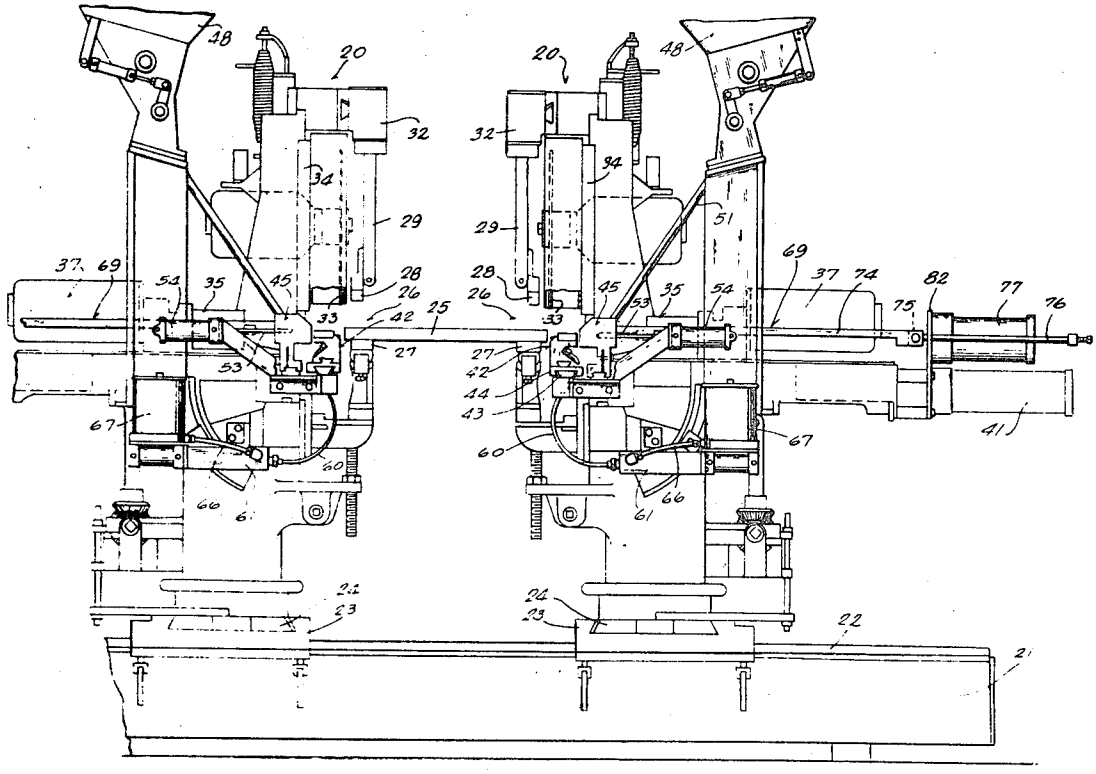
[52] **U.S. Cl.** **227/14, 227/69**
[51] **Int. Cl.** **B27f 4/00**
[50] **Field of Search** 227/14, 26, 67, 69, 70, 71

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

1,122,569	12/1914	Bell	227/14
1,909,791	5/1933	Welch	227/69
3,046,558	7/1962	Hadnagy	227/69

Primary Examiner—Granville Y. Custer, Jr.
Attorney—Wheeler, House and Wheeler

ABSTRACT: This disclosure relates to a furniture piece fabricating machine having a piece clamping station at which the piece is cut off, dowel-receiving holes bored therein, glue injected into the bores, and dowels set into the bores, all in successive operations at the same station and without requiring any manual manipulation of the piece intermediate the various successive steps.

