

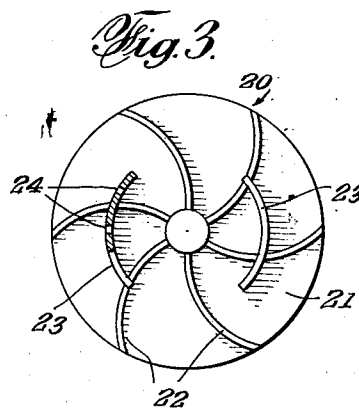
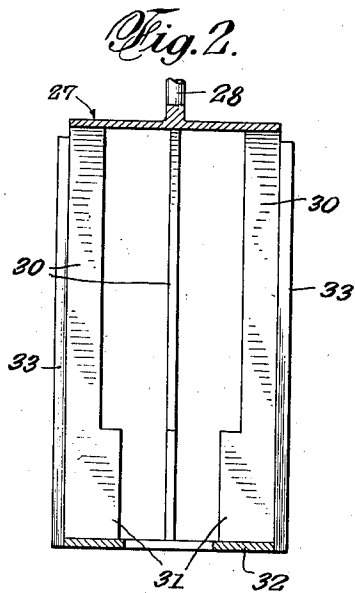
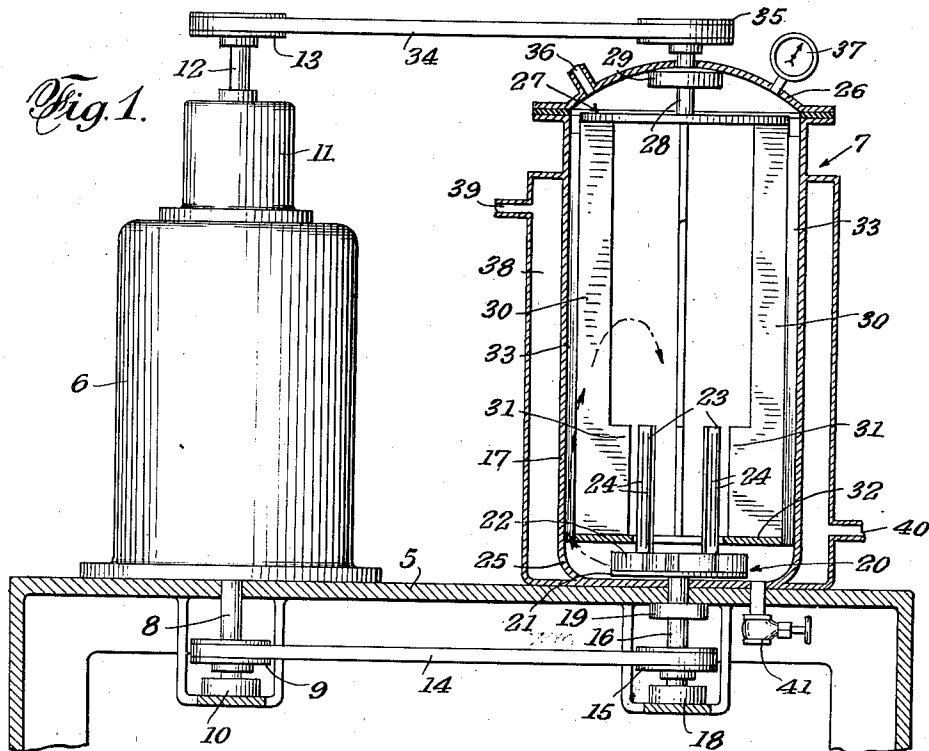
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DISPERSTON DEVICE AND THE LIKE

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DISPERSION DEVICE AND THE LIKE

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This invention relates to color dispersion and deals more particularly with an apparatus and process for color dispersing in which water-wetted colors or pigments are directly mixed with non-water miscible dispersing mediums.

The color dispersing process herein contemplated will be termed flushing and will relate to a process in which water-wetted colors are directly mixed with non-water miscible dispersing mediums to accomplish the dispersion of the color without going through the usual steps of drying the water-wetted color, pulverizing the same, and finally incorporating the pulverized color into dispersing media as by means of roller or pebble mills.

At the present time color dispersion is accomplished by apparatus which are modified forms of dough kneaders equipped for vacuum evaporation. In general, the basic principle upon which these devices operate, is the kneading of filter-cakes and the dispersing medium until a separation is achieved between the water and the color and medium phase. In these devices, due to the mechanical entrapment of some of the water, all of said water is not recovered. Hence, a subsequent stage of vacuum evaporation of the entrapped water is found necessary.

