United States Patent

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[54] **GLUE SPRAY SYSTEM**
3 Claims, 2 Drawing Figs.

[52] **U.S. Cl.** **118/5,** 118/302, 118/603, 239/127
[51] **Int. Cl.** **B05c 11/10**
[50] **Field of Search** 118/302, 5, 602, 603, 610, 325, 326; 239/127, 303

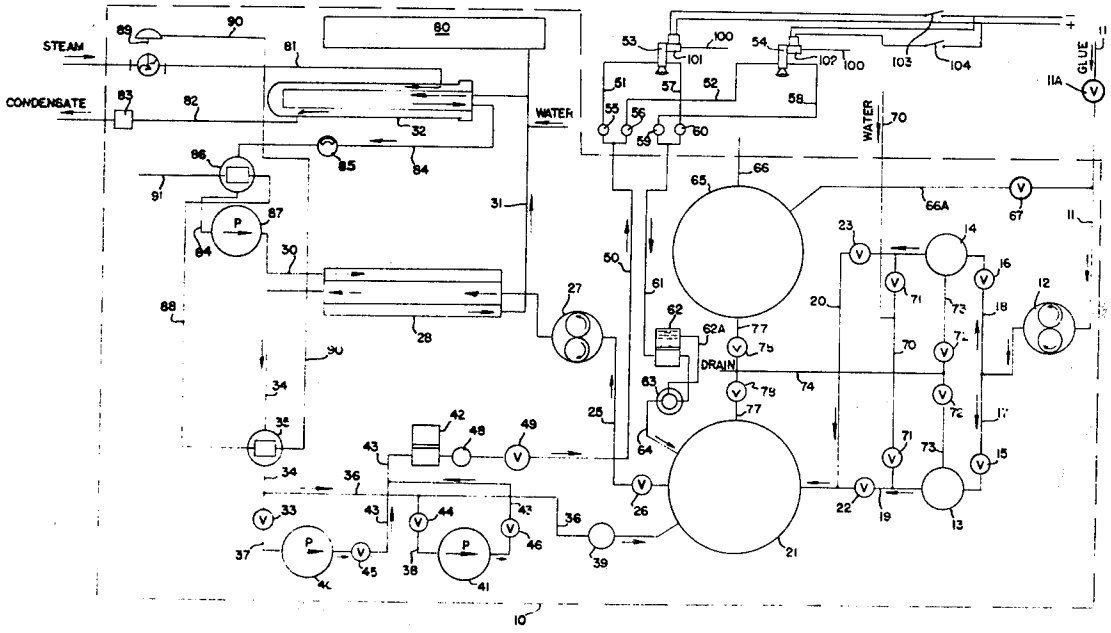
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ABSTRACT: A glue spray system is disclosed providing for the filtering, heating and pressurizing of viscous glue material preparatory to discharge thereof onto a surface. The glue is pressurized to the extent that a shaped discharge flow from a spray nozzle may cover a width of several feet such as, for example, the width or length of a veneer sheet in a plywood layup operation.



