# United States Patent

**Andris**

[15] **3,697,052**

[45] **Oct. 10, 1972**


[54] **AUTOMATIC VOLUMETRIC CHEMICAL MIXER**


[72] Inventor: **Fred A. Andris,** 671 East Elmwood, Troy, Mich. 48084



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[21] Appl. No.: **165,829**

**Related U.S. Application Data**

[63] Continuation of Ser. No. 865,009, Oct. 9, 1969, abandoned.

[52] **U.S. Cl.**.....**259/8,** 259/122

[51] **Int. Cl.**.....**B01f 7/16**

[58] **Field of Search**.....259/7, 8, 9, 10, 6, 22, 23, 259/24, 25, 26, 116, 118, 119, 121, 122, 123, 124, 43, 44



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*Attorney*—McGlynn, Reising, Milton & Ethington



[57] **ABSTRACT**

An automatic volumetric chemical mixer which has a mixing tank with agitator, an electronic liquid level control and a tank cover together with a hopper secured to said cover for delivering of dry granular chemicals, a power operated chemical feed metering mechanism between the hopper and cover to deliver to the tank predetermined quantities of chemical for a given time element and a chemical prewetting device for facilitating the production of homogenious solutions in the tank, with the total liquid feed to the tank delivered through the prewetting device in a predetermined volume for a given time element, together with a circuit to provide an automatic operation.


