

Jan. 22, 1963

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3,074,374

VARNISH POURING MACHINE

Filed March 20, 1959

6 Sheets-Sheet 1

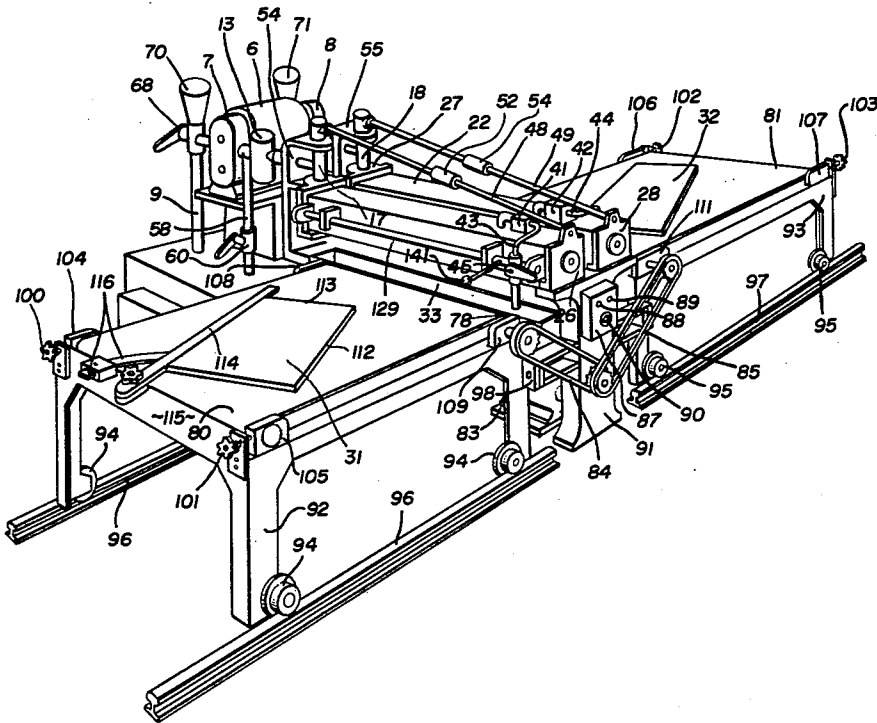


Fig. 1

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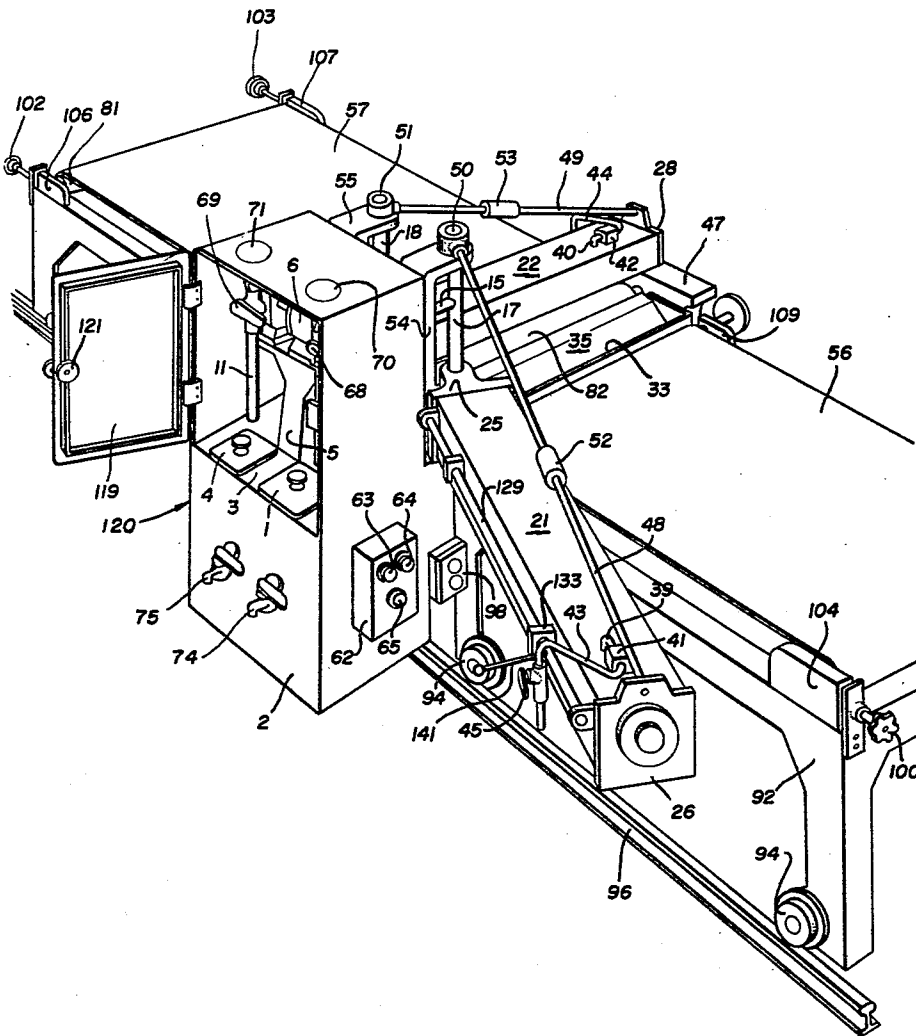


