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METHOD AND APPARATUS FOR HANDLING UNSTABLE CHEMICAL DISPERSIONS

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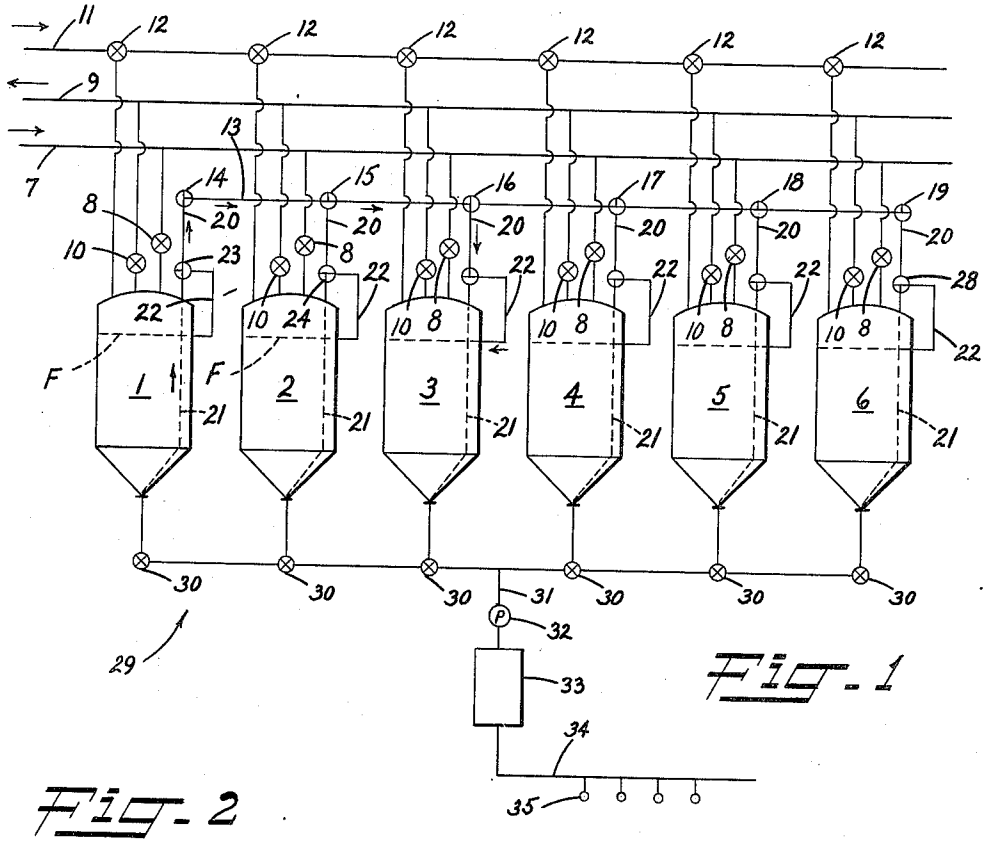

Fig. 1

Fig. 2

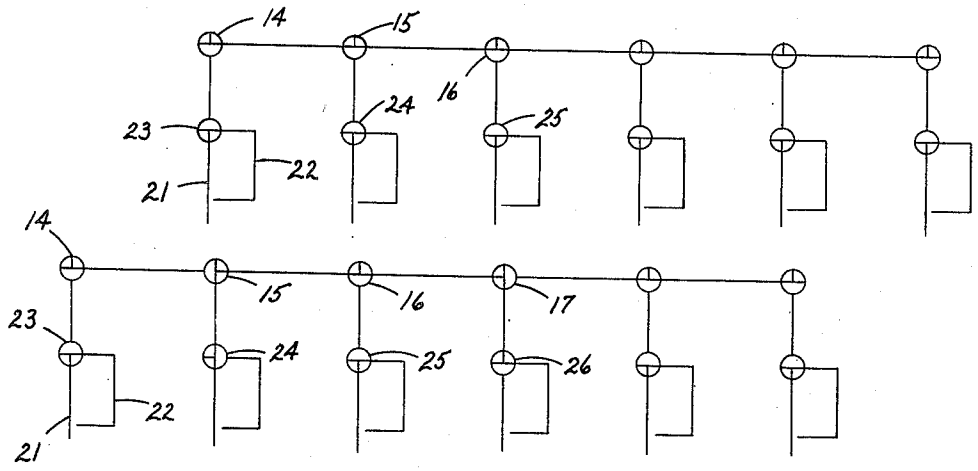

Fig. 3

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METHOD AND APPARATUS FOR HANDLING UNSTABLE CHEMICAL DISPERSIONS

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4 Claims. (Cl. 18—54)

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This invention relates to the handling of unstable chemical dispersions such as are employed in spinning artificial filaments. The invention is particularly concerned with the problem of reducing non-uniformity of viscose or other spinning solutions to be delivered to the spinning machines. Such solutions or dispersions are prepared by a procedure including steps of ageing or ripening under carefully controlled conditions, filtering and blending after which they are led into a set of supply tanks. The viscose dispersions, each having the desired ripeness, are led into the empty tanks of the set in predetermined order while the full tanks of the set are discharging, usually one at a time, in corresponding order so that the viscose supplied to the spinning machine is substantially uniform in ripeness, and hence in chemical and physical properties, and more particularly in viscosity.

