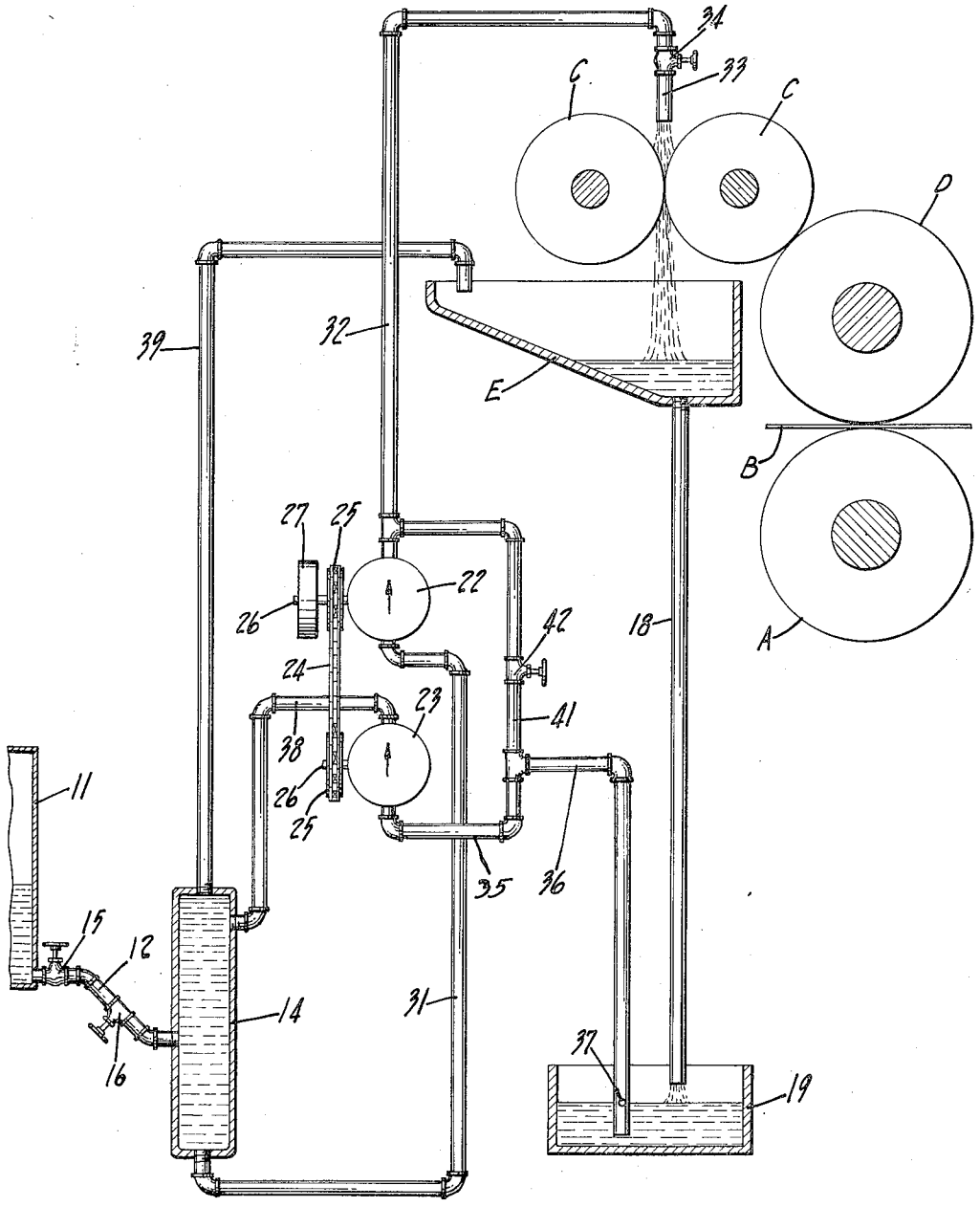
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SUPPLY SYSTEM FOR LIQUID SUBSTANCES

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SUPPLY SYSTEM FOR LIQUID SUBSTANCES

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The present invention relates to a system for supplying liquid materials, such as coating substances and the like, to machines in which the substances are used and has particular reference to such a supply system for maintaining a constant automatically regulated flow of a liquid or semi-liquid into the system from a source of supply at a rate substantially equal to the amount used.

Numerous supply systems are in use for conveying liquids such as coating materials, to coating machines but in most of these systems gravity or force feeding is resorted to without accurate control over the quantity of the liquid withdrawn from the source of supply. Most coating liquids are of a volatile nature due to the thinners that are mixed with them to facilitate the coating operation. When such liquids are exposed unduly to atmospheric action the thinners readily evaporate and the liquid becomes too thick and may clog the system. In order to overcome this difficulty, systems have been devised to handle small quantities of the liquid but since frequent stoppages of the machine are required to replenish the supply of coating liquid, this is not entirely satisfactory.