Fig. 3

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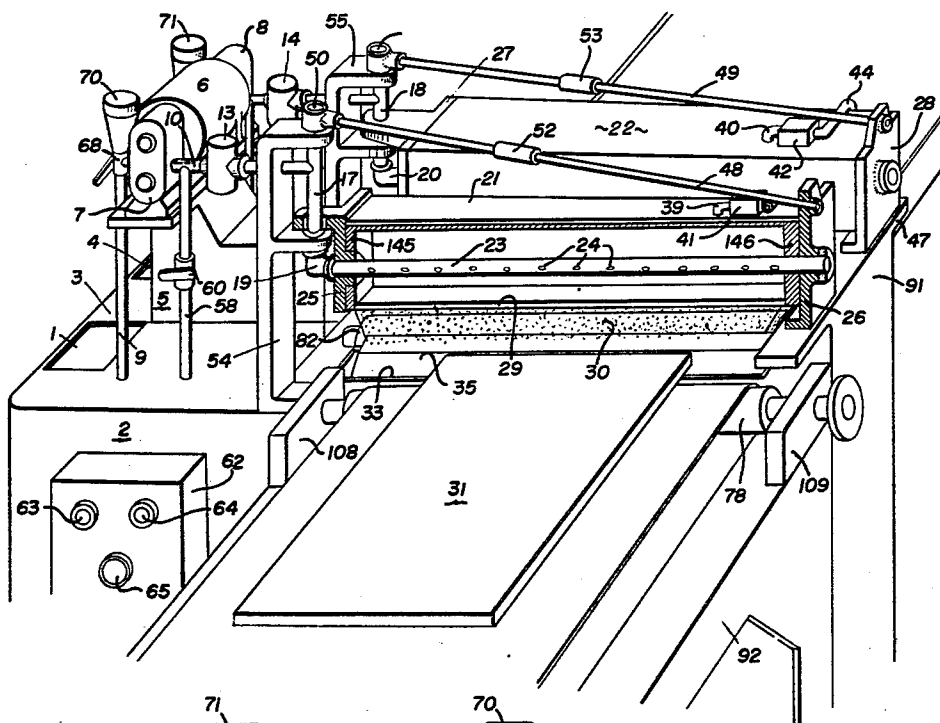


