March 4, 1941. F. STROVINK 2,233,965

METHOD OF DELIVERING AND DILUTING AQUEOUS DISPERSIONS OF WAX, ROSIN, AND THE LIKE

Filed May 14, 1937

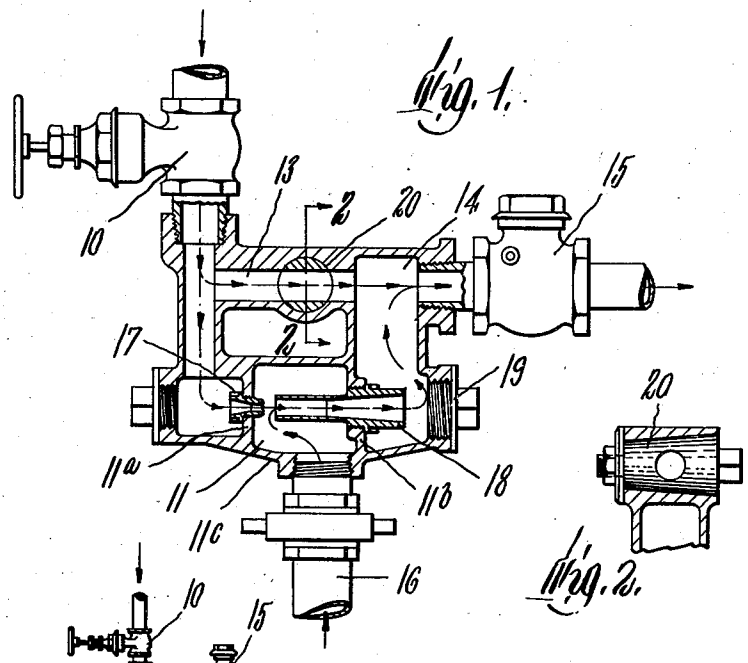
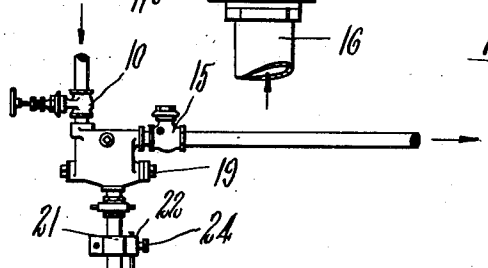


Fig. 1.

Fig. 2.



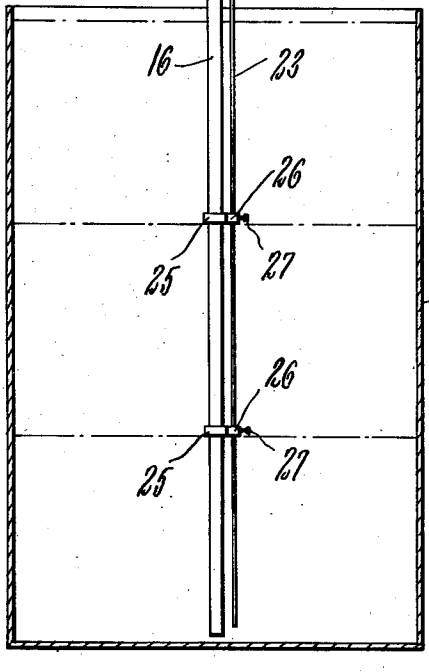


Fig. 3.

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Patented Mar. 4, 1941 2,233,965

UNITED STATES PATENT OFFICE

2,233,965

METHOD OF DELIVERING AND DILUTING AQUEOUS DISPERSIONS OF WAX, ROSIN, AND THE LIKE

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Application May 14, 1937, Serial No. 142,688

3 Claims. (Cl. 137—165)

This invention relates to a method of delivering from a source of supply to the desired destination and diluting while on their way to such destination thick aqueous dispersions or compositions containing dispersed wax, rosin, or like sizing material and a dispersion-stabilizer, such as are being currently sold on the market for use in sizing papermaking stock in the beater engine.