In the herein contemplated process, the forming of the filter-cake is obviated as are also the color dispersion steps by means of roller or pebble mills. The product obtained is at least equally as good as those obtained in the mentioned older devices and in many instances are superior in "grind" and tinting strength. Further, the mentioned older devices are designed to mix or knead at a slow rate and thus the color dispersion is a relatively slow operation. Also, the first flooded water tends to line the walls of the mixing chamber to cause slippage of the mass in preparation and thus reduce the efficiency of the kneading action. These kneaders also inefficiently agitate color pastes of thin consistency.

From the above it is quite apparent that the thorough mixing and agitating necessary for perfect color dispersion may not be obtained by devices employing kneading action.

Recognizing these faults, the present invention seeks to provide a novel device of simple and inexpensive construction for obtaining better color dispersion with less utilization of power and in a shorter period of time; novel means for obtaining rapid and efficient evaporation of entrapped water; providing for the direct use of the tank struck color to eliminate the necessity of filter-pressing; and generally shortening the overall

time of obtaining paint, printing ink, lacquer, or other such products, from slurry tank color.

The flushing of color or pigment as accomplished by the contemplated device and method, entails the following phenomena:

1. The preferential wetting of the water-wetted color or pigment by the dispersing medium.
2. The agglomeration of such medium-wetted particles.

And in consequence—

3. The flooding off of the water (which originally wetted the color) because of the immiscibility of water with the dispersing medium.

Although the apparatus contemplated is peculiarly adapted to carry out the process above set forth, it may also be efficiently used in the manufacture of tar emulsion, lacquer emulsion, ceresin wax emulsion, carnauba wax emulsion, in the blowing of linseed oil, in the reduction of a silica gel, in the grinding of tooth paste, in the manufacture of salad dressing, Ca arsenate, petroleum wax emulsions, the blending of greases, and aerating a slurry. The foregoing by no means exhausts the possible fields in which the invention may be used, but merely indicates the possibilities thereof.

With the foregoing in mind, the following specification, based on the accompanying drawing, describes an apparatus of novel design and incorporating features of the invention.

In the drawing:

Fig. 1 is a vertical sectional view of a color dispersion device as herein contemplated.

Fig. 2 is a similar view of a deflecting unit employed therein.

Fig. 3 is a top plan view of an impeller unit also used in the device.

Referring now to the drawing in greater detail, the apparatus preferably comprises a support base 5 upon which are mounted in side by side relation, a power unit such as the motor 6 and the flushing unit 7.

In the present instance, the motor is provided with a shaft 8 extending from the bottom of said motor, which is preferably arranged vertically, and upon said shaft is carried a pulley 9. In any desirable manner the shaft may be provided with suitable support means such as the thrust bearing 10.

The other end of the motor is preferably provided with a speed reduction unit 11 from which the shaft 12 is extended. Upon this shaft is carried a pulley 13. As at present contemplated, the pulley 9 is adapted to rotate at a relatively high rate of speed, 5,000 to 7,000 R. P. M. or

approximating this speed, and the pulley 13, at a relatively low rate of speed, 40 to 50 R. P. M. or thereabouts.

By means such as the belt 14, the pulley 9 is connected to drive a pulley 15 mounted on a vertical shaft 16 which enters the center of a kettle 17 or the like. The shaft 16 also may be provided with support means such as the thrust bearing 18 and with a stuffing box 19 to obviate leakage of the kettle.

Within the kettle and disposed at the bottom thereof, there is provided an impeller unit 20 carried by the shaft 16. This unit comprises a plate portion 21 upon which are arranged a plurality of curved blades or vanes 22 and a pair of arcuate vertically disposed members 23 concentrically arranged about the center of the impeller unit. These arcuate members are preferably slotted as at 24 and are arranged so that, upon rotation of the impeller unit, a cylinder is generated by said arcuate members. These members are of substantial height, and in the present instance are shown as approximately one-third the height of the kettle.

It is understood from this arrangement that the impeller unit may be rotated at the speed of the motor shaft 8 when the pulleys 9 and 15 are of equal size or at a proportional speed depending upon the relational size of said pulleys. In any event, it is desired to obtain a speed of between 5,000 to 7,000 R. P. M. of the impeller unit.

The bottom peripheral edge of the kettle is preferably rounded as at 25 for cooperative action with the impeller for reasons later apparent.

The kettle is formed with a cover 26 which, in the present case, is shown as convexly spherical, said cover being removably secured to suitable flanges at the open upper end of the kettle. This cover is arranged to revolvably support a deflector unit 27 as by means of the shaft 28 and a combined bearing and stuffing box is provided at 29 for efficient mounting of said deflector unit on said cover.

The deflector unit 27 is provided with deflectors 30, preferably radially arranged, and extending downward to a point somewhat above the vanes 22 of the impeller. These deflectors are formed, as shown with unreaching portions 31 terminating somewhat short of the cylinder generated by the arcuate members 23, and the lower ends of said deflectors are commonly connected by a ring shaped deflector member 32 having portions overstanding portions of the impeller vanes.