Fig. 4

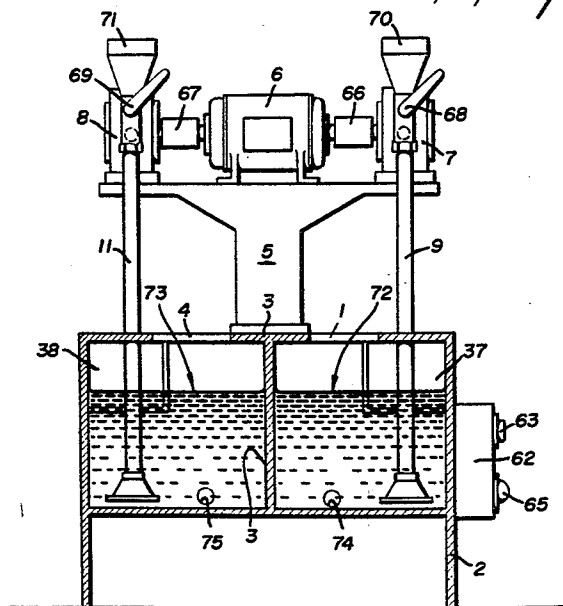


Fig. 8

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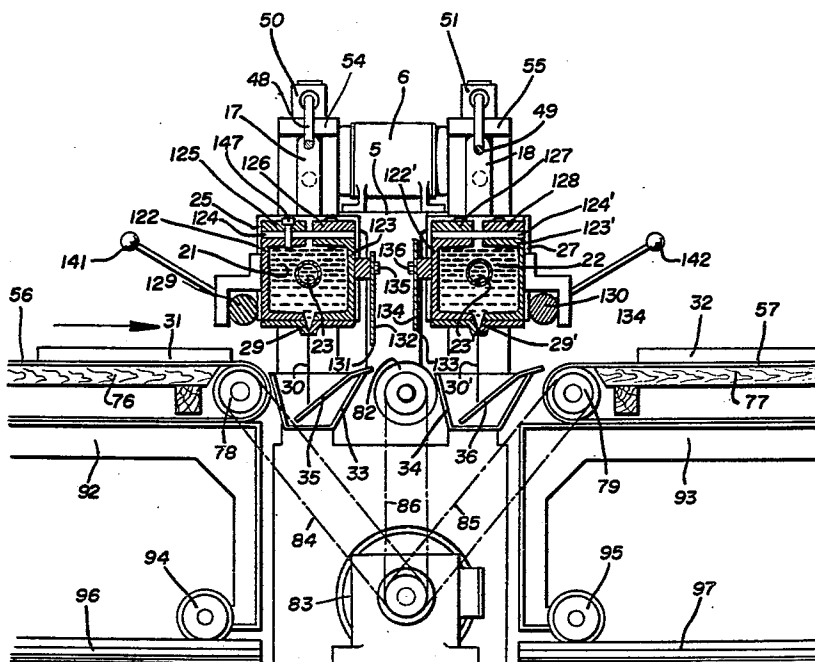


Fig. 5

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VARNISH POURING MACHINE

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Fig. 6

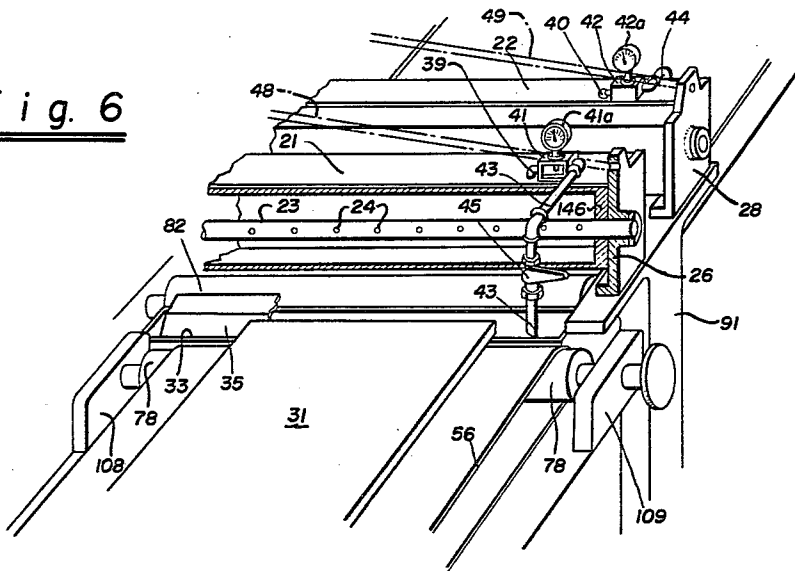
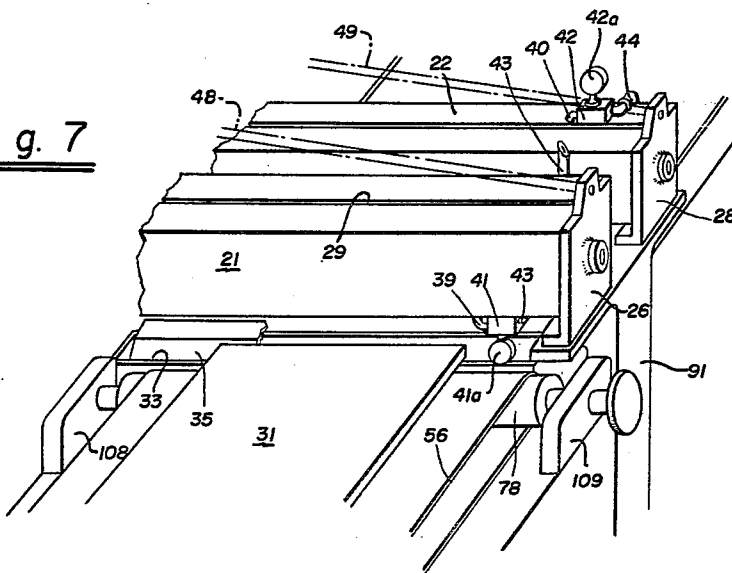