However, it has been the practice in emptying any given tank to leave a small part of the viscose in the bottom thereof in order to prevent the entraining of air bubbles in the viscose as it is discharged from the tank. The air bubbles would be entrained by virtue of the tendency of the viscose to form a vortex in the last portion to be removed, and the amount of the viscose necessary to be left in the tank in order to prevent any entrainment of air is quite large, especially in tanks whose bottoms are formed in the shape of relatively shallow cones.

This residual viscose left in the bottom of the tank, the so-called "heel" or "tank bottom," undergoes furher ripening so that its ripeness is considerably advanced with respect to that of tne next batch of viscose with which the tank is to be filled, and in the large proportions that such bottoms have heretofore been left in such tanks, the heel does not become mixed to any substantial extent within the new batch of viscose. Because of the fact that the final physical characteristics of the filamentary material depend upon the uniformity of the ripeness of the viscose or other solution from which it is spun, it is highly desirable to reduce as far as possible the amount of heel or tank bottom that is necessary to be left within any given supply tank.

The amount of heel necessary to be left has heretofore been reduced somewhat by the practice of opening the next supply tank to the pump as soon as the level in any given supply tank being discharged by the pump becomes dangerously low, but this procedure is inadequate so that quite a sizeable quantity of viscose still remains as a heel.

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It is an object of the invention to provide a novel method by which substantially all of the heel is removed from any given supply tank and is caused to mix with the batch in another tank before completion of deaeration of that batch. It is a further object of the invention to provide a novel arrangement of apparatus to effectuate the removal of the heel in the manner hereinafter described. Further objects of the invention will appear from the description thereof.

In the drawing, which is of diagrammatic character,

Figure 1 shows a preferred embodiment of the invention; and

Figures 2 and 3 show successive steps for manipulating the apparatus to apply the method to several tanks in succession.

For purposes of illustration, the description of the drawing hereinafter will refer specifically to the handling of viscose, but it is to be understood that the apparatus and procedure is applicable generally to the handling of other chemical solutions or dispersions presenting similar problems.

In Figure 1, there is shown diagrammatically a spinning set of six supply tanks for viscose, which are numbered in the order of discharge or withdrawal of their contents by the main pump to the spinning machine. Each of the supply tanks is provided with a connection to a compressed air line 7 by valves 8. These air valves may all be open constantly (except during filling of a tank when its valve will ordinarily be closed and the tank vented to the atmosphere) or they may be opened only to the respective tanks as they or their heels are being emptied and it is to be presumed that either of these conditions exists in the following description. The air pressure thereby assists the pumps in discharging the tanks.

A vacuum line 9 is also connected to each tank by valves 10. A filling or supply line 11 is also connected to the tanks by cocks 12.

The tanks are provided with an intercommunicating header 13 having cocks 14, 15, 16, 17, 18 and 19 controlling the communication through the branches 20. The branch line 20 to each tank is connected to a pipe 21 which extends into the tank and to its very bottom, where it is open to the contents of the tank. Each branch line 20 is also connected to a branch 22 which opens into the tank near the top, preferably substantially at the upper level of the contents, as indicated by the dotted lines F. The communication between the line 20 and its branches 21 and 22 for each tank is controlled by one of the respective cocks 23, 24, 25, 26, 27 and 28.

A common discharge header 29 is connected to the base of each tank, three-way cocks or valves 30 being provided to control the flow of the contents of any given tank or tanks into the discharge header 29. The header 29 is connected to a common discharge line 31 containing one or more pumps 32 and one or more line filters 33 for supplying one or more headers 34 feeding the viscose to the final points of distribution, such as spinnerets 35.