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SHEET 1 OF 2

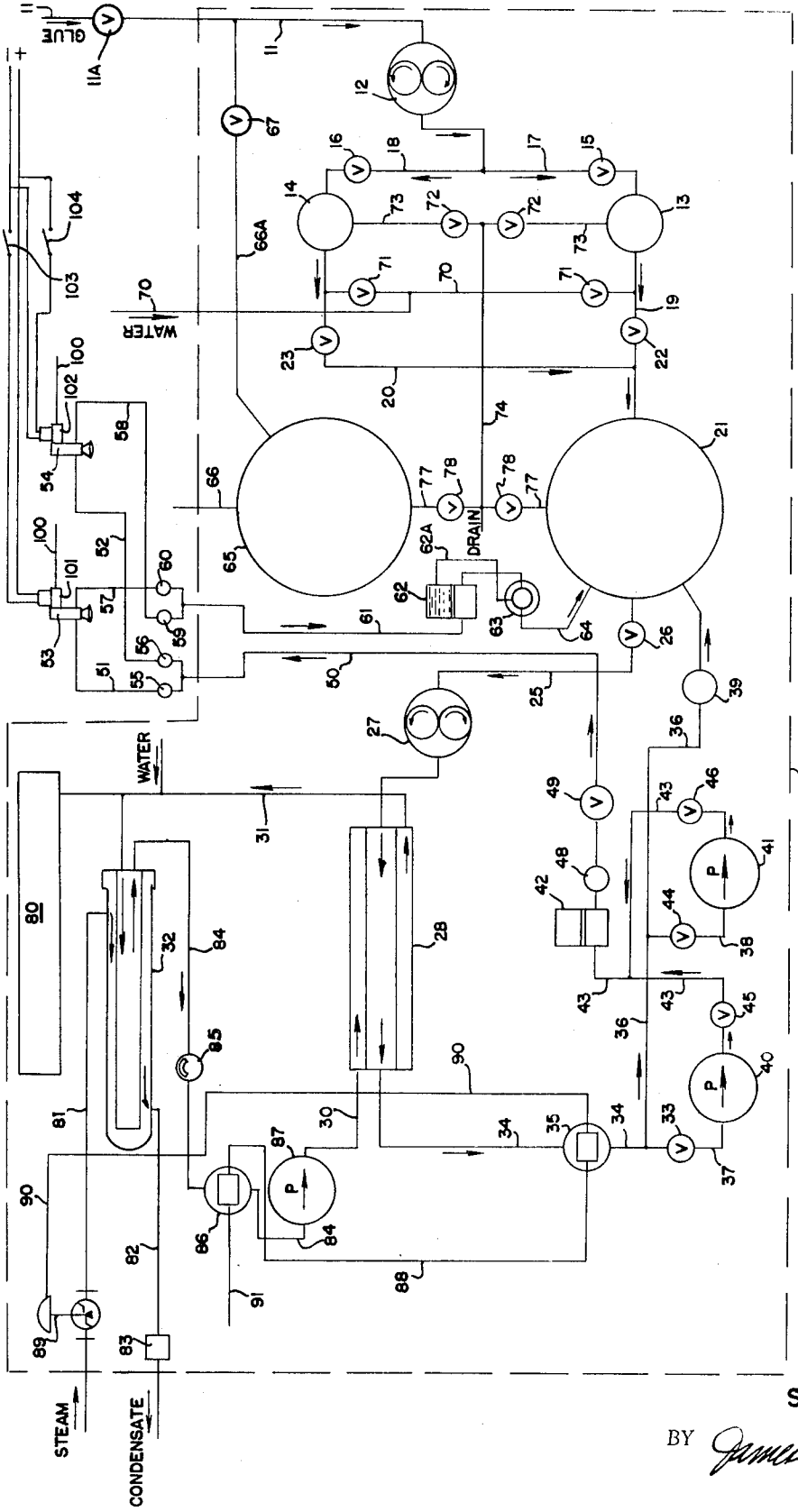


FIG. 1

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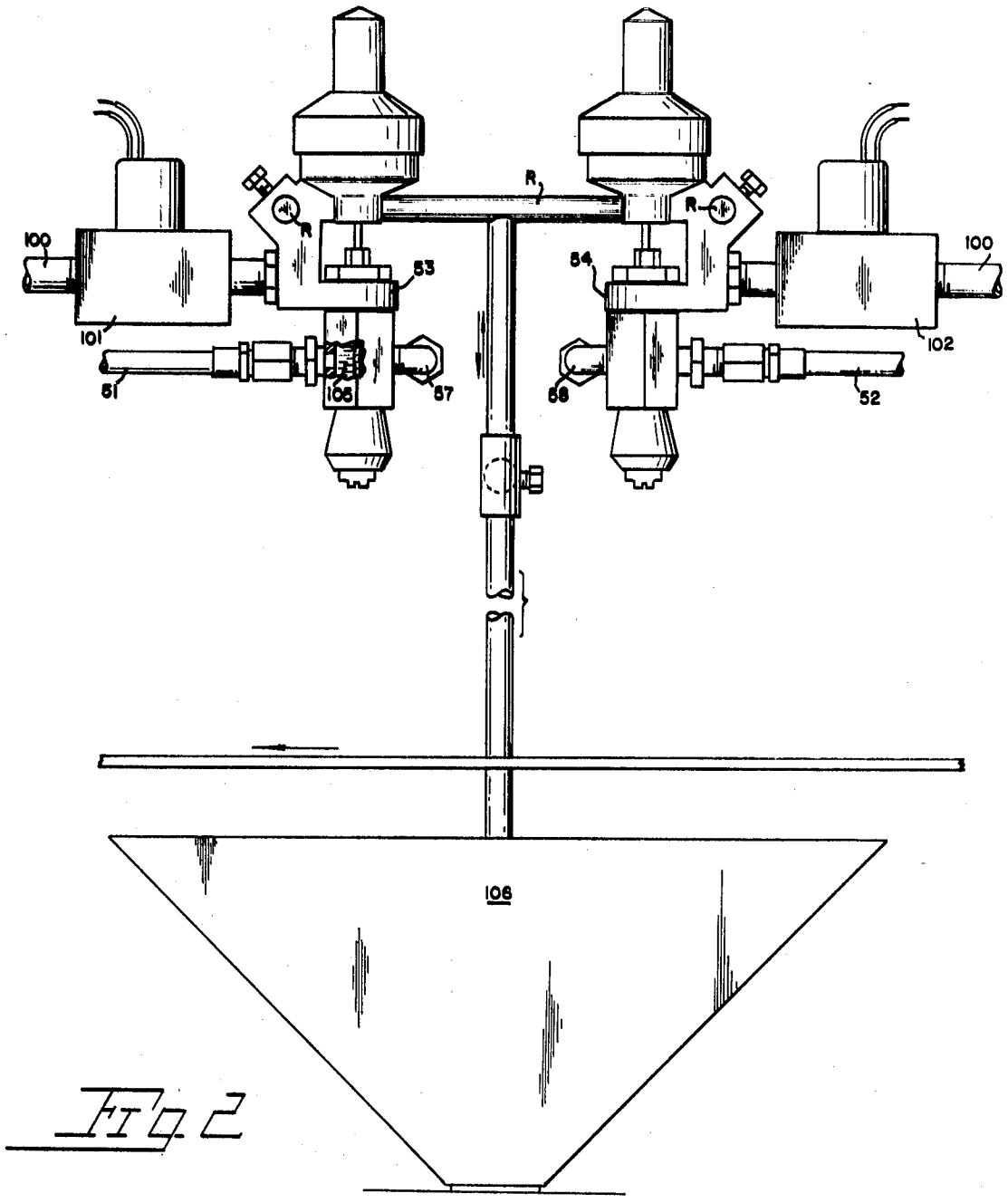


Fig. 2

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GLUE SPRAY SYSTEM

BACKGROUND OF THE INVENTION

The present invention is directed generally toward a spray application system for depositing viscous fluids such as a glue onto sheet material.

Conventional glue-applicating systems generally include mechanical means such as cooperating rollers to coat the veneer sheet material as it passes therebetween. While such systems have been in use for some time they have several drawbacks, some of which may be contributed to by the irregular nature of the surfaces being coated.

In particular, the wood veneer as used in the layup or manufacture of plywood is seldom of a uniform thickness thus making the roller application of glue uneven and subject to high and low spots on the veneer. The glue so applied may range from an excessive amount in the low areas to too little or even voids in the high areas known as "holidays" in the art. A veneer sheet so coated and if incorporated into a plywood sheet will result in a nonacceptable, rejected plywood panel.