Fig. 7



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VARNISH POURING MACHINE

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6 Claims. (Cl. 118—324)

The present invention relates to varnishing machines of the type wherein the article to be varnished is conveyed through a sheet or curtain of varnish that is produced by pouring the varnish from a pouring head provided with a narrow elongated nozzle. More particularly, the present invention relates to varnish pouring machines, of the type referred to, which employ a continuous varnish circuit which includes a pump, a pouring head and a varnish collecting trough. Machines of this type are disclosed in German Patents 156,267 and 281,994 of 1904 and 1905, respectively, and more recently on page 4 of the publication "Industrie-Lackierbetrieb" of October 1951, published by Curt R. Vincentz of Hannover, Germany.

The known machines have fallen short of complete success. They failed to produce continuous coatings of uniform thickness on the articles to be coated for a variety of different reasons.

I have found that in order to produce uniform and continuous coatings with machines, of the type referred to, it is necessary to free the varnish of all air inclusions and prevent entrainment of air during the varnishing process. For obtaining satisfactory results with varnish pouring machines of the type referred to, I have also found it to be essential to provide adequate possibilities, in the construction of the machine, for cleaning and supervising the sensitive elements in the varnish circuit.

It is an object of my invention to provide a varnish pouring machine, of the type referred to, which produces continuous coatings of uniform thickness under the most varied conditions of operation.

More specifically, it is an object of my invention to provide a varnish pouring machine having a continuous varnish circuit wherein air inclusions are removed from the varnish and the danger of forming new air inclusions in the varnish during the pouring and recirculation process is eliminated, or at least substantially minimized.

Furthermore, it is an object of my invention to provide a varnish pouring machine, of the type referred to, which is of such construction that the components of its varnish circuit are readily accessible for supervision and cleaning.

It is yet another object of my invention to provide a continuous-circuit-varnish-pouring machine, of the type referred to, which is of such construction that the last portion of the varnish in the circuit may be utilized without impairment of the quality of the coating produced in the last phase of its operation.

In accordance with the invention, I provide the pouring head with an escape line for air accumulated therein, or occluded in the varnish itself, and for excess of varnish delivered thereto. In addition I provide baffle plates adjacent the varnish curtain produced by the machine to minimize, or completely eliminate, the disturbing effects that external air currents may have upon the varnish curtain. Moreover, I provide above the varnish collecting trough, into which the unused portions of the varnish are gathered, oblique ramps to prevent splashing by conducting the unused varnish gradually from a vertical into a horizontal direction of movement. In this manner, entrainment of air in the unused varnish that is returned into the varnish circuit, is greatly reduced, if not entirely eliminated.

In accordance with the invention I also construct the pouring heads of the machine in such a manner that the

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width of the pouring nozzles may be adjusted so as to adapt the machine to varnish compositions of different consistencies and/or to adjust the thickness of the varnish coatings produced upon the work pieces by operation of the machine. In this connection I also provide an adjustable bypass line from the varnish delivery conduit of the supply pump or pumps so as to control the pressure that builds up in the pouring head under the action of the delivery pump and adapt it to different widths of the pouring nozzle and different consistencies of the varnish composition employed.