It is now usual for manufacturers of paper-sizing compositions to supply the papermaking industry with thick or concentrated aqueous compositions, for instance, aqueous wax dispersions or wax-rosin dispersions stabilized by rosin soap or other suitable agent. It will be appreciated that the storage or shipment of concentrated aqueous sizing compositions is advantageous in that the cost incident to storing or shipping water is minimized. In order to realize the desired distribution of the dispersed sizing material throughout the paper making stock and the desired sizing or water-repelling effect in the finished paper, it is customary practice to dilute such concentrated compositions having a solids content of, say, about 30% to 40%, with water to a solids content of, say, about 2%, in which latter condition they are very fluent and readily and uniformly mixable with papermaking stock. Heretofore, such dilution has been effected by the papermaker in one or more large mixing tanks of a capacity sufficient to hold diluted size for admixture with enough papermaking stock to keep one or more papermaking machines running for, say, half a day, a day, or even longer. Aside from the expense of such mixing equipment and the space occupied thereby, the storage of the diluted size for some hours is apt to cause sensible separation or "creaming" of the wax or other sizing material whose specific gravity is less than that of the aqueous medium in which it is dispersed; and, when the diluting water is hard, that is, contains electrolytes of one kind or another, such "creaming" or "scumming" may be aggravated by reason of the coalescence, through the reaction of the electrolytes on the dispersion-stabilizer, of minutely dispersed or colloidal size particles into aggregates whose tendency to float to the top of the diluted size is much greater than that of the minutely disposed or colloidal size particles. While secondary stabilizer, such as sodium silicate or other alkalies, may be added to a batch of size as it is being diluted to counteract the tendency toward creaming, secondary or additional stabilizer is undesirable and is to be avoided, if possible.

The present invention affords an improved method of diluting thick or concentrated size composition of the character described to the low solids content desired for admixture with papermaking stock and not only makes possible considerable saving in cost of equipment, elimination of storage, and the conservation of plant space, but enables ready control or variation of the degree to which the size is to be diluted at any particular time, obviation of "creaming" in the size, and, accordingly, elimination of the need for secondary stabilizer in the size.

The method hereof involves educing or suctionally withdrawing aqueous sizing composition containing dispersed wax, rosin, or the like and dispersion-stabilizer from a source of supply, for instance, a supply within a shipping drum, by the use of a jet-eductor through which diluting water is passed as an educing medium, whose eductor port is in educing or suctional communication with the source of supply, and whose discharge port leads to the ultimate destination for the diluted composition, for instance, a beater engine containing the papermaking stock to be admixed with the diluted composition. The jet-eductor hereof is preferably so constructed that, after the diluting water serving as the educing medium has become merged or mixed with the size composition so as to dilute the latter, it induces sufficient turbulence in the mixture or diluted composition to insure practically uniform dispersion or distribution of the sizing material in the diluted or extended aqueous medium. The jet-eductor hereof is preferably also designed to receive a secondary stream of diluting water and to commingle such secondary water with the mixture of size and the educing primary diluting water immediately after such latter mixture has through turbulence or agitation acquired a uniform, readily fluent consistency at which secondary diluting water is readily and uniformly mixable therewith.

With the foregoing and other features and objects in view, the invention hereof will now be described in further detail with particular reference to the accompanying drawing, wherein,

Figure 1 is a largely sectional view through a jet-eductor and the accessory fittings for practicing most advantageously the method hereof.

Figure 2 is a section or line 2—2 of Figure 1 and shows a valve or cock for regulating the volume of flow of the secondary diluting water to the prediluted composition immediately after the turbulence has been induced therein.

Figure 3 depicts the device of Figure 1 being used for delivering composition from a shipping

drum to any desired destination and diluting such composition on its way to such destination.

The device appearing in Figure 1 comprises a valved pipe 10 for delivering under suitable pressure the diluting water for an educing and primary diluting chamber 11 and for a valved by-pass 13 arranged immediately above the chamber 11 and discharging into a secondary mixing chamber 14 into which educed primarily diluted composition passes from the chamber 11 and from which secondarily or completely diluted composition emerges under pressure through a check-valve pipe 15, which leads to a beater engine containing papermaking stock or to any other desired destination. The chamber 11 is shown bounded by side walls 11*a* and 11*b* in which are fitted the nozzles or tubes for creating the desired educing or suctional effect in the chamber 11, into whose bottom 11*c* is threaded the upper end of an open-ended educing pipe 16. A reducing nozzle 17 is threaded through the wall 11*a* to receive water under pressure from the pipe 10 and to emit the water as a jet in the chamber 11 at a point somewhat removed from the small-diameter end of a flared expansion tube 18 threaded through the wall 11*b* and discharging substantially perpendicularly against a target afforded by the inner wall of a plug 19 threaded into a lower side wall portion of the chamber 14. It will be appreciated that, since the pressure in the water jet emitted from the nozzle 17 is expended in large measure through expansion of the jet in the expansion tube 18 to increase the velocity of the water streaming through such tube, an eduction or suctional effect is created in the chamber 11 sufficient to educe or suck up through the pipe 16 and into the tube 18 the liquid into which the lower end of such pipe opens. When the mixture of educing water and educed liquid are discharged under pressure from the expansion tube 18 against the target 19, a substantially uniform mixture is insured by the resulting turbulence even when the educed liquid is quite thick or viscous and is hence resistant to substantially uniform mixing with the educing water. The substantially uniform mixture flowing upwardly through the chamber 14 is sufficiently fluent to be readily and uniformly admixed with secondary diluting water; and, to this end, the secondary diluting water may flow from the pipe 10 through the valved by-pass 13 discharging into the chamber 14 near its upper end. The secondary diluting water entering the chamber 14 from the by-pass 13 may be regulated in quantity, as by a valve or cock 20.