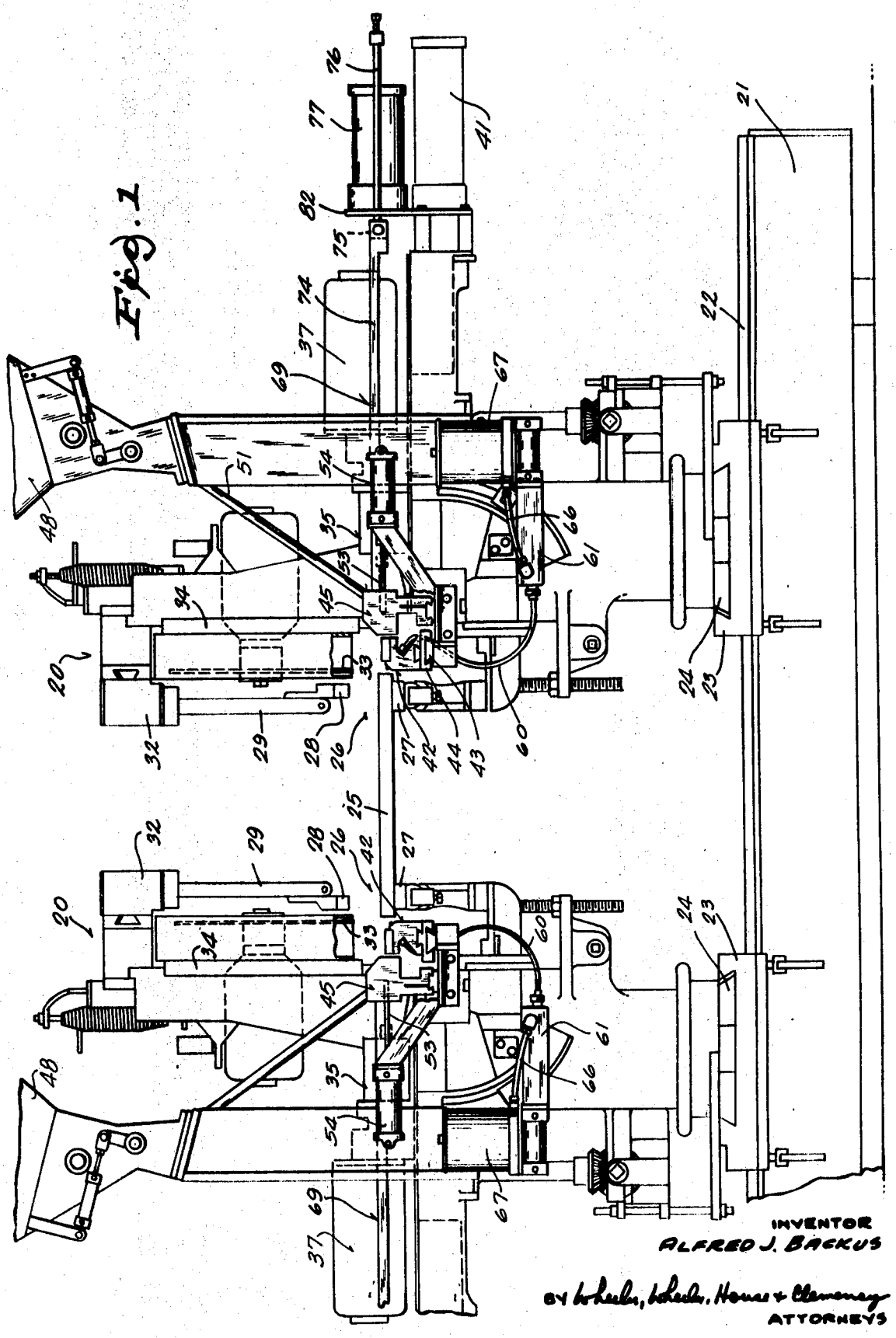


PATENTED AUG 24 1971

3,601,301

SHEET 1 OF 5

Fig. 1



INVENTOR
ALFRED J. BACKUS

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

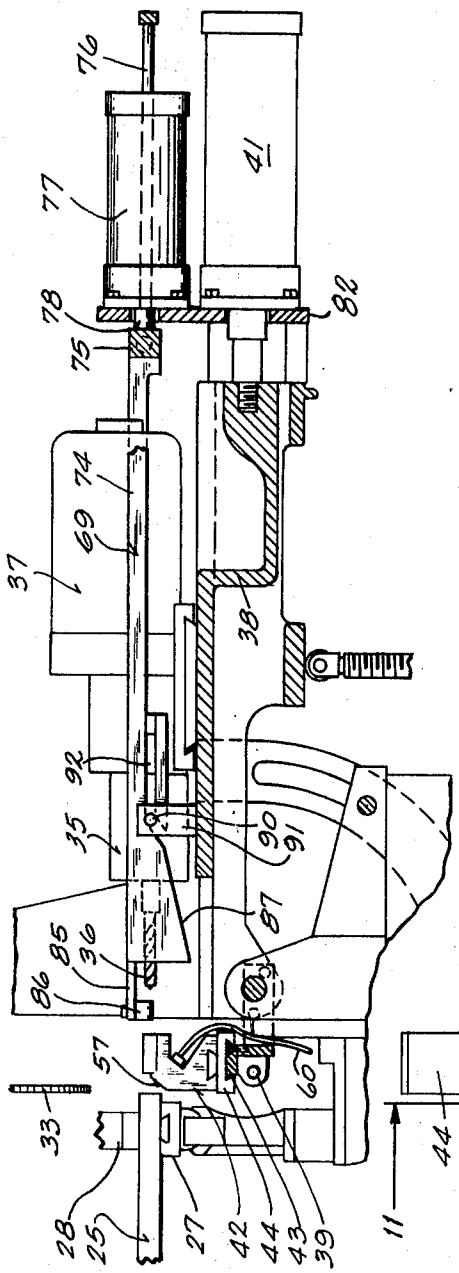


Fig. 2

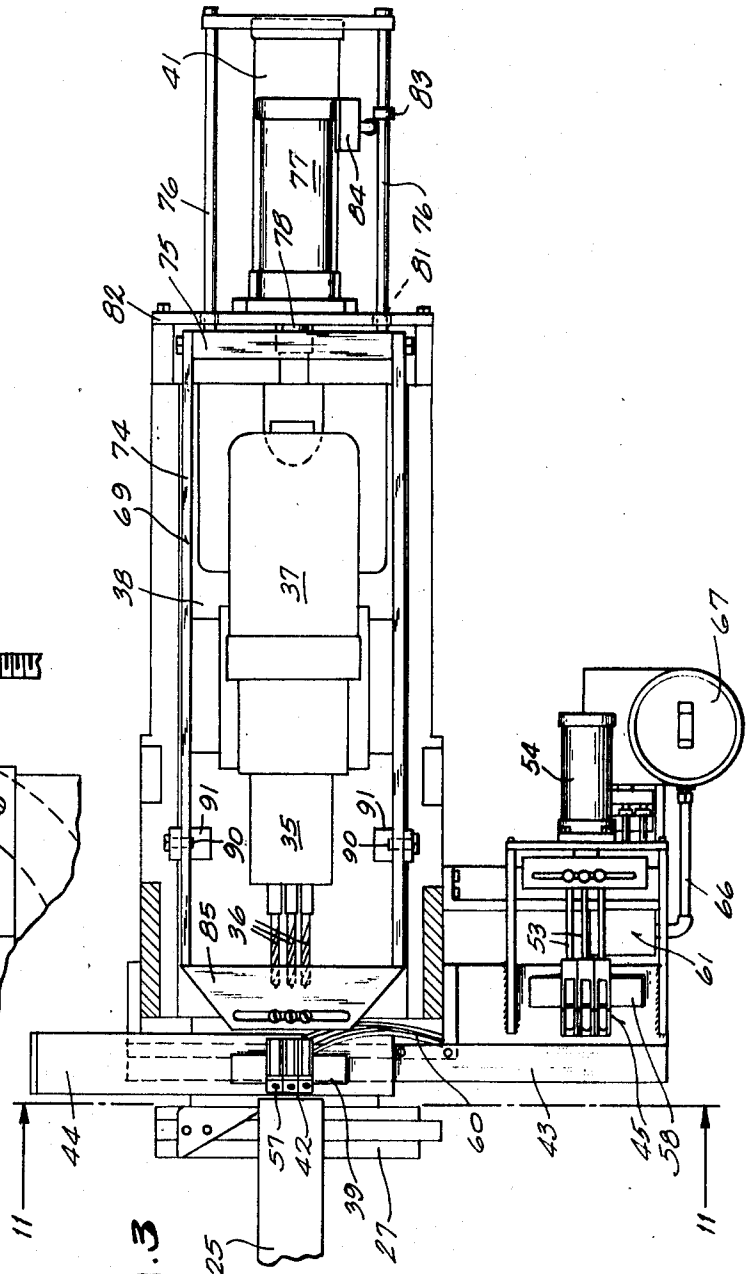


Fig. 3

INVENTOR
ALFRED J. BACKUS

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

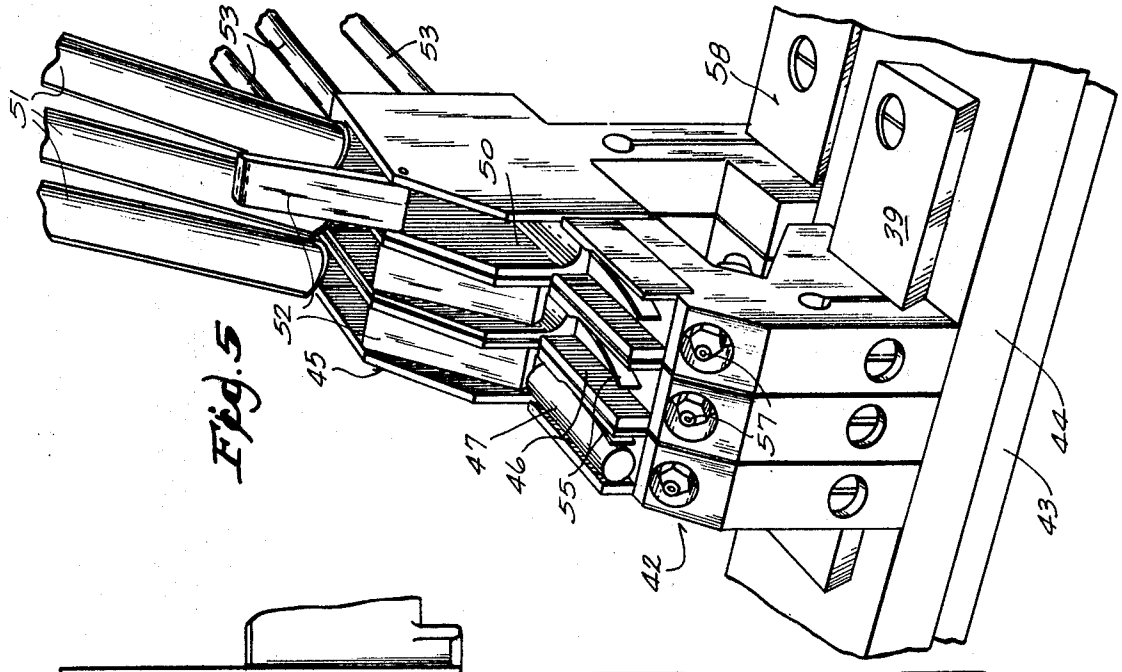


Fig. 5

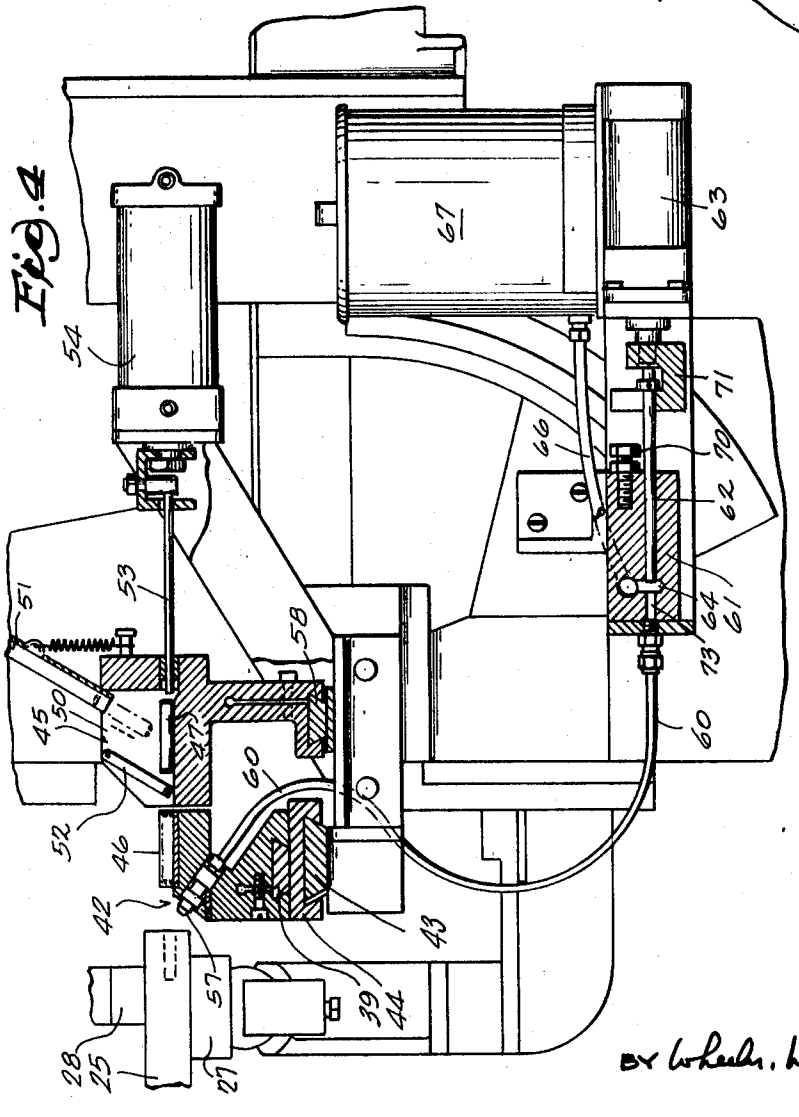


Fig. 4

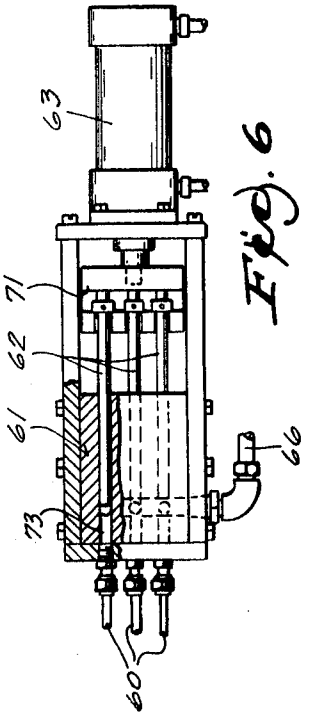


Fig. 6

INVENTOR
ALFRED J. BACKUS