To make it possible to keep the component parts of the varnish circuit and especially the components of the pouring heads thoroughly clean, I construct the pouring head of my machine in such a manner that it may be rotated about a horizontal axis until its pouring nozzle faces upwardly. Also I mount the pouring head in such a manner that it may be swung in a horizontal plane away from the conveying means that passes the work pieces through the varnish curtain of the machine. Moreover, I construct the conveying means for the work pieces in such a manner that it may readily be removed from the machine parts that establish the varnish circuit and the varnish curtain. Hence, all the critical parts of the machine are easily accessible for cleaning.

Finally I arrange the varnish delivery pump above the pouring head so that any supply of varnish left in the pump and in the varnish delivery line, when operation of the pump comes to a halt upon exhaustion of the varnish supply in the reservoir, will be delivered to the pouring head under force of gravity. In this manner the varnish supply in the machine may be effectively employed until it is completely exhausted.

The above stated objects and other objects of my invention will be apparent from the following description of the accompanying drawings which illustrate a preferred embodiment of my invention and wherein

FIGURE 1 is a perspective of a varnish pouring machine embodying my invention, viewed from one side of its feed end;

FIGURE 2 is a fragmentary perspective of the machine viewed from a point at the other side of its feed end;

FIGURE 3 is a fragmentary perspective of the machine, similar to FIGURE 2, with certain parts thereof in a different position;

FIGURE 4 is a close-up perspective of the central portion of the machine, partly in section, showing details of the pouring head assembly;

FIGURE 5 is a longitudinal vertical section through the central portion of the machine;

FIGURES 6 and 7 are close-up perspectives of the central portion of the machine, similar to FIGURE 4; and

FIGURE 8 is a vertical longitudinal section through the center portion of the machine showing details not discernible in FIGURE 5.

The varnish pouring machine illustrated in the accompanying drawing has a varnish tank or reservoir 2 which may be divided into two separate compartments 72 and 73 by a central partition 3 (FIGURE 8), each having a separate supply opening identified by the numerals 1 and 4, respectively, (FIGURES 2 and 3), so that the machine can be supplied with two different kinds of varnish components, such as nitrocellulose lacquer and lake. Each compartment may be provided with a discharge faucet 74 and 75, respectively, by means of which its contents can be emptied, if desired.

Mounted upon the tank 2 is a bracket 5 (FIGURE 2) upon which two pumps 7 and 8 are supported at an elevated level. Said pumps may be of conventional design and both may be driven from a common motor 6

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(FIGURE 8) that is mounted upon the bracket 5 immediately of said pumps and which may selectively be connected to either or both said pumps by means of sliding clutches 66 and 67. Operation of the motor may be regulated from a control panel 62 that is secured to a side wall of the reservoir 2 and which has a push button 63 for energizing the motor, a push button 64 for de-energizing the motor, and a control lamp 65 for visually indicating whether the motor is in operation or not. The pump 7 draws varnish from the reservoir through the suction pipe 9 and delivers it through a pipe 10, a varnish filter 13 and a pipe 15 into a hollow vertically disposed pivot column 17 at a point in the upper half thereof. Said column is held in an E-shaped bracket 54 which is likewise mounted upon the tank 2, as best shown in FIGURES 2 and 4. Similarly the pump 3 draws varnish from the left compartment of the reservoir 2 through a suction pipe 11 and passes it through a pipe 12, a varnish filter 14 and a pipe 16 into a vertically disposed hollow column 18 which is held in another E-shaped bracket 55 that is mounted upon the tank 2 adjacent the bracket 54. The upper ends of the suction pipes 9 and 11 are provided with funnels 70 and 71 which are controlled by venting valves 68 and 69, respectively. From the bottom of the columns 54 and 55 the varnish is directed through elbow joints 19 and 20 into horizontally disposed distributing pipes 23 and 23' which are provided with discharge openings 24 and form part of two pouring heads 21 and 22, respectively (FIGURE 4).