The instant invention contemplates a supply system which overcomes all of these difficulties.

An object of the invention is the provision of a supply system for feeding liquids to a machine wherein a constant automatically regulated flow of the liquid from a source of supply into the system may be had at all times at a rate substantially equal to the rate it is used in the machine.

Another object is the provision of such a supply system wherein a minimum quantity of the liquid is maintained in the system in circulation therethrough so that viscosity changes in the liquid are reduced to a minimum.

Another object is the provision of such a supply system wherein the liquid may be taken from the drum in which it is shipped and at a rate of flow which is substantially equal to the rate at which the liquid is used in the machine, the drum when empty being removable from the system for replacement without in any way affecting the supply of liquid to the machine.

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 drawing:

The single figure is a diagrammatic view of a supply system and principal parts of a coating machine embodying the instant invention.

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As a preferred embodiment of the invention the drawings illustrate a supply system for supplying liquid coating materials, such as lacquers, enamels or other viscous liquids to a conventional offset printing or coating machine A for applying a film or design of the liquid to the surface of a sheet B although the invention is equally well adapted to other machines in which a supply of viscous liquids is required.

The supply of coating liquid to be applied to the sheets B preferably is contained in a drum 11 and this may be the same drum in which the liquid was shipped. The liquid is taken directly from the drum as required, so that no other supply tank is needed. Hence when a drum is emptied, another filled drum may be substituted for the empty drum without in any way interfering with the operation of the supply system or the machine to be supplied with the coating liquid.

The drum 11 is connected by an inlet pipe 12 to a vertical stand pipe or reservoir 14, the inlet pipe connecting with the reservoir intermediate its ends. The coating liquid from the drum flows by gravity into the reservoir. A pair of cut-off valves 15, 16 are connected in the inlet pipe adjacent its ends for cutting off communication with the reservoir and the drum when it is necessary to disconnect an empty drum and substitute a full one. The lower end of the reservoir extends below the drum to insure a reserve supply of the coating liquid in the reservoir at all times.

The coating liquid is drawn from the reservoir 14 and applied to a pair of fountain rollers C in the coating machine for transfer to a coating roller D which applies the liquid to the sheets B. Any excess coating liquid falls from the fountain rollers into a drain pan E disposed beneath the rollers. This excess coating liquid received in the drain pan is conducted away by a drain pipe 18 which leads to an overflow receiver 19. The coating liquid in the overflow receiver is returned to the supply reservoir for reuse. In this manner the coating liquid in the system is kept in circulation at all times.

Circulation of the coating liquid through the supply system is brought about by a pair of continuously operated gear pumps, referred to as a supply pump 22 and a return pump 23. These pumps preferably are disposed adjacent each other and are operated in unison and at the same speed by an endless chain 24 which takes over sprockets 25 mounted on pump driving

shafts 26. One of the shafts carries a pulley 27 which receives the necessary power for driving the pumps. The pumping capacities of the two pumps are equal.

The intake side of the supply pump 22 is connected by an intake pipe 31 to the lower end of the reservoir 14. The discharge side of this pump is connected by a supply pipe 32 which terminates in a nozzle 33 disposed adjacent the line of contact of the two fountain rollers C of the coating machine A, as shown in the drawing.

Hence the supply pump 22 withdraws coating liquid from the reservoir and delivers it by way of the supply pipe 32 and nozzle 33 to the fountain rollers C. A valve 34 connected into the supply pipe adjacent the nozzle is provided for controlling the quantity of coating liquid delivered to the rollers C to keep the amount of liquid exposed to the action of the atmosphere, at a minimum.

The intake side of the return pump 23 is by way of pipes 35, 36 the latter of which terminates in the overflow receiver 19. An inlet hole 37, provided in the side of this pipe adjacent the end immersed in the excess coating liquid contained in the overflow receiver, maintains the coating liquid at a predetermined level in the receiver. The discharge end of the return pump 23 is connected by a return pipe 38 to the reservoir 14. The pipe is secured in the side of the reservoir near its top end. The top end of the reservoir is provided with a vent pipe 39 which leads to and terminates in the drain pan E of the coating machine A.

Hence excess coating liquid that is drained into the overflow receiver 19 is pumped by the return pump 23, back into the reservoir 14 for reuse. Any air which appears as bubbles in the liquid is pumped into the reservoir and is vented through the vent pipe 39. This venting allows the released liquid upon bursting of the bubbles, to flow down the walls of the vent pipe and to be recovered in the reservoir.

