June 21, 1938. H. J. PAYNTER 2,121,045

VISCOSITY CONTROL

Filed March 28, 1935 2 Sheets-Sheet 1

Fig. 1

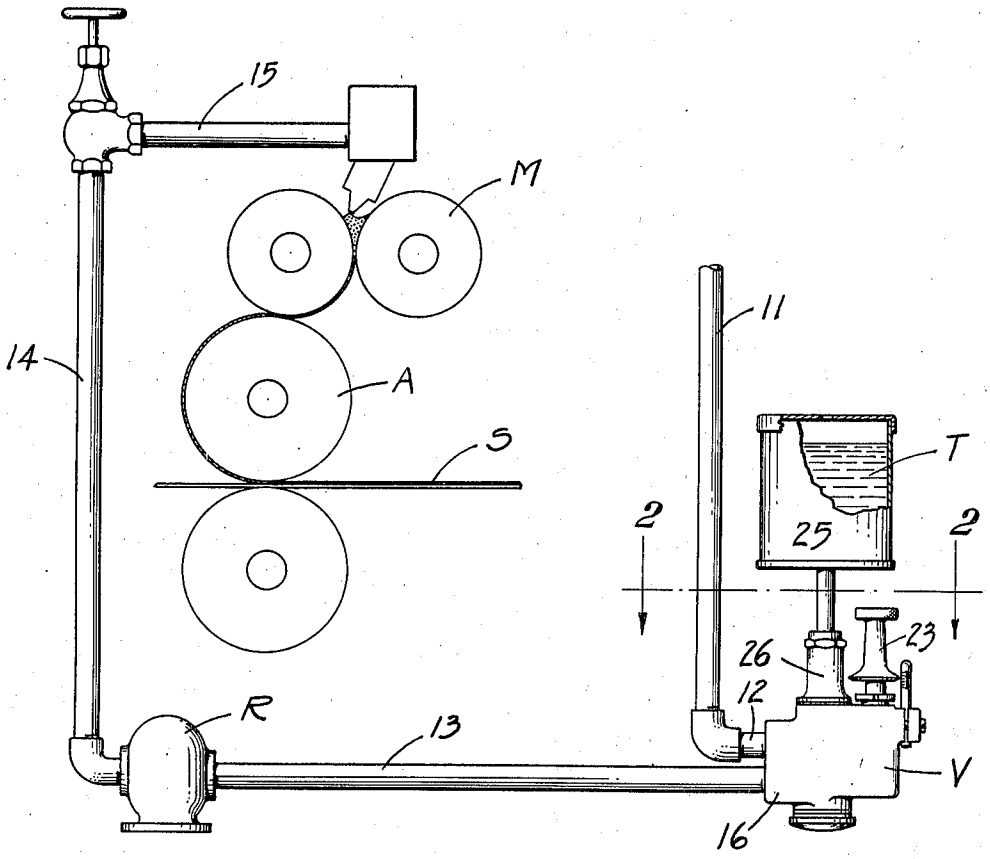
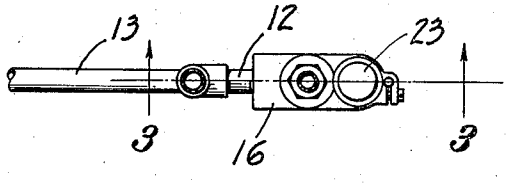