In applying the device hereinbefore described for delivering aqueous size composition to papermaking stock in a beater engine and for diluting the composition on its way to the beater engine, one may be dealing with a supply of composition of a solids content of about 30% and of a pasty consistency as contained in a shipping drum or barrel. Accordingly, Figure 3 depicts the device hereof put to use with its eductor pipe 16 extending through the open top of the drum D substantially to the drum bottom. Since it may be desirable to withdraw only a portion of the drum contents at any one time for mixing with a particular amount of papermaking stock in the beater engine, the pipe 16 may be provided with suitable means for gauging the portion of the drum contents removed at any one time. Such means may comprise a collar 21 encompassing the pipe 16 immediately below the eduction chamber 11 and having an apertured lug 22 to which may be affixed a measuring rod, as by a set-screw 24. The rod 23 may carry therein graduations corresponding to the contents of the drum at a particular depth thereof; and encompassing the eduction pipe 16 may be gauge elements in the form of a pair of collars 25 provided with apertured lugs 26 to which the measuring rod 23 may be fixed as by set-screws 27. The collars 25 and their lugs 26 are slidable on the pipe 16 and the rod 23 so that they may set at any time in a position to denote three portions of the drum contents to be successively withdrawn for admixture in the desired diluted condition with papermaking stock. Figure 3 illustrates the gauge elements 25 set in a position to show the dividing levels between three equal portions of the barrel contents but, it is obvious, that any other desired settings of the gauge elements might be made and that a larger number of gauge elements might be employed indicating a larger number of portions of the barrel contents.

In a specific instance of application of the invention hereof to aqueous size composition of 30% solids content designed to dilute such composition to a solids content of about 2% on its way to papermaking stock in the beater engine, of each 100 pounds of diluting water entering the device hereof, about 12 pounds may pass through the jet-eductor and serve to educe or suck up from the source of supply approximately 2 pounds of sizing solids, on a dry basis, and about 88 pounds of the water may be by-passed so as to serve as the secondary diluting water for the educed or primarily diluted composition. It will, of course, be appreciated that the amount of sizing solids educed in any particular case from a source of supply will be governed by various factors, for instance, the pressure of the water entering the device, the viscosity of the sizing composition being educed, the length of the eductor pipe, etc., but, in actual practice, it is desirable to use as the educing and primary diluting medium for the composition sufficient water to dilute the composition to a solids content not exceeding about 15% before the primarily diluted composition merges with the secondary stream of diluting water and is reduced to a solids content of, say, about 2%, since, at a solids content not exceeding about 15%, the composition acquires after the necessary agitation a fluent, substantially homogeneous character, bespeaking ready miscibility with secondary diluting water in any desired amount.

Because it is undesirable to utilize any more of the capacity of the jet-eductor than is necessary for the purpose of primary dilution of the size composition, that is, reduction of the composition to a consistency whereat it is readily miscible with the secondary diluting water, it is preferable that at least about 70% of the total diluting water employed serve as secondary diluting water, thereby maintaining the educing or suctional capacity of the jet-eductor at the desired high value. However, educing or primary diluting water should, as already indicated, preferably be used in amount sufficient to reduce the solids content of the sizing composition to a value not exceeding about 15%. When the invention hereof is applied to wax, rosin, wax-rosin, or similar aqueous sizing composition of about 30% to 40% or greater solids content, at which solids content such composition is usually of pasty consistency, it is desirable that the water introduced into the device hereof as the educing and diluting medium be under substantial pressure, for in-

stance, upwards of about 40 pounds, so as to make possible withdrawal of composition at a reasonable or practical rate from a source of supply in a drum or other container. The pressure under which such water is introduced is, of course, partly determined by the level to which the diluted size is to be delivered; and, when the diluted size is being delivered to a level higher than the source of supply from which it is being withdrawn, it may be desirable to introduce such water under a pressure of about 40 to 100 pounds or even greater.