Each of the pouring heads is formed by an elongated box or casing of substantially square cross section that is supported from its respective pivot column 17 or 18, as the case may be, for rotation thereabout and which surrounds its distributing pipe 23 and 23'; and each is composed of two portions in the form of C-shaped channels 122, 123, and 122', 123' respectively, that are connected at their upper ends by an elastic hinge strip 124 and 124'. Said hinge strips are held to the upper faces of their respective channel portions by pressure plates 125, 126 and 127, 128 respectively (FIGURE 5) that are bolted to the upper flanges of the channels 122, 123 and 122', 123'.

Along their lower ends the channels 122, 123 and 122', 123' form elongated narrow varnish-pouring nozzles 29 and 29' respectively. The position of the inner channels 123 and 122' is stationary, but the position of the outer channels 122 and 123' of the pouring heads may be adjusted by rotation of eccentric shafts 129 and 130, respectively, which are mounted at either side of the pouring heads and bearing against the inside of actuating lips that are secured to the side walls of said channels 122 and 123', as shown in FIGURE 5. By turning the shafts 129 and 130 with the aid of manipulating levers 141 and 142, respectively, the transverse width of the pouring nozzles 29 and 29' may be adjusted.

The end walls 145 and 146 (FIGURES 4 and 6) of the pouring heads are rotatably mounted upon the distributing pipes 23 and 23' and the smoothly finished outer surfaces of said end walls bear against end plates 25, 26 and 27, 28 respectively that have smoothly finished inner surfaces and which are supported from adjacent parts of the machine frame. By means of this arrangement the boxes formed by the C-shaped channels 122, 123 and 122', 123' may be turned manually about the distributing pipes 23 and 23', respectively, until the nozzles 29 and 29' point upwardly, as illustrated in FIGURE 7. In this position they are readily accessible for inspection, cleaning and adjustment.

From the elongated nozzles 29 and 29' varnish delivered into the casings 122, 123 and 122', 123' by the action of the pumps 7 and 8, issues downwardly in the form of a sheet or curtain, as indicated at 30 and 30' in FIGURES 4 and 5, and if not intercepted by, and retained on work pieces, such as shown at 31 and 32 in

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FIGURES 2, 4 and 7, it is collected in troughs 33 and 34 which are best visible in FIGURE 5.

To avoid splashing and undue agitation of the varnish as it descends into the troughs 33 and 34, and in this manner inhibit the formation of air inclusions in the varnish circuit, the troughs are provided with inclined plates 35 and 36, respectively, that act as varnish receiving ramps in that they guide the descending sheets of varnish gradually into a horizontal plane (FIGURE 5). From the troughs 33 and 34 the unused varnish returns over inclined passages 37 and 38, respectively, to the two compartments (FIGURES 3 and 8) of the tank or reservoir 2, from where it is again delivered to the pouring heads 21 and 22 by the action of pumps 6 and 7 respectively.

Reverting to the pouring heads 21 and 22, each of them is provided at its upper end with an outlet pipe 39 and 40, respectively, and during operation of the machine varnish from the pouring heads may rise through said pipes and enter inspecting chambers 41 and 42 respectively, which may be provided with temperature-reading devices, as indicated at 41a and 42a in FIGURES 6 and 7. From the chambers 41 and 42 the varnish may flow into the troughs 33 and 34 through overflow conduits 43 and 44 provided with control valves 45. Through the windows of the inspection chambers the physical condition of the varnish may be inspected and through the outlet pipes 39, 40, the chambers 41, 42 and the overflow pipes 43, 44 air which tends to collect in the upper regions of the pouring heads is allowed to escape so that it cannot be entrained in the varnish and impair the efficiency of the varnish curtains that are formed by the pouring nozzles 29 and 29'. Hence, the varnish actually applied to the work pieces passing underneath the pouring heads is free from air and will form an uninterrupted continuous coat or film over the work pieces.