Fig. 2



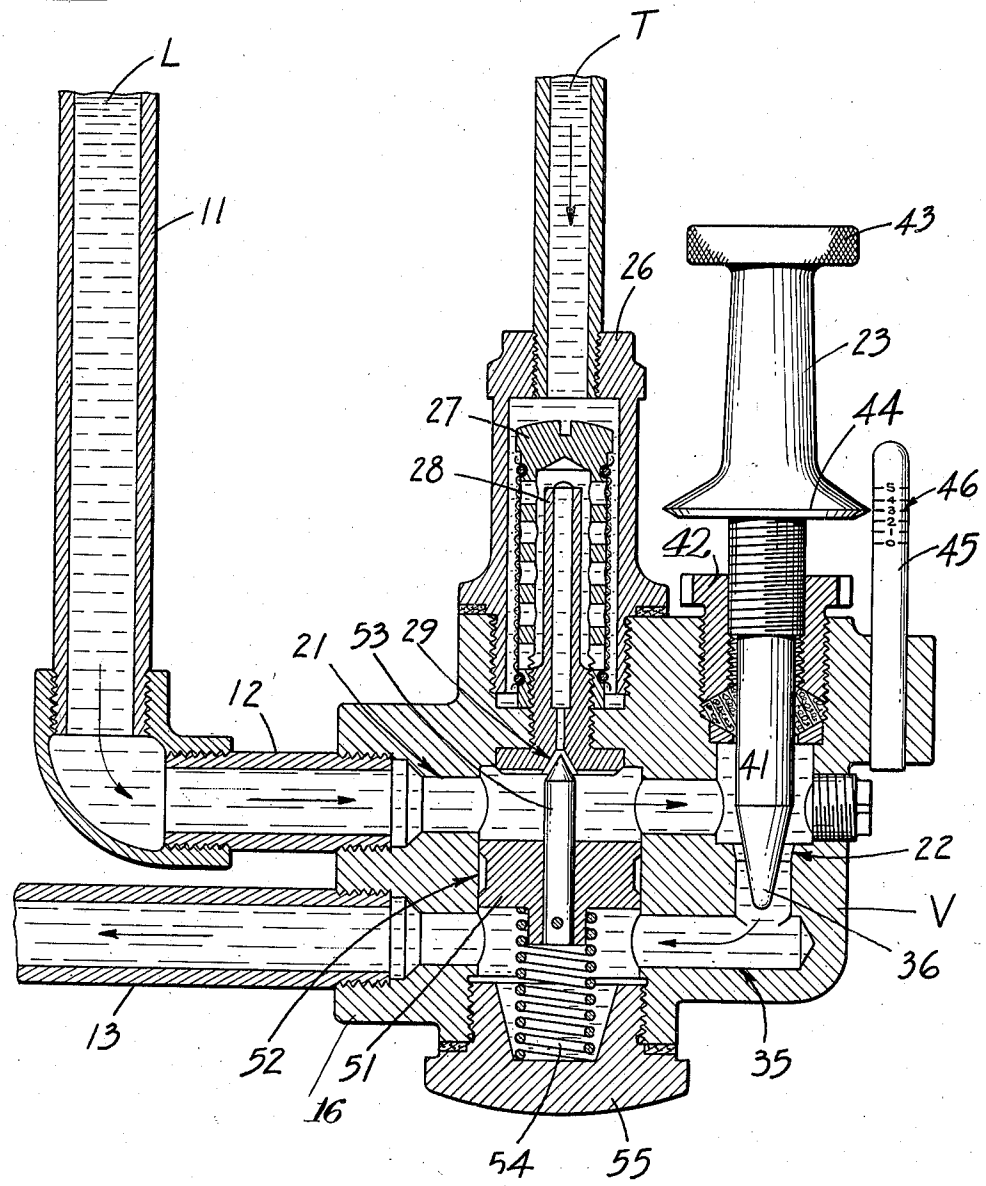
INVENTOR
Horace J. Paynter
BY Ivan D. Thornburgh
Charles H. Ernest
ATTORNEYS

June 21, 1938. H. J. PAYNTER 2,121,045

VISCOSITY CONTROL

Filed March 28, 1935 2 Sheets-Sheet 2

Fig. 3



INVENTOR
Horace J. Paynter
BY Evan D. Thornburgh
Charles H. Lyne
ATTORNEYS

Patented June 21, 1938 2,121,045

UNITED STATES PATENT OFFICE

2,121,045

VISCOSITY CONTROL

Horace J. Paynter, Maplewood, N. J., assignor to American Can Company, New York, N. Y., a corporation of New Jersey

Application March 28, 1935, Serial No. 13,532

10 Claims. (Cl. 137—165)

This invention relates in general to machines for applying viscous substances, such as lacquers, enamels or coating compositions to sheet stock or articles, and has particular reference to a mechanism for the control of the viscosity of such substances before or during application.

An object of the invention is the provision of means for maintaining or controlling a predetermined viscosity in flowing lacquers, enamels, or other viscous fluids, so as to effect more uniform results, and higher production efficiency.

Another object of the invention is the provision of a valve unit for automatically altering the viscosity of flowing viscous liquids to a predetermined viscosity by the admission of a solvent or thinner into the stream of liquid.

A further object of the invention is the provision of a viscosity control unit of the above nature in which the solvent is admitted in amounts varying with the difference in pressure of incoming unthinned fluid and outgoing fluid thinned to the required viscosity.