A further disadvantage of such roller coating of glue is the physical damage which may occur to the veneer on rough contact with the coating rollers, such damage being in the nature of dislodged wood particles including knots which may become trapped between veneers resulting in the finished plywood panel having other than flat outer surfaces. In a subsequent sanding operation the irregular surface may result in "sand-through" in the outer veneer components, thus depreciating the value of the panel or requiring patching of the panel.

Coating of veneer with rollers involves additional problems in the manual handling of glued sheets and the necessary thorough, time-consuming washing down of equipment.

Some advances in the glue application art have been made toward the application of glue by a spray system utilizing a discharged flow of pressurized air to atomize the glue. While being a clear advance over the roller-coating system there are some substantial disadvantages attendant to it.

As in any kind of a spray system utilizing a discharge flow of pressurized air the sprayed material is having a substantial amount of atomized, or in other words, reduced to very fine particles or droplets which once discharged are quickly subject to random air currents. To remedy this an exhaust booth has been necessary. The present system to be described obviates the problems encountered in attempting to direct an atomized spray by dispensing with the previously used pressurized airflow and instead relying on fluid pressure alone with the glue being dispensed in globule form.

The important advantages of using an airless nozzle are several:

a. A shaped discharge pattern is achieved up to several feet in width permitting a single nozzle to cover the broadest dimension of a veneer sheet. The globular nature of the discharged glue permits directional and velocity characteristics which in turn allows a desired pattern to be sprayed. Use of a single nozzle assures a uniform spray pattern as compared with a bank of nozzles spaced across the width of a veneer sheet with consequent lapping problems.

b. Original and maintenance costs are considerably reduced over the air spray system. Obviously the sizeable air compression system is dispensed with. A single nozzle is adequate and is less susceptible to drying or fouling by reason of no air mixing and having a larger orifice than an air spray system nozzle. This last feature also permits easing of the system's filtering requirements. No exhaust spray booth is necessary.

c. The single-nozzle discharge feature simplifies glue delivery in that no overlapping of sprays is possible, no variables in discharge rate resulting from unlike wear and/or different sized orifices and further the system's operation is simplified by the fact that a fluctuating air pressure factor need not be contended with.

d. Plant cleanup operations which can account for several man hours daily is now reduced to a simple and quick hosing down operation.

e. A substantial savings in glue is realized by reason of only a small amount of glue that misses the veneer sheet being returned into the system as compared to a compressed air atomized system which always incurs some waste by overatomization.

f. The glue in globule form is not subject to surface drying as in the case of overatomized glue particles but rather the moisture is encapsulated until a second veneer sheet is applied.

g. A redundant or backup system is provided and includes a second nozzle easily incorporated into the system to permit instantaneous switch-over without stoppage of the veneer feed line.

SUMMARY OF THE INVENTION

The present invention is embodied within a system for delivering glue under sufficient pressure to discharge same from a nozzle in globular form in a desired pattern. To accomplish this the system includes glue-filtering means, heat exchangers, temperature and pressure actuated components. An airless spray gun is utilized through which a continuous flow of heated glue is circulated. The system further embodies certain dual components such as filters and pumps, each of which is individually functional.

DRAWING DESCRIPTION

In the accompanying drawings:

FIG. 1 is a schematic of the glue spray system,

FIG. 2 is an elevational view of a typical spray area and spray gun assemblies.

DESCRIPTION OF THE PREFERRED EMBODIMENT

With attention to the drawings wherein like numerals indicate like parts and particularly to FIG. 1 thereof, the reference numeral **10** indicates generally a cabinet outline preferably disposed adjacent to the layup area of a plywood-manufacturing plant.

A glue supply is available to the present system through an inlet conduit **11** past an automatically actuated valve **11A**, the glue being customarily mixed in the plant at a glue loft site.

