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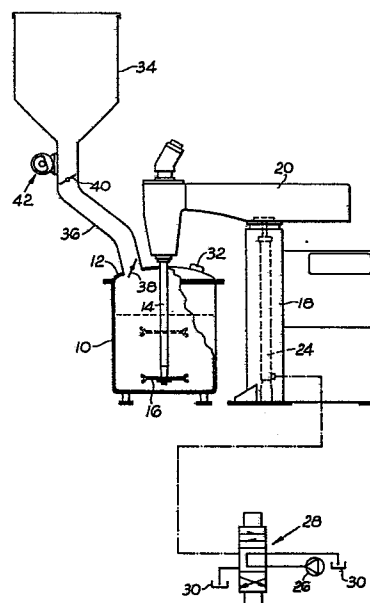
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Apparatus for the production of mixture, dispersions and the like.

Mixing apparatus for making paint etc. is described in which powder materials are added to the vessel when the noise level increases beyond the threshold, using a microphone to detect the noise and circuitry to operate control valves regulating the materials admission to the vessel.



EP 0 109 168 A2

1.

APPARATUS FOR THE PRODUCTION OF
MIXTURE, DISPERSIONS AND THE LIKE.

European Patent No. 0000827 describes apparatus for production of mixtures, dispersions and the like in which mixing apparatus comprises a vessel for receiving liquid and other material to be
5 mixed and a rotary agitator for immersion into the contents of the vessel, and is characterised by means responsive to the noise level emitted by the contents of the vessel during agitation for automatically adjusting the vertical position
10 of the agitator.

Such apparatus is widely used for example in the manufacture of paint, and before the proposals in the said European Patent mixing was controlled manually, and in particular the operator would
15 raise and lower the agitator to an optimum height depending upon the observed level of liquid in the pot and upon the observed condition of the mixture, which called for a high degree of operator skill.

20 The object of the present invention is to provide further improvements in apparatus of this kind.

In accordance with the 'invention, mixing apparatus comprises a vessel for receiving liquid
25 and other materials to be mixed, a rotary agitator for immersion into the contents of the vessel, and means responsive to the noise level emitted by the contents of the vessel during agitation, and is characterised in that the said means responsive
30 to the noise level are used to control admission of materials to the vessel.

It is preferred to utilise the said means for the purpose mentioned in the said European Patent, namely automatically adjusting the vertical position of the agitator, as well as for the purposes of the present invention. Effectively, noise sensing will then cause the agitator to be moved up and down until one increment of material has been satisfactorily dispersed and mixed and the signal will then permit or cause a further increment to be admitted.

One embodiment of the invention is now described with reference to the accompanying schematic elevation drawing. In the drawing the apparatus comprises a pot 10 for receiving liquid and finely divided materials to be mixed with the liquid. The pot has a cover 12 which may have suitable openings (not shown) for introduction of the materials. A vertical shaft 14 extends through the cover 12 and carries an agitator 16 which may be of any structure conventionally used in the art. The shaft 14 is supported from a column 18 via a cantilever arm 20 and is driven rotatably by an electric motor (not shown). The arm 20 is movable upwardly and downwardly to vary the depth of immersion of the agitator 16 and suitable raising and lowering gear is provided for this purpose. The raising and lowering gear may take various forms and the illustrated embodiment employs a single acting hydraulic ram 24 whose cylinder is fixed and whose piston is connected to the arm 20. Hydraulic oil is supplied to the ram 24 by a pump 26 via an electrically operable spool valve 28. As shown, the valve 28 is in a neutral condition in which no oil is supplied to or withdrawn from the ram 24, the pump 26

3.

being connected directly to sump 30. When the spool valve is displaced upwardly, the pump 26 supplies oil to the ram 24 to raise the agitator and when the valve is displaced downwardly from the neutral position, oil is with drawn from the ram 24 to lower the agitator 16.

The valve 28 is controlled by appropriate circuitry which is designed to maintain the agitator at a level within the vessel which will give optimum mixing of the contents of the pot. The optimum level may vary, e.g. as more and more material is introduced into the vessel, which means that the vertical position of the agitator must be varied accordingly to maintain optimum mixing conditions. To achieve this, the noise level produced by the turbulence of the agitated contents of the vessel is monitored by means of a microphone 32 and the circuitry and the valve 28 is operated so that the agitator is maintained at a level corresponding to a preselected range of noise levels, i.e. the noise level range corresponding to the optimum vertical position of the agitator. This range can be readily determined on an empirical basis and typically will be in the region of 80 to 90 decibels. In general, the noise level will increase beyond the desired range when the agitator is too close to the liquid surface and will decrease when the agitator is too remote from the surface.

Material to be admitted to the pot is stored in the hopper 34 connected by a delivery duct 36 to an opening in the lid of the pot, with a control valve 38 at the end of the duct adjacent the lid and possibly with a further control valve

40 at the hopper end of the duct. Powder in the hopper 34 is fluidised by by a vibro-motor 42. When both valves 38 and 40 are open, and at least when the vibro-motor 42 is operated, powder is discharged from the hopper into the pot 10.

In accordance with the invention, the valves 38 and 40 are motor-operated under the control of signals from said circuitry, and the signal (to cause the valves to open, or hold them open) is generated only when the noise increases beyond a preselected level. In other words, when the noise level causes the agitator to be lowered, the valves 38, 40 can be opened, and when the noise level causes the agiator to be raised, the valves 38, 40 will be closed.

A current development in paint manufacturing technology is the use of "big bags" containing typically one tonne of powder instead of the 56 lbs bags which have been common place for some considerable time. These big bags are conventionally loaded into appropriate hoppers and the present invention may be employed in handling them by using the noise generated signal to operate the vibrator for the purpose of fluidising powder at least in the delivery duct from the hopper to the mixing vessel.

In a preferred arrangement material delivery will be under the control of a more complex circuit including load cells and a micro-processor together with the control valves, so that a required quantity of powder can be weighed out into the duct and delivered in suitable increments to the mixing

5.

vessel at intervals dictated by the mixing rate, which is likely to vary during the course of the mixing operation, but with detected noise as the controlling factor.

5 Thus, in a preferred operational cycle, noise variation between upper and lower thresholds has no effect on agitator position and the powder control valves remain closed. A rise in noise level above the upper of these thresholds will
10 cause a powder increment admission which may result in a fall in noise level below the lower threshold, and the rotor will then be raised, and so on. The two valves can be used sequentially to weigh increments, that is, the upper valve
15 40 can be opened whilst the lower is closed, to prepare an increment for later addition. Successive increments may possibly be from different powder sources and of different quantities, e.g. to
20 cause different combination of pigments to produce specific paint shades.

CLAIMS

1. Mixing apparatus comprising a vessel for receiving liquid and other materials to be mixed, a rotary agitator for immersion into the contents of the vessel, and means responsive to the noise level emitted by the contents of the vessel during agitation, and characterised in that the said means responsive to the noise level are used to control admission of materials to the vessel.
2. Mixing apparatus as claimed in Claim 1 wherein the noise level also causes automatic adjustment of the vertical position of the agitator.
3. Mixing apparatus as claimed in Claim 1 or Claim 2 wherein the noise generated signal is used to cause opening of a valve controlling admission of materials to the vessel.

1/1