The invention hereof thus enables a papermaker to dilute concentrated aqueous sizing composition with which he is being supplied by an economical method and device requiring little plant space and subject to ready control or variation, insofar as concerns the degree to which the composition is to be diluted in any particular instance. Ordinarily, it is desired to dilute such composition to a solids content of about 1% to 2%, at which dilution the composition may be readily and homogeneously mixed with papermaking stock in the beater engine, wherein the stock consistency is generally about 4% to 8%, taking into account the water added to the stock along with the diluted size. In instances when the diluting water is of appropriate softness, the sizing composition may, accordant with the present invention, be diluted to a solids content even less than 1%, although, when the composition is diluted by the practice hereof to a solids content of about 1% to 2% preparatory to admixture with papermaking stock, no difficulty whatever is had in attaining such homogeneous distribution of the dispersed size particles throughout the stock as to avoid such troubles as spottiness in the finished paper or tendency for the wax or other size particles to deposit on and foul the wire or press rolls of the papermaking machine. It is to be understood that the prediluted size may be added to papermaking stock in any desired volume, depending upon the amount of sizing solids to be incorporated into the finished paper. About 1% to 2% sizing solids, based on the dry weight of the papermaking stock, is currently desired for most papermaking purposes, although, in some instances, only a fraction of a percent of sizing solids may be desired in the paper and, in other instances, as in paperboard to be used in making cartons and containers for moist or wet foodstuffs, the sizing solids may amount to as much as 4% to 8%. Along with the prediluted size may be added to the papermaking stock such other papermaking ingredients as fillers, pigments, dyes, etc.

The prediluted size prepared accordant with the instant invention may in some instances be advantageously delivered as a progressively flowing stream to papermaking stock at some stage of papermaking beyond the beater engine, for instance, to a stream of stock as it is flowing progressively at controlled rate and consistency from a jordan to the mixing chest or headbox of the papermaking machine. In order to realize the desired constant rate of feed of the prediluted size in such latter instance, it is necessary to maintain substantially constant such factors as the pressure of water introduced into the device hereof, the level or head of the supply of sizing composition that is being withdrawn and diluted, and the characteristics of such sizing composition, particularly its viscosity.

I claim:

1. A method of withdrawing from a source of supply an aqueous dispersion of wax, rosin, or the like of a solids content of at least about 30% and of diluting the dispersion substantially uniformly with water as it is being passed to the desired destination, which comprises progressively withdrawing from said source of supply to the desired destination said dispersion in the form of a progressively moving steam; progressively commingling with said stream of dispersion a primary stream of diluting water in amount and under sufficient turbulence to impart to said dispersion a substantially uniform, readily fluent consistency at which secondary diluting water is readily and uniformly mixable therewith; and progressively adding to the resulting stream of diluted dispersion before it reaches said destination a secondary stream of diluting water in amount to impart to said dispersion a solids content not greater than about 2%.

2. A method of withdrawing from a source of supply an aqueous dispersion of wax, rosin, or the like of a solids content of at least about 30% and of diluting the dispersion substantially uniformly with water as it is being passed to the desired destination, which comprises progressively withdrawing from said source of supply to the desired destination said dispersion in the form of a progressively moving stream; progressively commingling with said stream of dispersion a primary stream of diluting water in amount and under sufficient turbulence to impart to said dispersion a solids content not exceeding about 15% and a substantially uniform, readily fluent consistency at which secondary diluting water is readily and uniformly mixable therewith; and progressively adding to the resulting stream of diluted dispersion before it reaches said destination a secondary stream of diluting water in amount much larger than said primary stream of diluting water.

3. A method of withdrawing from a source of supply an aqueous dispersion of wax, rosin, or the like of a solids content of at least about 30% and of diluting the dispersion substantially uniformly with water as it is being passed to the desired destination, which comprises progressively withdrawing from said source of supply to the desired destination said dispersion in the form of a progressively moving stream; progressively commingling with said stream of dispersion a primary stream of diluting water in amount and under sufficient turbulence to impart to said dispersion a solids content not exceeding about 15% and a substantially uniform, readily fluent consistency at which secondary diluting water is readily and uniformly mixable therewith; and progressively adding to the resulting stream of diluted dispersion before it reaches said destination a secondary stream of diluting water in amount sufficiently larger than said primary stream of diluting water to impart to said dispersion a solids content not greater than about 2%.

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