The glue is pumped at **12** under suitable pressure selectively to one of two filtering units **13** and **14** past flow control valves **15** and **16** in each of the branch lines **17** and **18**. The discharge side of the filters is in communication by means of intercepting conduits **19** and **20** with a main glue tank **21**. Additional flow control valves at **22** and **23** may be provided as shown as part of a back-flushing arrangement as later described.

It has been found entirely practical to employ all metal filters of the type which may be cleaned without flow disruption, such filters are commercially available under the trademark "Cuno" by the Cuno Engineering Corporation. Satisfactory results have been achieved by filtering out of the glue foreign particles in excess of twelve-thousandths of an inch. The filtering requirements may vary with the orifice size of the spray tip being used.

The outlet side of the main tank **21** is in communication via a line **25** having a shutoff **26** therein, with the inlet side of a pump **27** which serves to supply filtered glue downstream to a water to glue heat exchanger unit **28**. Pump **27** may, in similarity to the pump **12**, be of gear type. The pump **27** provides a flow of approximately 10 gallons per minute to the unit **28**. It will be apparent that for various glue spray installations it may be desirable to alter upwardly or downwardly pump capacities.

The heat exchanger unit **28** is provided with a flow of heated water through line **30** with a return line **31** being in communication with a steam to water heat exchanger **32** later described in detail as part of a water-heating system.

The heated glue leaving the unit 28 may be within a temperature range of 60° F.—150° F. and is directed by conduit 34 at a point along which is located a first temperature pilot 35 responsive to the glue temperature in line 34. The temperature pilot 35 may be of conventional construction incorporating a settable heat responsive element acting upon a pressurized water or air-operating medium which is in relaying communication with other like temperature sensing pilot controls in the above-mentioned heating system to be described. Such a temperature pilot is commercially available under the Leslie trademark of the Leslie Company. Their structure and operation are well known to those skilled in the art and hence as in other instances in this specification, a detail explanation is believed unnecessary.

The conduit 34, beyond the pilot 35, branches to provide a return line 36 to the main glue tank 21 and two inlet conduits 37 and 38 to the intake side two positive displacement pumps 40—41. The output side of the pumps 40—41 are in selective fluid connection via branched line 43 with a nitrogen charged accumulator 42 for dampening pump pulsations.

Shutoff valves 33 and 44 selectively admit glue into one or the other of pumps 40—41 while shutoff valves at 45 and 46 prevent return flow toward an inoperative pump.

The pumps 40—41 are positive displacement type capable of having independent drives and capable of pressurizing the glue within a satisfactory range of 100—500 p.s.i. In view of the abrasive nature of the glue used, it has been found practical to employ pumps having ceramic components for long life. O One source of suitable pumps 40—41 is that sold under the John Bean Division trade name of the F M C Corporation, the pumps being more specifically identified as high-pressure duplex type. A predetermined inlet pressure approximately 30—50 p.s.i. to the pumps 40—41 is achieved by location of a back pressure regulator 39 in the tank return line 36 which regulator also serves to depressurize the returned glue.

Downstream from accumulator 42 is a pressure gauge 48 and a pressure relief valve 49 to safeguard a spray delivery line 50 which terminates remote from the cabinet in the layup area.

The line 50 preferably terminates in a Y-connection with downstream conduits 51 and 52 for selectively directing glue to spray gun assemblies 53 and 54 through flow control valves 55 and 56, the valves provided for the purpose of shutting off glue flow during servicing of a spray gun. In operation only one spray gun assembly is required, the second being merely a backup or alternate in case of spray gun or tip malfunction. The guns 53 and 54 as shown supported centrally over passing sheet material on a positionable support rod R.

To complete the flow circuit through the spray guns back to main tank 21, return lines 57—58 after passing through flow control valves 59—60 join into a common conduit 61 along which is located a second accumulator 62, preferably of the oil type and a back pressure regulator 63.