BY Wheeler, Wheeler, Hamer & Clemmey
ATTORNEYS

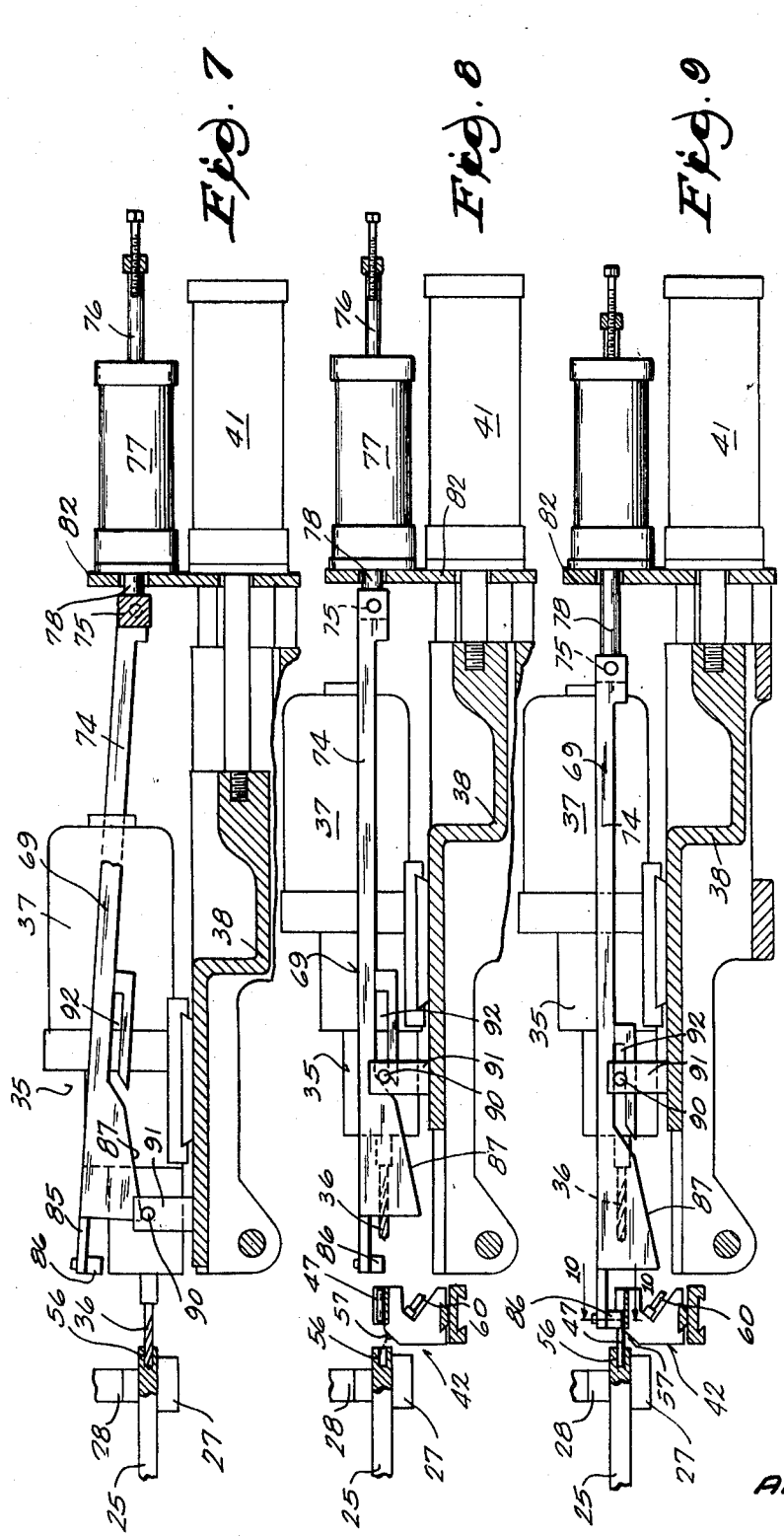


Fig. 7

Fig. 8

Fig. 9

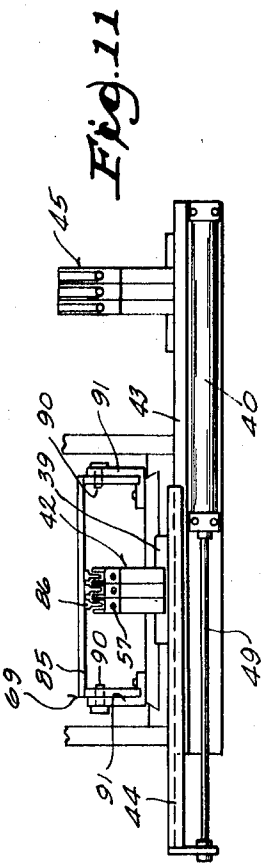


Fig. 11

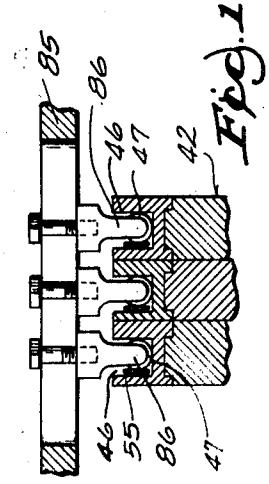


Fig. 10

INVENTOR
ALFRED J. BACKUS

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

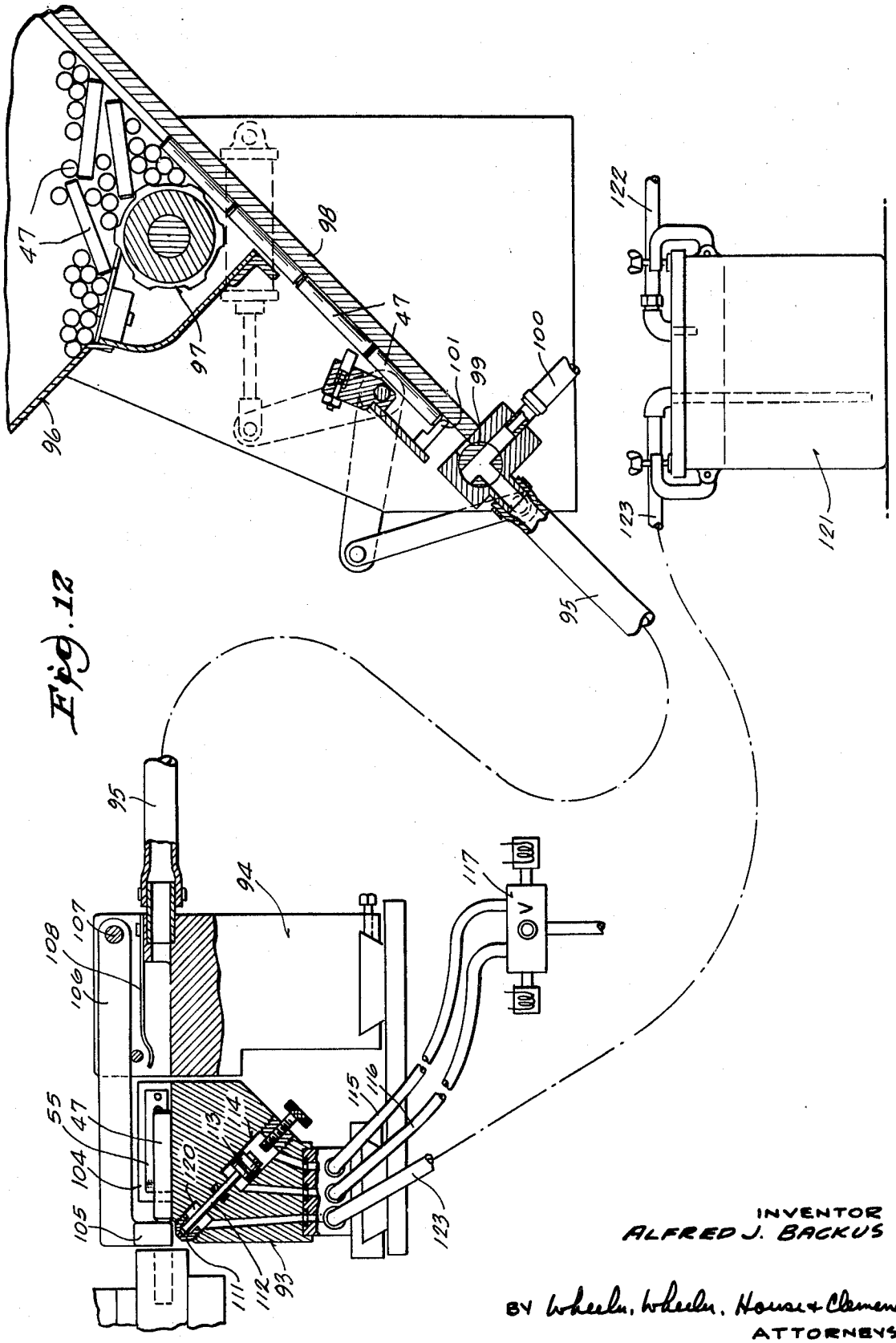


Fig. 12

INVENTOR
ALFRED J. BACKUS

BY Wheeler, Wheeler, House & Clemency
ATTORNEYS

FURNITURE PIECE FABRICATING MACHINE

BACKGROUND OF THE INVENTION

In the known prior art, separate machines are required for performing various operations in setting a dowel in a furniture piece, such as a chair leg stretcher, etc. Typically, a cutting and boring machine will perform the operations of cutting the piece to the proper length and boring dowel holes therein. The piece is then removed from this machine and transferred to another machine in which glue will be injected into the bore and a dowel set therein.

SUMMARY OF THE INVENTION

In accordance with the present invention, all operations are performed on the same machine and at the same station without need for transferring the piece from one machine to another. The piece is clamped, cut off, bored, glue is injected into the bore, and the dowel is set into the glued bore in a rapid sequence of steps requiring no manual intervention or manipulation. The machine features a dowel carrier and a transfer mechanism by which the carrier is shuttled between a dowel loading position remote from the station and a dowel setting position proximate the station. There is a dowel loader at the dowel-loading position of the carrier and a dowel setter at the dowel-setting position of the carrier.