**46 Claims, 17 Drawing Figures**

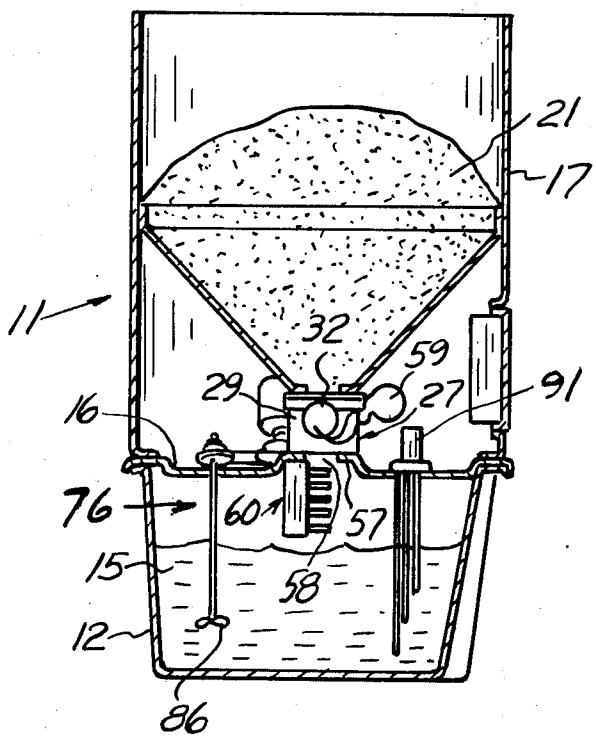


FIG. 1

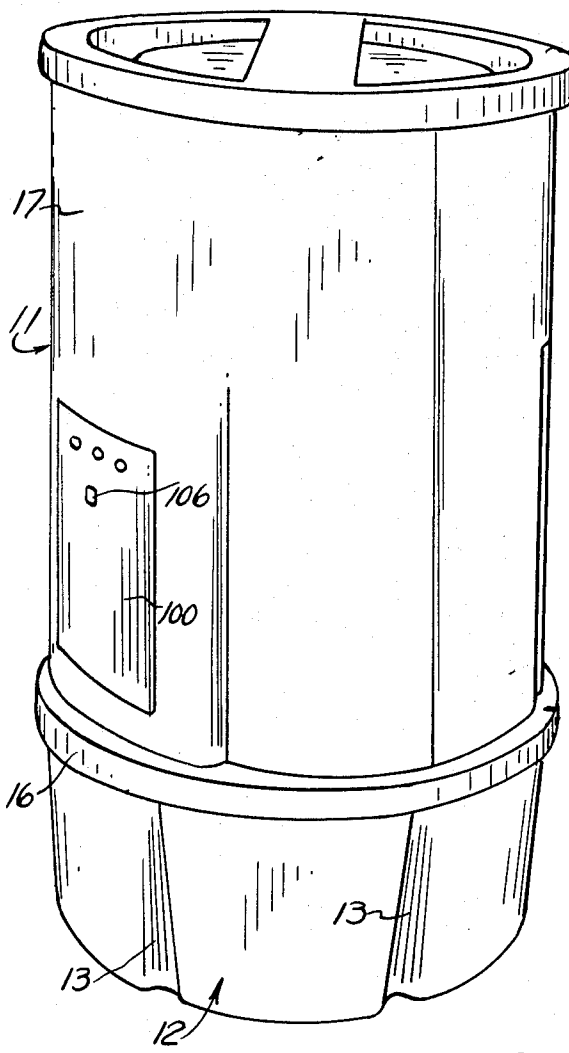
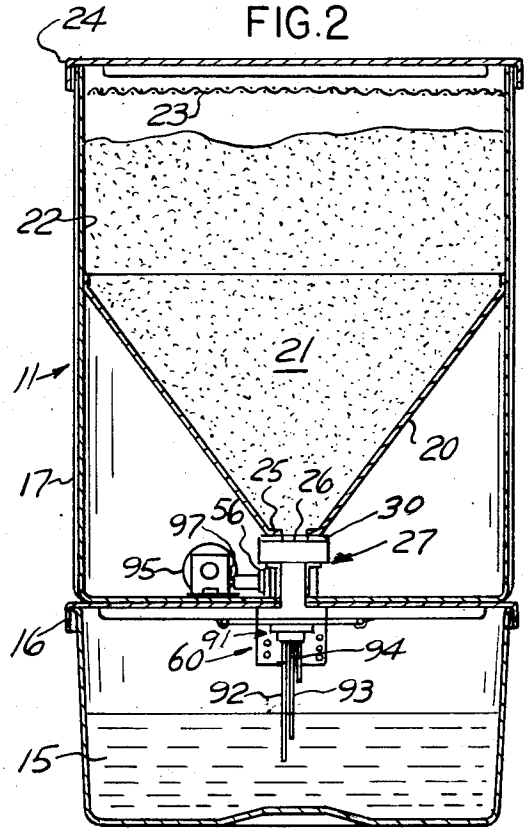



FIG. 2



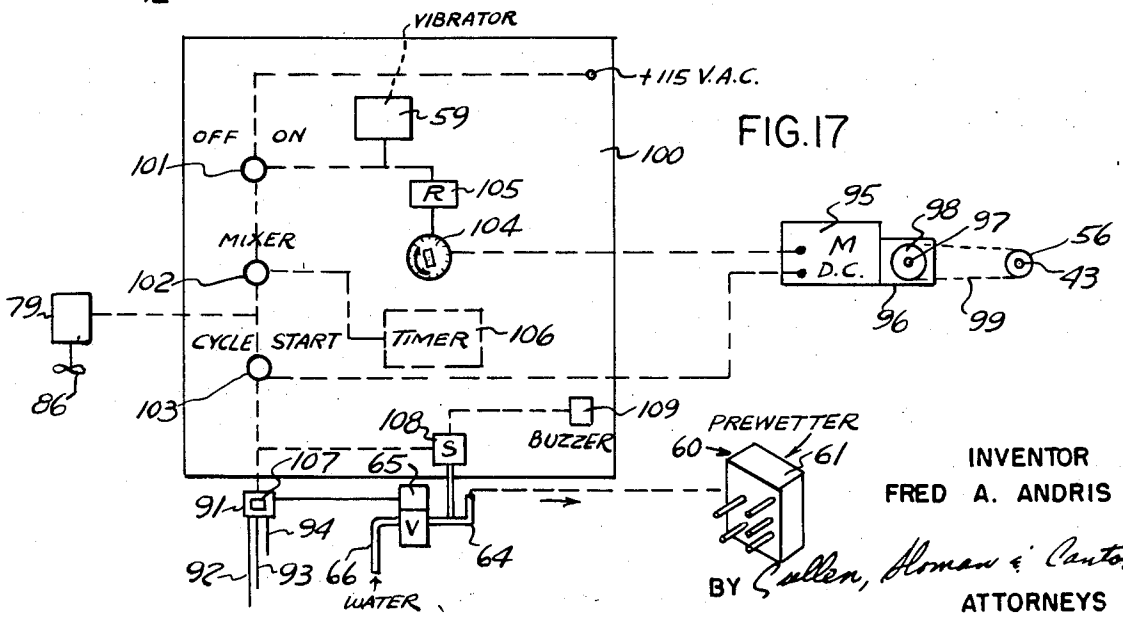
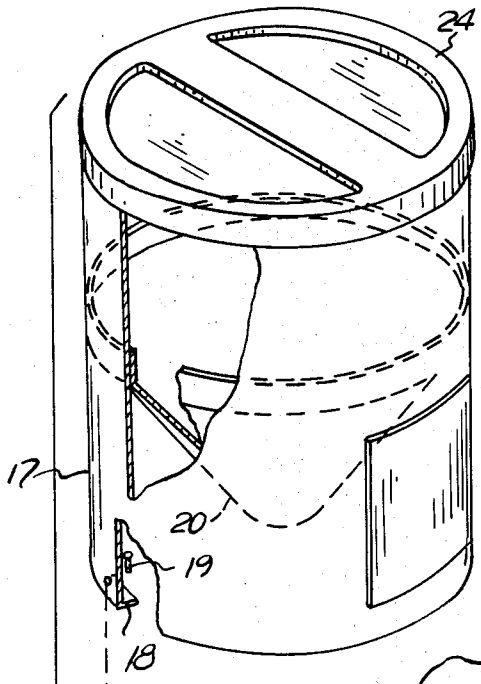