The oil side of accumulator 62 is in communication by a line 62A with the regulator 63 which is of the conventional air loaded, diaphragm type and includes a valve stem assembly regulated by the differences in opening pressure in the oil medium transmitted through line 62A and a constant closing pressure acting on the opposite side of the diaphragm. By this arrangement glue returned via line 64 to the main tank 21 is relieved of pump pressure.

A reclaim glue tank is indicated at 65 fed by a line 66 serving to return sprayed glue from a catch basin which is located below the spray guns 53—54 and the panel P being sprayed to receive the glue sprayed past the panel edges and intermediate the sometimes spaced apart ends of successive panels passing through the spray area. The tank 65 may be provided with an automatic glue level sensing and valve device to permit discharge of glue through a conduit 66A, past an automatic shutoff valve 67 to the main inlet conduit 11 to reenter the system previously described. The automatic valves 11A and 67 are controlled by a conventional level-sensing device in the reclaim tank 65. They may be solenoid-actuated valves which will, upon the glue level reaching a selected height, stop the incoming loft-originating flow by closing of valve 11A and by simultaneous opening of valve 67 admit the reclaimed glue into line 11, via line 66A.

Of practical importance to the present glue spray system is the back-flushing system provided to permit quick and thorough cleaning after or during spray system operation. A source of water at tap pressure in branched line 70 to manually operated shutoff valves 71. Prior to opening valves 71 the glue valves 15—16 and 22—23 are closed. Opening of a second pair of valves 72 along with valves 71 allows a water flow in a reverse direction through filters 13—14, through water lines 73 into a common drain line 74. A single filter may be back-flushed during operation of the system by opening one each of the pairs of valves 71 and 72 while shutting the glue valves immediately upstream and downstream from the filter being cleaned.

Each tank 21 and 65 has a water drain line at 77 with shutoff valves 78 for draining of the tanks after they have been cleaned.

The previously mentioned water-heating system includes heat exchangers 28 and 32 and temperature pilot 35 previously described. A source of water is provided to the heating system at the water line 31 for flow into heat exchanger 32 along with recirculated water. A water expansion tank is indicated at 80.

The heat exchanger 32 receives a valve controlled flow of steam via pipe 81 which steam is discharged in condensed form through a pipe 82 having a trap 83 therein. The water heated by the steam in exchanger 32 is directed to the other or glue heat exchanger 28 via conduit 84, past a temperature gauge 85, a second temperature pilot 86 and a water-circulating pump 87.

The temperature pilot 35, as previously described, is in operative communication with the temperature pilot 86 both of which may be generally of the same type and have as their objective the regulation of glue temperature within a 60° F.—150° F. range prior to entering pump 40 or 41. Each of the pilots 35 and 86 includes a temperature sensitive tube responsive to glue and water temperatures respectively. Said tubes each actuate an integral, double-acting relay unit which relays are in series communication with one another via line 88, and with a steam flow control valve 89 of the diaphragm type by a line 90.

In the present arrangement the operating medium, air or liquid, is directed to the relay unit of pilot 86 by means of a conduit 91 which may be from the plant's compressed air system through a reducing valve (not shown) effecting approximately 20—22 p.s.i. In a typical installation the set point of the pilot 86 may be approximately 150° F. below which point its relay will open to direct the 20—22 p.s.i. air-operating pressure to the relay unit of temperature pilot 35. Assuming for purposes of explanation the glue passing the pilot 35 is below the selected set point for that pilot, the relay unit of pilot 35 will open to put the relay-operating medium into communication, through line 90, with the steam flow control valve 89 to increase the steam flow to heat exchanger 32 through pipe 81. Depending upon which relays maximum set point is reached first one of the relay units will close with the trapped air pressure between the unit and the control valve 89 being bled off by the airless relay unit.