The dowel carrier is in its dowel-loading position and one or more dowels are loaded thereinto while the piece is being cut off to proper length and a corresponding number of dowel bores are drilled therein. The drill retracts, and the dowel carrier shuttles into its setting position between the drill and the piece. The carrier is provided with a corresponding number of glue-injecting nozzles, inclined at an angle to the bore, and a slug of glue is injected into each bore. The glue-injecting step occurs at the beginning of the forward motion of the dowel setter which pushes the dowels out of the dowel carrier and into the glued bores. The glue-injecting step terminates prior to entry of the dowels into the bores. The setter then retracts and the carrier shuttles back to its dowel-loading position. The piece is unclamped and is removed as a finished doweled piece. The machine is then in readiness for the next operation.

Other objects, features and advantages of the invention will appear from the following disclosure.

DESCRIPTION OF DRAWINGS

FIG. 1 is a side elevation of apparatus embodying the present invention in which there are spaced machines to concurrently work on both ends of a single piece.

FIG. 2 is a fragmentary side elevation of the right side machine shown in FIG. 1, portions being broken away and shown in cross section. In this view the dowel carrier is shown in its dowel-setting position.

FIG. 3 is a fragmentary plan view of a portion of the right side machine of FIG. 1, portions being broken away and shown in cross section. In this view the dowel carrier is also shown in its dowel-setting position.

FIG. 4 is a fragmentary side elevation of a portion of the right side machine shown in FIG. 1 and showing the dowel carrier in its dowel-loading position.

FIG. 5 is a fragmentary perspective view of the dowel carrier and the transfer chute of the dowel loader.

FIG. 6 is a fragmentary horizontal cross section through the glue pump of FIG. 4.

FIGS. 7, 8, and 9 are fragmentary side views, partly in cross section, showing successive positions of the drill, dowel carrier, and dowel setter in the course of successively drilling, gluing, and setting the dowel into glued bore of the workpiece.

FIG. 10 is a fragmentary cross section along the line 10—10 of FIG. 9.

FIG. 11 is a fragmentary view taken along the line 11—11 of FIG. 3 and showing the mechanism for shuttling the dowel carrier between its dowel-setting position, where the dowel carrier is shown in this view, and the dowel-loading position.

FIG. 12 is a layout showing a modified embodiment of glue and dowel supply mechanism for the dowel loader and dowel carrier.

DESCRIPTION OF PREFERRED EMBODIMENTS

Although the disclosure hereof is detailed and exact to enable those skilled in the art to practice the invention, the physical embodiments herein disclosed merely exemplify the invention which may be embodied in other specific structure. The scope of the invention is defined in the claims appended hereto.

As best shown in FIG. 1, two furniture fabricating machines 20 embodying the invention are mounted on a base 21 having slideways 22 upon which the spacing between the machines can be adjusted. Each machine 20 is mounted on an intermediate carrier 23 further provided with a transverse slideway 24 upon which the lateral position of each machine 20 can also be adjusted. By using two machines 20, both ends of a workpiece 25 (typically a chair leg stretcher) can be worked on concurrently.

Each machine 20 is provided with a piece clamping station 26 which comprises a laterally elongated anvil 27 and an overhead clamp pad or foot 28 which is mounted on a clamping arm 29 depending from a clamping motor 32. In FIG. 1, the piece 25 is shown as it is positioned on the anvils 27 and before the pads 28 are clamped thereagainst. When the piece 25 is clamped at the stations 26, circular cutoff saws 33 are moved downwardly on their ways 34 to cut off the ends of the workpiece 25 to the exact length required for the workpieces as is established by the adjusted spacing between the machines 20. The saws 33 then retract upwardly and dowel holes are bored into the ends of the workpiece by the drills 35.

In the illustrated embodiment, each drill head 35 has a set of three drill bits 36 by which three bores are drilled into the end of the workpiece 25 (FIG. 3). Each drill head 35 is powered by an electric motor 37. Each drill head 35 and its motor 37 are mounted on a carriage 38 on which the drill, etc., is advanced and retracted with respect to the workpiece 25. Carriage 38 is powered by a fluid motor 41. In FIG. 7, the drill 35 is shown in its advanced position in which bores 56 are being drilled into the end of the workpiece 25. In FIGS. 8 and 9, the drill has been retracted.

In accordance with the present invention, apparatus is provided for injecting glue into the drilled bores and setting dowels into the glued bores while the workpiece remains clamped at station 26. For this purpose a dowel carrier 42 is mounted on a transfer mechanism which, in the disclosed embodiment, includes a slideway 43. The carrier 42 is mounted on a complementary slide bar 44 which has a short dovetail bar 39 which provides for minor adjustments of the carrier 42 along the bar 44.

As best shown in FIG. 11, the carrier 42 is shuttled between its dowel-setting position at station 26 and a dowel-loading position adjacent the dowel loader 45 by a fluid motor 40, the piston rod 49 of which is connected to the slide 44.

The dowel carrier 42 comprises a battery of similar units, each having at its top a dowel saddle 46 into which a dowel 47 is loaded from a corresponding transfer chute of the dowel loader 45. The dowel loader may be of the construction shown in FIGS. 4 and 5 or in FIG. 12. In both embodiments, the loader 45 is adjustably mounted on a slide bar 58, thus to align the loader and the carrier 42.

In the embodiment of FIGS. 4 and 5, the dowels are stored in a hopper 48 (FIG. 1) and are gravity fed down chutes 51 into transfer chutes 50 where each dowel 47 will be aligned axially with a saddle 46 in the carrier 42. A pivoted gate 52 yieldably closes the ends of the chutes 50 so that only one dowel 47 will be in its horizontal full line position shown in FIG. 4. When the mechanism shown in FIG. 11 shuttles the carrier 42 to its position shown in FIGS. 4 and 5, a dowel push rod 53, powered by a fluid motor 54, pushes the dowel 47 axially into the saddle 46 of the carrier 42. The dowels are held snugly in their saddles 46 by the leaf springs 55 (FIGS. 5 and

10). The throw of the push rod 53 is just sufficient to completely transfer the dowel to its dotted position in the carrier 42, as shown in FIG. 4. In the course of movement, the gate 52 will be lifted. After the push rod 53 has retracted, the gate 52 closes by gravity. After a complete withdrawal of the push rod 53, the next dowel in chute 51 will descend by gravity into the full line position shown in FIG. 4.