In a suitable manner, each deflector 30 may carry a scraper member 33 having scraping engagement with the inner surface of the kettle wall.

The deflector unit 27 is arranged to be rotated by a belt 34 connecting the pulley 13 with a pulley 35 on the deflector shaft 28. The speed of rotation of this deflector unit is approximately that of the shaft 12 (40 to 50 R. P. M.) and preferably in an opposite direction to the rotation of the impeller unit.

The kettle is provided with a connection 36 to vacuum and condenser apparatus and in the present instance the connection is made to the cover 26 so as to be located above the moving parts within the kettle. A vacuum gauge 37 also may be provided as shown.

It is preferred to heat the wall of the kettle and for this purpose said kettle is formed with a jacket 38 through which steam may be circulated from a steam inlet 39 to an outlet 40. Also, the water resulting from the flushing operation may

be drawn off through a cock 41 connected to the bottom of the kettle.

In operation, a quantity of dispersing medium is placed in the bottom of the kettle. For paint, raw linseed oil may be used; for lithographic printing ink, boiled linseed oil; and for lacquers, plasticizers, such as castor oil. The water-wetted color or pigment is added, the cover applied to the kettle, and rotation of the impeller and deflector units started.

The impeller, rotated at a high rate of speed, is designed to give the mixture of water-wetted color and dispersing oil the following type of agitation:

The high speed of the impeller causes centrifugal ejection of all materials coming in contact therewith. The ring 32 prevents direct upward movement of the materials except beyond its outer peripheral edge. Hence, this flattening action of the ring causes said material to be directed towards the walls of the kettle and to climb said walls to a height which is limited by the flow and density of the material involved. This upward movement of the material is aided by the rounded bottom edge 25 of the kettle which acts to minimize the reactive forces which might cause other than smooth flow of the materials under the urgency of the impeller blades. In this manner a vortex is formed in the flow of the materials which move upward at the sides of the kettle and downward at the center thereof.

The cylinder which is generated by the rotational speed of the arcuate members 23, serves various purposes. During the stage when there is uniformity in the materials being mixed, said generated cylinder seeks to maintain the central portion of the impeller free of materials. This aids the formation of a vortex having downwardly moving materials within said cylinder to cause more efficient expulsion of such materials which fall into said cylinder. During the stage when water is flooded off from the mass, the space enclosed by said generated cylinder serves as a paste agglomerant collection chamber and simultaneously acts as a focal point of the vortex produced in the water circuit, insuring continued contact between the color and oil phase and said water circuit.

The arcuate members also act to chop the paste agglomerants deflected into their path by the deflectors. The slots in said arcuate members also serve to do this. In cases of very thin paste, where the generated cylinder does not act as a collection chamber, the chopping and shearing actions of these members insure the absence of "livers" from the paste produced. As herein understood, a liver comprises a plurality of color particles having a common envelope of oil. Since this condition is undesirable the above action is important.

The above-mentioned vortex also serves to incorporate air into the mixture. This is desirable not only to ease agitation but also because this air serves, in vehicles of a higher density than water, to float the color and vehicle phase substantially in the manner mineral ores are floated.

The deflector ring, in addition to preventing the direct upward movement of the materials, also serves to prevent overloading of the impeller by intercepting and retarding the paste agglomerants which seek to fall directly thereon and in addition shear the materials between itself and the impeller.

Briefly then, the flushing occurs as follows:—The above-mentioned mixture of dispersing medium (oil) and water-wetted color is subjected

to the aforesaid action until water (color free) is noticed circulating through the vortex. The mixture is then rested in the case of thin pastes, and a separation of the water from the non-water phases is effected. The valve 41 is used for this purpose.

After the water is removed, a suitable thinner for the paste such as mineral spirits, toluol, xylol, or butyl acetate, etc. is added for the purpose of increasing the flow properties of the paste and therefore the efficiency of the heat transfer from the steam jacket. The thinning solvent thus added may in some cases contribute directly to the acceleration of the evaporation by acting as a carrier for the water.

After the thinner has been added and the steam circulated in the jacket, a vacuum condition is introduced into the flusher through the connection 36, and the water and thinner evaporated under these conditions are condensed in a suitable condensation apparatus. This condition is continued until a satisfactory freedom from water or dryness is achieved in the mass. Of course, the choice of a thinning solvent depends upon the finished paint, enamel, ink, or lacquer. Whenever necessary, thinning more solvent may be added from time to time.

After the water has been evaporated, those materials which are necessary to complete the product, may be added and the mixing continued until a satisfactory uniformity of texture is achieved. In this stage of the process, the agglomerant collecting properties of the generated cylinder holding said agglomerants in the focal point of the vortex, makes this final stage of the process a quick one.