A still further object of the invention is the provision of a choke valve or regulating valve in the above unit to restrict the flows to a predetermined degree between incoming and outgoing fluid and thereby vary the pressure difference and consequently the flow of solvent.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 shows a diagrammatic elevational view of a coating machine with lacquer feed showing one manner of embodying the present invention;

Fig. 2 is a top plan view of the viscosity control unit taken as indicated by the line 2—2 in Fig. 1; and

Fig. 3 is a larger scale vertical section of the unit as indicated by the line 3—3 in Fig. 2.

In the drawings which disclose a preferred embodiment of the present invention, the viscous liquid, which will be referred to hereinafter as lacquer L (see Fig. 1), is drawn by a rotary pump R, from a source of supply by means of the conduits or pipe sections 11, 12 and 13, through a viscosity control unit or viscosimeter V, where, if required, a solvent or thinner T is added to the liquid. When the lacquer of changed or unchanged viscosity reaches the pump R, the latter then forces it through pipe sections 14 and 15 to a coating machine generally indicated by M, wherein sheets S may be coated with a film of lacquer deposited by an applying roll A. The unit V alters or controls, if required, the viscosity of the lacquer flowing through it. It is understood, of course, that the principle of the invention is applicable to a variety of viscous liquids other than lacquers and that the viscosity control unit may be associated with a variety of machines or viscous liquid feeding devices.

Describing the invention in more detail by reference to Fig. 3, lacquer L is drawn into the body or housing 16 of the viscosity control unit V through the pipe 12 connecting with an upper or receiving chamber 21.

The chamber 21 is extended within the body 16 from the pipe 12 to a valve seat 22 of a viscosity choke or regulating valve, indicated generally by numeral 23. It is within this extension that the viscosity of the lacquer is changed when necessary.

Reduction of the viscosity of the incoming lacquer is accomplished by the addition of a solvent or thinner T, a supply of which is held in a reservoir 25 (Fig. 1), and fed by gravity to a solvent metering valve indicated generally by the numeral 26. Here the solvent passes through a cylindrical strainer 27 and enters a hollow vertical stem 28, which is threadedly held in the body 16. The solvent then flows through the hollow stem and emerges at a conical valve seat 29 formed at the lower end of the stem and there mixes with the flowing lacquer L in the chamber 21, where solvent pressure is kept greater than lacquer pressure and consequently the flow is always from the solvent source into the lacquer stream. The volume of solvent flow is regulated by a gate or conical valve stem 53 cooperating with the valve seat 29, and the gate is operated by a difference in pressures of inflowing and outflowing lacquer as will presently be described.

The lacquer, having passed the solvent valve 26, flows downwardly by the valve seat 22 of the viscosity regulating or choke valve 23 and enters a lower or delivery chamber 35 formed therebeneath, and parallel to the upper chamber 21. A valve gate or stem 36 cooperates with the valve seat 22 to regulate, i. e. restrict or liberate the flow of lacquer from chamber 21 to chamber 35. The valve gate 36 is the conical end of a stem 41, which stem is threadedly held in a gland 42 where it is liquid sealed with the body 16. The stem is provided with a knurled top 43, whereby it may be readily turned to adjust the gate 36 with respect to its seat 22. A sharp edged skirt 44, beneath the knurled top, serves to indicate the vertical movement of the stem relative to a stationary, graduated gage stud 45 secured in a bore of the body 16. Each of the several graduations 46 is a predetermined indication of a degree of viscosity desired in the liquid passing into the delivery chamber 35.

A valve piston 51, acting in a cylinder 52 which communicates between these chambers, carries a valve stem 53 on the upper end of which is formed the conical valve gate 31 previously men-

tioned. The gate is normally held against the valve seat 29 by a spring 54. This spring is seated in a hollow screw cap 55 held and liquid sealed in the body 16. Lacquer pressure in the upper chamber 21, is always lower than that of solvent at the valve gate 31, and usually higher than that of lacquer in chamber 35 so that there is a tendency to force the piston 51 down and with it the valve gate 31, while the combined pressures of spring 54 and liquid pressure in the delivery chamber 35 tend to force the piston up.