For the purpose of illustrating the operation of the invention, it may be assumed that supply line 11 is blanked off from tanks 1 to 5 by cocks 12, whereas it is feeding into tank 6 through its associated cock 12, tank 6 being vented in the conventional manner during such filling. All of the tanks 1 to 5 have previously been filled, tank 1 has just been emptied through the cock 30 down to the normal bottom or heel and tank 2 is being emptied through the cock 30. Under these conditions, the pressure line 7 is open to tank 2 through the valve 8 to assist the action of the pump 32 in emptying tank 2. The cock 30 associated with tank 1 is closed against the header 29 and the pressure line 7 is open to tank 1, by its valve 8. Cocks 14 and 23 are set as shown in Figure 1 to allow viscose in tank 1 to flow up through the branch 21 into line 13, cock 15 being set as shown to allow such viscose to pass to cock 16, where it is diverted through the branch 20 and cock 25 into line 22, where it is admitted into tank 3, preferably at the side thereof and preferably substantially at the top level of the contents therein. Simultaneously with the discharge of the heel from tank 1 to the top surface of the contents in tank 3, or at any time after such discharge has been completed, the vacuum line 9 is opened by the appropriate valve 10 to effect deaeration of the contents of tank 3. By such arrangement, the heel in tank 1 is completely eliminated and no special care need be taken during such elimination to prevent entrainment of air bubbles, since very quickly after its discharge into tank 3, deaeration is accomplished. By discharging the heel of tank 1 into the top of tank 3, it is disposed in a manner to accomplish rapid deaeration without affecting the great bulk of the contents of tank 3. Thus, if desired, the transfer of the heel from tank 1 into tank 3 may be accomplished toward the last part of the deaerating period of tank 3, since it is spread out into a thin layer over the top of the contents in the latter tank.

After transfer of the heel from tank 1, cocks 14, 16, 23 and 25 may be turned into their normal positions shown in Figure 2 and tank 1 may again be filled without encountering the disadvantage of mixing the heel that would otherwise have been left therein with the fresh viscose. When the cocks 23 to 28 are in their normal positions shown in Figure 2, both branches 21 and 22 have the opportunity to equalize pressures therein and application of vacuum for deaerating the next batch in the tank cannot draw in air that might otherwise be trapped in branch line 21.

When the contents of tank 2 have been reduced to the normal heel, tank 3 is connected into the discharge header 29, deaeration thereof having been previously completed and valve 10 connecting it to the vacuum line being closed, while valve 8 connecting it to the pressure line is open. Cocks 16 and 25 are then turned to the position shown in Figure 3, so that line 13 is disconnected from tank 3 and cocks 15, 24, 17 and 26 are turned

in the manner shown in Figure 3 to transfer the heel in tank 2 to the upper surface of tank 4, tank 4 being then or shortly thereafter connected to the vacuum line 9 by opening its associated valve 10.

The process is thus repeated cyclically for each tank. In this fashion, there is no opportunity for any heel whatsoever to be left in a given tank where it could mix with fresh viscose introduced later, and at the same time no special precautions need be taken to prevent mixing of air into the heel when it is discharged later into the contents of another tank.

The invention is applicable to spinning sets having any number of tanks more or less than the six disclosed in the drawing. The three-way valves may be substituted by three distinct valves in each of the lines connecting to form the juncture at which the three-way valves are shown in the drawing. The several supply tanks may be provided with the customary thermometer wells and pressure gages, and also with sight glasses at any desired levels or with signaling devices to indicate when designated or predetermined levels are reached by the viscose in the tanks.

While a preferred embodiment of the invention has been disclosed, the description is intended to be illustrative only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. In apparatus for handling dispersions and the like, such as viscose, a plurality of supply tanks, a discharge header connected to each of the tanks, means for controlling the flow of the contents of each of said tanks through said header, a second header associated with the tanks, a branch line communicating substantially with the bottom of the interior of each tank, a second branch line connected to the upper region of the interior of each tank, means for selectively connecting the second header with said branch lines, an independent pressure line, conduits each provided with a valve or cock and independent of the headers and said branch lines for selectively connecting said pressure line to the several tanks.

2. In apparatus for handling dispersions and the like, such as viscose, a plurality of supply tanks, a discharge header connected to each of the tanks, means for controlling the flow of the contents of each of said tanks through said header, a second header associated with the tanks, a branch line communicating substantially with the bottom of the interior of each tank, a second branch line connected to the upper region of the interior of each tank substantially at the full line thereof, means for selectively connecting the second header with said branch lines, an independent pressure line, conduits each provided with a valve or cock and independent of the headers and said branch lines for selectively connecting said pressure line to the several tanks.

3. In the method of handling dispersions and the like, such as viscose, involving distribution of the dispersion among a group of supply tanks in succession, deaeration in each tank of the dispersion therein, withdrawal thereof from the tanks in the same sequence after deaeration and leaving a heel in each tank after the withdrawal of the bulk of the contents of the tank, the step of transferring the heel left in each tank into

a substantially full tank before completion of deaeration of the contents of the latter tank.

4. In the method of handling dispersions and the like, such as viscose, involving distribution of the dispersion among a group of supply tanks in succession, deaeration in each tank of the dispersion therein, withdrawal thereof from the tanks in the same sequence after deaeration, and leaving a heel in each tank after the withdrawal of the bulk of the contents of the tank, the step of transferring the heel left in each tank to substantially the top surface of the contents of a substantially full tank before completion of deaeration of the contents of the latter tank.

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