From the above, it may be seen that the active phase of flushing (the flooding off of water due to the exchange of dispersing media by the color or pigment) as produced by this process, is based on the following principles:

1. The intimate intermixing of materials (color, water, and dispersing vehicle) by means of a high speed mixing mechanism of the turbine type.
2. The charging of each phase due to violent mixing, rapid translation of the mixed materials, and shearing action; and the accomplishment of the flooding off of water due to the opposite charging (electrostatic charges) of color particles and dispersing vehicle particles.
3. The mechanical production of a vortex to accomplish the inclusion of air into the mixture and simultaneously entrapping the paste phase in the vortex to insure continuous operating contact between water and non-water phases.
4. The entrapping of air into the non-water phase to make possible the flotation of the paste phase and also to make easier the subsequent vacuum evaporation stage.
5. The maintenance of maximum shearing action to insure the most intimate intermixture of the various phases present in the mass, and also, where filter-press cake instead of slurry tank color is used, to insure that the color is in its ultimate particle size.
6. The maintenance of a generated cylinder or the like to insure a vortex for heavy pastes and also more flowy materials, and also to obviate overloading the impeller.
7. The maintenance of the chopping action for continuously exposing all the surfaces of the paste.
8. The application of the principles of flotation.

While the above is descriptive of a machine and process as herein contemplated, the machine may

also be used for mixing water paints such as casein paints.

From the foregoing disclosure, it is readily apparent, that a novel device has been provided for the flushing of colors; and that the method employed for the process above-described is also new, simple, and more economical than prior processes. However, this disclosure should be considered as exemplary only, since many variations may be incorporated by those skilled in the art. For this reason, the prior pertinent art rather than the instant disclosure, should form the basis of interpretation of the spirit and scope of the invention as claimed.

What I claim as new and desire to obtain by Letters Patent, is:

1. A dispersion device or the like comprising a kettle, means for rapidly agitating a mass of materials in said kettle to cause upward flow of said materials along the walls of said kettle, means carried by said agitating means for receiving agglomerants formed in said mass of materials, said means also acting to shear materials contacting them, and means for retarding the flow of agglomerants outside said receiving means towards said agitating means.

2. A color dispersion device comprising a kettle adapted to receive a mixture of water-wetted color and a dispersion medium, means for rapidly agitating said mixture to cause an upward flow thereof along the walls of said kettle, means for deflecting said flow towards the center of the kettle comprising flow deflector members, means for receiving agglomerants formed in the downwardly flowing central mass of the mixture and for guiding said agglomerants towards said agitating means, and means for retarding the flow of agglomerants outside said receiving means towards said agitating means.

3. In a dispersion device or the like, an agitating unit comprising a rotating impeller for causing flow of a mass of materials in said device, means on said unit for receiving and seeking to retain the agglomerants formed in said mass by the mentioned agitating means, said receiving means comprising vertically disposed arcuately shaped members adapted to generate a cylinder during rotation of said impeller and to shear materials contacting them.

4. In a dispersion device or the like, an agitating unit comprising a rotating impeller for causing flow of a mass of materials in said device, and means on said unit for receiving and seeking to retain the agglomerants formed in said mass by mentioned agitating means, said receiving means comprising vertically disposed arcuately shaped members adapted to generate a cylinder during rotation of said impeller, said arcuate members being slotted to cause shearing and chopping of the materials contacting them.

5. A device of the character described comprising a kettle, a rotating impeller mounted in said kettle for agitating a mass of materials therein, a member positioned above said impeller to induce an upward flow of said materials along the vertical walls of said kettle, means for deflecting said flow in a direction transverse to the mentioned flow, and means carried by the impeller for receiving a cylindrical portion of the downward flowing mass of materials, the mentioned member also acting to retard the remainder of said downward flow towards said impeller.

6. In a device of the character described, an impeller, a member disposed above the impeller

for directing the flow from said impeller outwardly therefrom, said member also retarding a portion of the flow towards said impeller from above, and means carried by the impeller for directing a cylindrical portion of the flow from above towards the center of said impeller.

7. In a device of the character described, an impeller, a member disposed above the impeller for directing the flow from said impeller outwardly therefrom, said member also retarding a portion of the flow towards said impeller from above, means carried by the impeller for directing the remainder of the flow from above towards the center of said impeller, and means for rotating the impeller and the mentioned member at different rates of speed.

8. In a device of the character described, an impeller, means on the impeller for directing the central portion of a flow from above to the center of said impeller, means for rotating said impeller, a member disposed above and in spaced relation to said impeller, the peripheral portion of said member extending beyond the outer periphery of said impeller to guide the flow from said impeller in an outward direction, the said member also retarding the remaining portion of the flow from above towards the impeller, flow deflecting means connected with said member, and means for rotating said member and said flow deflecting means.

ABRAHAM BROTHMAN. 15