As previously pointed out, the pouring heads are supported from the brackets 54 and 55 for rotation about the pivot columns 17 and 18, respectively, so that they may be swung out of their operative position along a horizontal plane (FIGURE 3) to facilitate cleaning of their component parts and adjustment of the nozzle width. To impart stability to the pouring heads, when in operative position, their end plates 26 and 28 respectively, are supported upon a pedestal 47 formed at the upper end of a standard 91; in addition said end plates 26 and 28 are detachably suspended from the upper ends of the pivot columns by ties 48 and 49, which may be appropriately tensioned by means of turn buckles 52 and 53.

To control the quantity of varnish delivered to the pouring heads and the pressure that builds up in the pouring heads under the action of the pumps 7 and 8, and to adjust said pressure to the consistency of the particular varnish used and/or to the particular width of the pouring nozzle whenever said width is set to establish a varnish curtain of desired thickness, the pressure line of the pumps is provided with a by-pass line 58 and 59, respectively, that may return a larger or smaller part of the output of said pumps directly to the reservoir 2, depending upon the setting of control valves 60, as illustrated in FIGURE 2.

Two endless conveyor belts 56 and 57 (FIGURE 1) arranged in tandem relation, and a power-driven roller 82 located between the adjacent ends of said conveyor belts at a point immediately of the varnish collecting troughs 33 and 34 (FIGURE 5), serve to convey articles to be varnished to and through the varnish curtains established by the nozzles 29 and 29'. The conveyor belt is trained around an idler roller 80 and a drive roller 78 and its upper run is supported by a base plate 76. The drive roller 78 is journaled in bearing blocks 108 and 109 that are firmly mounted upon a table 91 ad-

adjacent the inner end thereof, and the idler roller 80 is journaled in bearing blocks 104 and 105 that are mounted for longitudinally sliding movement upon the outer end of the table 91 and which are provided with set screws 100 and 101, respectively, by means of which their position longitudinally of the table 91 may be adjusted to impart the proper tension to the endless conveyor belt 56. Similarly the conveyor belt 57 has its upper run supported by a base plate 77 and is trained around a drive roller 79 which is journaled in stationary bearings 110 and 111 mounted upon the inner end of a table 93, and an idler roller 81 that is journaled in bearings 106 and 107 which are mounted upon the opposite end of the table for longitudinally sliding movement thereon and which are provided with set screws 102 and 103, respectively, for tensioning the belt 57. All the drive rollers, i.e. rollers 78, 79 and 82 may be driven from a common motor 83 by suitable pulley and belt connections, such as indicated at 84, 85 and 86 in FIGURES 1 and 5, and the operation of the motor may be regulated from a control panel 87 that is secured to the front surface of the hereinbefore mentioned standard 91 and which comprises a push button 88 for energizing the motor, a push button 89 for de-energizing the motor, and a control lamp 90 for visually indicating whether the motor is in operation or not.

The tables 92 and 93 upon which the conveyors 56 and 57 are mounted, are mobile tables, they are each provided with a set of wheels 94 and 95, respectively, which run on rails 96 and 97, as shown in FIGURES 1, 2 and 3; and near their inner ends the tables are provided with ears 98 (FIGURES 1 and 3) through which they may be bolted to the tank 2 and the standard 91 respectively, so as to hold them firmly in their proper operating positions. To provide easy access to the pouring heads for cleaning or adjustment, the tables 92 and 93 with the conveyors supported thereon, may readily be withdrawn from the center portion of the machine which establishes the varnish circuit of the invention. It is merely necessary to release the belt connections 84 and 85, detach the ears 98 and 99, and roll the tables 92 and 93 on the rails 94 and 95 away from the center structure of the machine.

In order to varnish the outer edges of the work pieces, it may be necessary to pass them in an oblique position through the machine. The critical point in this case is the angle at which the work pieces are placed upon the conveyor belt. To establish the correct angle, a guide bar 114 may be pivotally supported at the feed end 115 of the machine for movement in a horizontal plane above the upper run of the conveyor belt 56. Said guide bar may be provided with a curved angle indicator 116 so that its position may readily be adjusted to any desired angle, and means may be provided to fix it temporarily in any position of adjustment.