In the disclosed exemplary embodiment, there are three saddles 46 and three transfer chutes 50. This is to suit the particular requirements of the illustrated workpiece 25 for which three end dowels are required. A greater or lesser number of dowels would involve adding or removing carrier and transfer chute sections.

After the dowels are loaded into carrier 42 and the drill 35 is withdrawn to its position shown in FIG. 8, fluid motor 40 is actuated to shuttle the carrier 42 to its position shown in FIGS. 8 and 11 in which the carrier 42 intervenes between the drill 35 and the bored end of the workpiece 25. In this position the dowels 47 in the carrier 42 align axially with the bores 56 which were drilled into the end of the workpiece 25.

Each unit of the dowel carrier 42 also carries a glue nozzle 57 which is offset below the axis of the carried dowel 47 and which is inclined to said axis to aim obliquely into the workpiece bore 56, as shown in FIGS. 4 and 8.

Each nozzle 57 is provided with a flexible glue supply tube 60 connected to a glue pump 61. Tube 60 is flexible to permit shuttling motion of the carrier 42. Pump 61 has the construction best shown in FIGS. 4 and 6. Plungers 62 (one for each glue line) are adapted to pressurize glue in chamber 64. The upper end of chamber 64 is connected by a fluid line 66 to glue reservoir 67. The stroke of the plunger 62 is limited by an adjustable stop bolt 70. Plunger 62 carries a stop yoke 71 which contacts the stop bolt 70 to limit forward movement of the plunger.

As the plunger 62 advances (moves to the left in FIG. 4), the glue in chamber 64 will have a slight flow back into reservoir 67 until the plunger 62 enters bore 73. Then the glue in bore 73 and tube 60 is pressurized to jet a slug of glue from nozzle 57 against the sidewall of the bore 56 and coat the wall with glue. When the plunger 62 retracts (moves to the right in FIG. 4) it will apply suction on the tube 60 and withdraw from the end of nozzle 57 any excess glue that tends to dribble out of the nozzle, thus to keep the end of the nozzle clear. As soon as the end of the plunger 62 retracts into the chamber 64 the suction is relieved and a new supply of glue can flow from reservoir 67 into chamber 64.

FIG. 8 shows nozzle 57 jetting glue into the bore 56. The glue injecting step is very short and terminates before the dowel setter, best shown in FIGS. 2, 3, and 7–11 inclusive, pushes the dowels 47 from their saddles 46 into the glued bores 56 in the workpiece 25. The dowel setter comprises a pivoted frame 69 having long side arms 74, the rear ends of which are pivotally mounted on a crosshead 75 mounted on the piston rod 78 of fluid motor 77. Crosshead 75 is also connected near its ends to rods 76 which slide through appropriate openings 81 in mounting plate 82, thus to guide the movement of pusher frame 69. One slide rod 76 carries a switch actuator collar 83 which cooperates with the actuator of switch 84.

At the forward ends of the pusher frame 69 there is a crosshead 85 spanning between the arms 74 and which carries pusher pads 86 (FIG. 10) which align axially with the dowels 47 in the saddles 46 of the dowel carrier 42. Accordingly, when the pusher frame 69 is advanced, as shown in FIG. 9, the pusher pads 86 pick up the dowels 47 and inject them into the glued bores 56. When the pusher frame 74 retracts, the cycle is complete. The clamp 27, 28 is then released and the piece 25 removed from station 26. A new piece can then be positioned in the machine.

FIGS. 7–9 also illustrate another feature of the machine by which the pusher pads 86 are swung to a position out of the path of the drill bits 36 of the drill 35 when the bore 56 in the end of workpiece 25 is being drilled, as shown in FIG. 7. Arms 74 are provided with depending inclined cam follower edges 87. The slide platform 38 on which the drill 35 and its motor 37 are mounted also carries a pair of cam pegs or rollers 90, mounted on brackets 91. Arms 74 also carry a rectilinear hook 92. Accordingly, when the pusher frame 69 moves from its position shown in FIG. 8 to its position shown in FIG. 9, cam rollers 90 are engaged in the bight of the rectilinear hook 92, thus to guide the push pads 86 on a rectilinear path and insure smooth injection of the dowels 47 into the bores 56.

However, when the drill 35 is used at the beginning of the cycle to drill the bores 56, the carrier 38 advances the cam rollers 90 against the cam follower edges 87, as shown in FIG. 7, thus to pivot the frame 69 about its pivotal connection with the rear cross head 75 and swing the pusher pads 86 out of the path of the drill bits 36. Accordingly, while both the drill bits 36 and pusher pads 86 are disposed to advance on the same path, this is effectuated without interference because of the structure aforesaid in which the pusher frame 69 is swung upwardly when the drill is used.

A modified embodiment of the dowel loader and glue injector is shown in FIG. 12. The dowel carrier 93 is generally similar to dowel carrier 42 of the previous embodiment, but there are a few differences, as will be hereinafter described. The transfer chute 94 which performs the same function as transfer chute 50 in the previous embodiment is also modified somewhat. In this embodiment dowels are fed to the chute 94 from hopper 96 through a pneumatic tube 95. The dowels 47 are loose in the hopper 96 and are metered therefrom by a cog wheel 97 along the inclined bottom wall or slide 98. At the lower end of wall 98 there is a valve plug 99 through which a dowel 47 will physically pass in one position of the valve and which will pressurize the tube 95 from a source of air 100 in another position of the valve, as shown in FIG. 12.