Since the capacity of the pump 22 is constant but the valve 34 varies the amount of discharge from the nozzle 33, any coating liquid pumped by the supply pump 22 in excess of that delivered by the nozzle is by-passed or diverted to the return pump 23 for return to the reservoir 14. For this purpose a by-pass or flow diverting line 41 having a cut-off valve 42 is provided. This line joins with the pipe 35 to complete the diversion of flow around the two pumps. One end of the pipe line 41 is connected into the supply pipe 32 while the opposite end is connected into the pipes 35 and 36.

Since the two pumps have the same capacity they are capable of pumping the same amount of liquid. However, some of the liquid which is delivered by the supply pump 22 is deposited on the sheets B in the machine A and thus is not returned to the system. Hence the quantity of excess liquid that is drained into the overflow receiver 19 plus the amount of liquid diverted from the supply pump 22 is not enough to equal the full capacity of the return pump 23. Thus a quantity of air is pumped by the return pump into the reservoir 14 and this air is vented to the atmosphere by way of the vent pipe 39. This means that the quantity of coating liquid returned to the reservoir is less than the amount withdrawn for delivery to the coating machine, by an amount which is equal to that applied to the sheets B.

This unbalanced condition between the out-go and in-take of the reservoir creates a difference in the hydrostatic head of the liquid in the reservoir in respect to that in the supply drum 11. This difference in head is equal to the amount of liquid applied to the sheets B. Hence a quantity of liquid directly proportional to the amount deposited on the sheets B flows from the supply drum 11 by gravity into the reservoir 14 and thus restores the unbalanced head condition. Thus the reservoir is continuously replenished with new coating liquid at a rate which is equal to the rate at which the liquid is applied to the sheets B.

In this manner the pumping system maintains a minimum amount of liquid in the system and in continuous circulation at all times so that viscosity changes in the liquid are reduced to a minimum. Thus, since the returned liquid is continuously replenished with a predetermined amount of the new liquid, the viscosity of the liquid used for application to the sheets B is readily maintained at a uniform predetermined amount. With such a system a constant automatically regulated flow of the coating liquid at a predetermined viscosity is maintained at all times for use in the coating machine.

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. A supply system for supplying a liquid for use in a machine, comprising a reservoir containing a liquid, a liquid supply tank having communication with said reservoir with the lowest liquid level of said tank above the lowest liquid level in said reservoir, a supply pipe line including a continuously operating supply pump connecting said reservoir and the machine for continuously pumping said liquid from said reservoir to a point of discharge in the machine, the liquid discharged being in excess of that used in the machine, means for intercepting the discharged excess liquid not used in the machine, a return pipe line including a continuously operating return pump connecting said intercepting means with said reservoir for continuously returning liquid to said reservoir, valve means in said supply pipe line between said supply pump and the machine for controlling the amount of liquid discharged into the machine, said amount being less than the total liquid passed by said supply pump, and a flow-diverting pipe line connecting the outlet of said supply pump with the inlet of said return pump and also having connection with said intercepting means for mixing the liquid pumped by said supply pump in excess of that delivered through said valve means with the liquid in said intercepting means, said supply tank thereupon supplying fresh liquid to said reservoir to replenish that used in the machine.

2. A supply system for supplying a liquid for use in a machine, comprising a supply tank for containing a supply of liquid, a reservoir for receiving liquid from said supply tank, the lowest point within said reservoir lying at a lower level than the lowest point in said supply tank, a vertically disposed vent pipe mounted on top of said reservoir and extending above the highest point

in said supply tank, a conduit between said supply tank and said reservoir and having connection with the supply tank adjacent its bottom for conducting liquid by gravity from the tank to the reservoir, a machine for using said liquid, feeding means for withdrawing liquid from adjacent the lower portion of said reservoir and for feeding it to the machine in excess of the amount used therein, and return means for withdrawing said excess liquid from said machine, entrained air contained in the excess liquid appearing as air bubbles, said return means delivering liquid and air bubbles to the upper portion of said reservoir so that the air bubbles contained therein upon rising to the surface in said reservoir pass upwardly with some liquid into said vent pipe and

dissipate, the freed liquid flowing down the walls of the pipe into said reservoir preparatory to recirculation by said feeding means.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
913,008	Herr	Feb. 28, 1909
1,154,447	Sleeper	Sept. 21, 1915
1,236,002	Nivling	Aug. 7, 1917
1,263,858	Cole	Apr. 23, 1918
2,266,354	Christenson et al.	Dec. 16, 1941