I have found that it is of great importance for obtaining a continuous and even varnish coating to protect the varnish curtain from the effects of air currents. This is particularly true in cases where the work pieces are delivered to, and passed through, the varnish curtain at considerable speed. Furthermore, it is only when the curtain retains its vertical position, that it will strike the ramp plates 35 and 36 in the collecting vessels 33 and 34, respectively, without entraining air bubbles into the varnish circuit. I therefore provide adjacent the pouring heads 21 and 22 of the machine, transverse baffle plates 132 and 134 (FIGURE 5) which are coextensive in width with the varnish curtains and which are preferably of a vertical disposition. These baffle plates inhibit effectively air motion such as may be caused by the movement of the work piece and/or conveyor belts. I believe that these baffle plates establish between themselves and the varnish curtains air cushions which cannot partake in the air motion produced by the advancing work pieces and the conveyor belts. I have found it advantageous to place the lower

edges of these baffle plates only slightly higher than the highest point of the work piece and I prefer to dispose these baffle plates vertically as illustrated in FIGURE 5. It is, however, possible to present their lower edges obliquely to the wind direction in such a manner that the air motion produced by the work piece and the conveyor belts is harmlessly deflected from the direction of movement of the work piece.

As shown in FIGURE 5 the baffle plates 132 and 134 are supported laterally from the inner segments of the pouring heads 21 and 22, respectively, and to adjust the level of their lower edges, set screws are provided, as indicated at 135 and 136 respectively.

For protection against soiling, the center portion of the machine, i.e. the pumps 7 and 8 and their accessories may be encased in a housing 120. Access to the mechanisms within the housing is afforded by a door 119 that is hingedly connected to the housing as shown in FIGURE 3 and which is provided with a suitable bolt 121.

While I have explained my invention with the aid of certain preferred embodiments thereof, it will be understood that the invention is not limited to the specific constructional details shown and described which may be departed from without departing from the scope and spirit of my invention.

I claim:

1. In a varnishing machine of the type described a pouring head comprising a horizontally disposed apertured varnish distributing pipe, a pair of members arranged to form an outer casing around said distributing pipe, a hinge strip hingedly connecting the upper ends of said members so that their lower ends are movable relative to each other to form an elongated discharge slot of adjustable width, and means operable to adjust the width of said slot.

2. In a varnish pouring machine of the type described a pouring head comprising a horizontally disposed, apertured varnish distributing pipe, a pair of members arranged to form an outer casing around said distributing pipe, a hinge strip, connecting the upper ends of said cover members so that their lower ends form an elongated discharge slot of adjustable width, an escape line provided in the upper end of said casing to permit air and surplus varnish to escape from said pouring head, and manually adjustable flow control means for said escape line.

3. A varnish pouring machine comprising means for conveying a work piece along a predetermined rectilinear and substantially horizontal path, a varnish pouring head having an ordinarily downwardly directed horizontally disposed elongated nozzle adapted to form a varnish curtain, means mounting said varnish pouring head for rotation in a horizontal plane about a vertical axis from an operative position wherein said nozzle extends transversely above and across the path of advance of the work piece to an idle position where said nozzle extends adjacent and along said path.

4. A varnish pouring machine comprising a varnish pouring head having an elongated nozzle adapted to form a varnish curtain, means for conveying a work piece along a predetermined path, means for mounting said conveying means for rectilinear movement from an operative position underneath the nozzle wherein it carries a work piece through the varnish curtain to a position removed from said pouring head so as to render said pouring head readily accessible for inspection, cleaning and adjustment, and means for securing said conveying means in its operative position.

5. A varnish pouring machine according to claim 4, wherein said mounting means include a table, rollers on said table and guide rails engaged by said rollers.

6. A varnish pouring machine comprising a varnish reservoir, a varnish pouring head having an elongated nozzle adapted to form a varnish curtain, a pump operable

to deliver varnish from said reservoir to said pouring head, means arranged below said pouring head for receiving unused portions of the varnish curtain and returning them to said reservoir, means for conveying a work piece along a predetermined path, and means for mounting said conveying means for rectilinear movement from an operative position wherein it carries a work piece through the varnish curtain below said varnish pouring nozzle and above said varnish collecting means to a position removed from said pouring head and said varnish receiving means so as to render said pouring head readily accessible for inspection, cleaning and adjustment, said mounting means including a table, rollers on said table and guide rails engaged by said rollers.

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