There is also an escapement gate 101 which meters dowels one by one into and through the valve 99. Accordingly, for each shuttle of the dowel carrier 93, the foremost dowel 47 on the slide 98 is fed through the valve 99, and the dowel is then pneumatically propelled through the tube 95, through the transfer chute 94 and into the saddle 104 of the dowel carrier 93. A stop 105 mounted on swing arm 106 overhangs the front of saddle 104 to define the final position of the dowel 47. The saddle has a leaf spring 55 to hold the dowel in its final position. Arm 106 may pivot around pintle 107.

Transfer chute 94 is also provided with a spring 108 which acts as a brake for the dowel 47 as it travels through the chute 94.

The glue nozzle 111 has a valve plunger 112 mounted on a piston 113 of fluid motor 114. Air is supplied fore and aft of the piston 113 through air lines 116, 115 under control of valve 117. Glue is supplied to a chamber 120 in nozzle 111 through hose 123 from a glue reservoir 121 which is under superatmospheric pressure from the air supply at 122.

Accordingly, when the carrier 93 is in a position comparable to that shown in FIG. 8, the valve 117 is actuated to withdraw the valve plunger 112 from its seat, whereupon the pressurized glue in chamber 120 will jet a slug of glue into the bore 56. Subsequently, the valve 117 is actuated to advance the valve plunger 112 against its seat and close the nozzle. The hoses 95, 116, 115, and 123 are flexible to permit shuttle movement of the dowel carrier 93.

Control of the movement of the various parts in the sequence hereinbefore described is effectuated by an electric and fluid circuit which includes conventional limit switches and interlocks. Switch 84 controls the glue injecting apparatus. For the embodiment of FIGS. 4 and 6, it controls actuation of fluid motor 63. For the embodiment of FIG. 12, it controls valve 117. As soon as the pusher frame 69 starts its advance from FIG. 8 position toward FIG. 9 position, switch 84 is actuated to cause injection of glue into the workpiece bore 56. The injection step is terminated prior to the entry of the dowels into the bores 56.

I claim:

1. In a furniture piece fabricating machine having a piece clamping station at which the piece is bored to receive dowels, the improvement for dowel gluing and setting at said station and comprising:

a dowel carrier,

transfer mechanism by which the carrier is transferred between a dowel-loading position remote from said station and a dowel-setting position proximate said station,

a dowel loader at the dowel-loading position of the carrier,

a dowel setter at the dowel-setting position of the carrier,

a glue-injecting nozzle,

and means for injecting glue from said nozzle into the piece bore prior to setting the dowel.

2. In a furniture piece fabricating machine having a piece clamping station at which the piece is bored to receive dowels, the improvement of dowel gluing and setting at said station and comprising a dowel carrier, transfer mechanism by which the carrier is transferred between a dowel-loading position remote from said station and a dowel-setting position proximate said station, a dowel loader at the dowel-loading position of the carrier, and a dowel setter at the dowel-setting position of the carrier, said carrier being provided with a glue-injecting nozzle, a glue source for said nozzle and means for feeding glue to the nozzle when it is at the dowel-setting position of the carrier.

3. The invention of claim 2 in which said carrier has a dowel saddle in which the dowel is axially aligned with the piece bore, said nozzle being offset from the bore axis and inclined obliquely thereto to inject glue into the bore.

4. The invention of claim 2 in which the means for feeding glue includes means for drawing excess glue back into the nozzle after glue has been injected into the bore.

5. In a furniture piece fabricating machine having a piece clamping station at which the piece is bored to receive dowels, the improvement for dowel gluing and setting at said station and comprising a dowel carrier, transfer mechanism by which the carrier is transferred between a dowel-loading position remote from said station and a dowel-setting position proximate said station, a dowel loader at the dowel-loading position of the carrier, and a dowel setter at the dowel-setting position of the carrier, said transfer mechanism comprising a track and means to shuttle said carried on said track between its said positions.

6. The invention of claim 1 in which the dowel loader comprises a dowel transfer chute having a fixed position at the dowel-loading position of the carrier and with which the carrier aligns in its dowel-loading position and means for transferring dowels through the chute and into the carrier.

7. The invention of claim 6 in which the means comprises a pusher for ejecting the dowel axially from the transfer chute into the dowel carrier.

8. The invention of claim 6 in which the means comprises a pneumatic tube for blowing the dowel into the dowel carrier.

9. The invention of claim 1 in which the dowel setter comprises a pusher for pushing the dowel out of the dowel carrier and into the piece bore, said pusher having a fixed position at the dowel-setting position of the carrier.

10. In a furniture piece fabricating machine having a piece clamping station at which the piece is bored to receive dowels, the improvement for dowel gluing and setting at said station and comprising a dowel carrier, transfer mechanism by which the carrier is transferred between a dowel-loading position remote from said station and a dowel-setting position proximate said station, a dowel loader at the dowel-loading position of the carrier, and a dowel setter at the dowel-setting position of the carrier, a drill to bore said piece, said drill being mounted on a carrier by which it is advanced and retracted with respect to the piece, said dowel setter comprising a pusher mounted for advancing and retracting movement on substantially the same path as the drill, and means responsive to drill movement for moving said pusher out of said path when the drill advances.

11. The invention of claim 10 in which the last mentioned means comprises a cam movable with the drill, said pusher having a cam follower coacting with the cam.

12. In a furniture piece fabricating machine having a piece clamping station at which the piece is bored to receive dowels, the improvement for dowel gluing and setting at said station and comprising a dowel carrier, transfer mechanism by which the carrier is transferred between a dowel-loading position remote from said station and a dowel-setting position proximate said station, a dowel loader at the dowel-loading position of the carrier, and a dowel setter at the dowel-setting position of the carrier, in combination with a piece cutoff saw at said station and a drill to bore the piece after it has been cut off.