The gate 36, when set at a desired height, restricts the flow of lacquer from chamber 21 to chamber 35 and thereby creates a difference in pressures between the chambers in excess of that difference which may normally exist in the liquid if flowing unrestricted past the valve seat 22. The difference created by the gate 36 is further accentuated or modified by any small change in the viscosity of lacquer being supplied to the viscosimeter V. A more viscous liquid passes less freely through the valve 22 while a less viscous liquid flows more freely through it. A more viscous liquid creates a greater pressure difference which causes the valve 53 to open wider and admit more solvent to the stream. Conversely, a less viscous liquid reduces the pressure difference and the flow of solvent is reduced, or altogether shut off, to alter the viscosity or leave it unchanged as the occasion demands.

The lacquer which has thus passed through the viscosity control unit is ready for application to the sheet stock and is drawn from the unit and delivered to the coating machine M by the rotary pump R.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction and arrangement of the parts without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the form hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a viscosity control unit for feeding viscous liquids, a liquid receiving chamber, a liquid delivering chamber and a metering valve for controlling the flow of a solvent into said receiving chamber in amount determined by the difference in liquid pressures in said receiving and delivering chambers, and a regulating valve arranged between said chambers.

2. In a viscosity contrcl unit for feeding viscous liquids, a liquid receiving chamber, a liquid delivering chamber, a valve between said chambers for regulating the liquid pressure difference in said respective chambers and a metering valve for controlling the flow of a thinner into said receiving chamber, said flow of thinner being determined by said liquid pressure differences and the consequent movement of the metering valve.

3. In a viscosity control unit for feeding liquids, a liquid receiving chamber, a liquid delivering chamber connected therewith, a metering valve, operable by a difference in pressures between the liquids in said receiving and delivering chambers, for regulating the admission of a thinner into said receiving chamber to thin said liquid, and a regulating valve between said chambers to substantially predetermine said pressure differences and the operation of the metering valve and said admission of thinner.

4. In a viscosity control unit for feeding viscous liquids, a receiving chamber for receiving a stream of viscous liquid under pressure from a source of supply, means for introducing into said stream a thinner when the viscosity of said liquid is too high, a delivery chamber for delivering a liquid of proper viscosity to a place of need, and reciprocating means actuated by a pressure difference in said chambers for controlling the flow of said thinner.

5. In a viscosity control unit for feeding viscuos liquids, a conduit receiving and delivering a viscous liquid under pressure to a place of need, means intermediate said conduit for feeding a thinner into said viscous liquid to reduce its viscosity in accordance with a pressure difference between the receiving and delivering sections of said conduit and a regulating valve causing said pressure difference.

6. In a viscosity control the combination of a conduit for delivering viscous liquid, said conduit having portions which are arranged side by side, a hollow cylinder connecting said conduit portions, a pressure-transmitting piston in said cylinder, a passage connecting said conduit portions, a valve for enlarging and diminishing said passage, and a valve element carried by said piston and arranged to control the flow of a solvent to said conduit.

7. In a viscosity control unit for feeding viscous liquids, a liquid receiving chamber and a metering valve for admitting solvent to said receiving chamber to control the viscosity of the liquid flowing therethrough in accordance with the degree of viscosity of the liquid received in said chamber, said unit having means for automatically controlling said valve and its admission of solvent to said chamber by pressure differentials of combined viscous liquid and solvent on opposite sides of said controlling means.

8. In a viscosity control unit for feeding viscous liquids, a receiving chamber for receiving a stream of viscous liquid under pressure from a source of supply, means for introducing into said stream a thinner when the viscosity of said liquid is too high, a delivery chamber for delivering a liquid of proper viscosity to a place of need, and regulating means associated with said chambers for controlling the amount of thinner introduced into said stream, said regulating means being operated by the difference in pressure between separated increments of combined viscous liquid and thinner on opposite sides thereof.

9. In an apparatus for coating articles with a liquid of predetermined viscosity, a source of viscous liquid, a source of thinner, a system of passages for conducting said liquid to a coating machine, and means associated with said passages and operated by the difference in pressures between combined portions of viscous liquid and thinner in separated passages for introducing said thinner into said liquid in accordance with pressure differences in said passages.

10. In a viscosity control the combination of a conduit for supplying lacquer, means for supplying thinner to said lacquer, a regulating valve in said conduit for limiting the flow of lacquer and thinner therethrough, and a valve whereby the supply of thinner is regulated, said latter mentioned valve having a controlling piston, the pressures on the latter valve being imparted by varying proportions of combined lacquer and thinner on opposite sides of said controlling piston.

HORACE J. PAYNTER.