The spray gun assemblies at 53—54 may be of conventional type manufactured by the Gray Company and further described as an automatic, circulating type permitting a flow of pressurized glue to be circulated through the fluid chamber 105 of the gun. The flow of glue from the chamber to the spray tip for discharge is controlled by a valve actuated by an air piston, all housed within the spray gun assembly. Air, under pressure is utilized only as an operating medium for each gun assembly and does not mix with the glue being sprayed. For operative remote control of the spray a source of air pressure in lines 100 is in communication with the spray gun through solenoid operated valves 101 and 102, each in turn being

separately actuated by control switches **103** and **104**. Accordingly, a circuit from an electrical source may be closed through one or the other solenoids **101** to individually put in operation one or the other spray gun assemblies **53—54** as the spray operator may desire.

The gun assemblies each utilize a spray tip having an oblong orifice therein the longest dimension of which is transversely orientated to the path of the veneer panels to vertically discharge a triangularly shaped spray pattern with the widest part of the pattern extending transversely across and beyond the passing sheet material. In a typical spray system installation of the present invention the spray gun assemblies will be mounted in juxtaposed relationship 8 feet or so above the panels path of travel and catch basin **106**. It will be realized that the shape and size of the orifice as well as the gun height may all be easily varied to suit the particular job at hand.

While I have shown but a single form of the invention, it is to be understood that the scope of the present invention is not limited to the embodiment shown and described but rather, includes all the modified forms thereof rightfully coming under the invention as claimed.

I claim:

1. A glue spray system for depositing glue in globular form onto successive sheets of material conveyed along a horizontal path, said system comprising in combination,

glue-filtering means in communication with a source of glue,

glue-pumping means in communication with said filtering means for pumping glue having a temperature range of 60° F. to 150° F. to pressurize same for subsequent sprayed discharge onto said sheet material,

globular spray discharge means in communication with said pumping and filtering means to receive and discharge the pressurized glue in globular form in a vertical spray pattern perpendicularly to the passing sheet material,

said discharge means including a glue-receiving head fixedly disposed above the centerline of said passing sheet material and having glue inlet and outlet means and defining a glue-receiving chamber occupied by a transient flow of glue, a glue discharge tip in said discharge means having an oblong glue orifice transversely orientated to the path of the sheet material for shaping the glue discharged into globules to effect uniform globule deposit across said passing sheet material, and

said glue filtering and pumping means including independently operable filtering and pumping components enabling glue spray system operation with one of said components each of the filtering and pumping means inoperative.

2. A glue spray system as claimed in claim **1** wherein said filtering means includes at least a pair of independent filtering units and valve means associated therewith for selectively directing a flow of glue through one of said filters and isolating the other filter, a back-flushing system for said filters including a source of back-flushing liquid and valve means for selectively directing the liquid through said other filter for back-flushing during operation of the glue spray system.

3. A glue spray system for depositing glue in globular form onto successive sheets of material conveyed along a horizontal path, said system comprising in combination, heating means for the glue for heating same to within a temperature range of 60° F. to 150° F. preparatory to pumping with said heating means including both a steam to water heat exchanger and a water to glue heat exchanger, a steam flow control valve in communication with and regulating the supply of steam to the first mentioned heat exchanger, a first temperature responsive pilot valve responsive to the temperature of the discharged water of said first mentioned heat exchanger, a second temperature responsive pilot valve responsive to the temperature of discharged glue from the second mentioned heat exchanger, said first and second pilot valves operative in series communication with said steam flow control valve,

glue-pumping means to pressurize the heated glue for subsequent sprayed discharge onto said sheet material,

globular spray discharge means in communication with said pumping means to receive and discharge the heated pressurized glue in globular form in a vertical spray pattern perpendicularly to the passing sheet material, and

said discharge means including a glue-receiving head fixedly disposed above the centerline of said passing sheet material and having glue inlet and outlet means and a glue-receiving chamber occupied by a transient flow of glue, a glue discharge tip in said discharge means defining an oblong glue orifice transversely orientated to the path of the sheet material, said tip shaping the glue discharged into globules to effect uniform globule deposit across said passing sheet material.