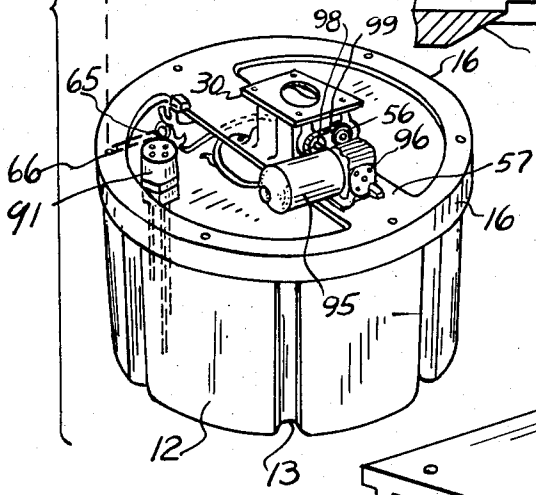

FIG. 17

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FIG. 3



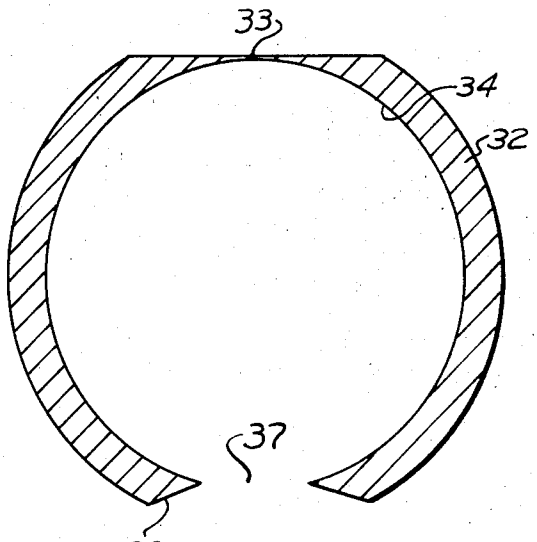




FIG. 5

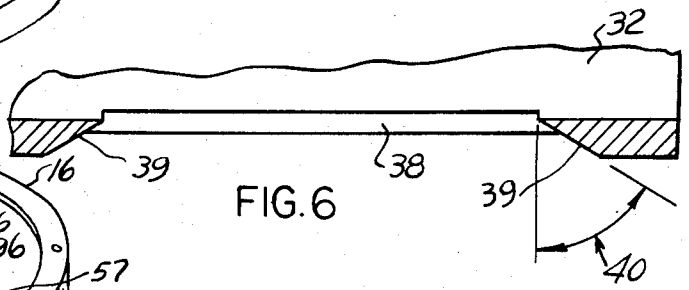



FIG. 6

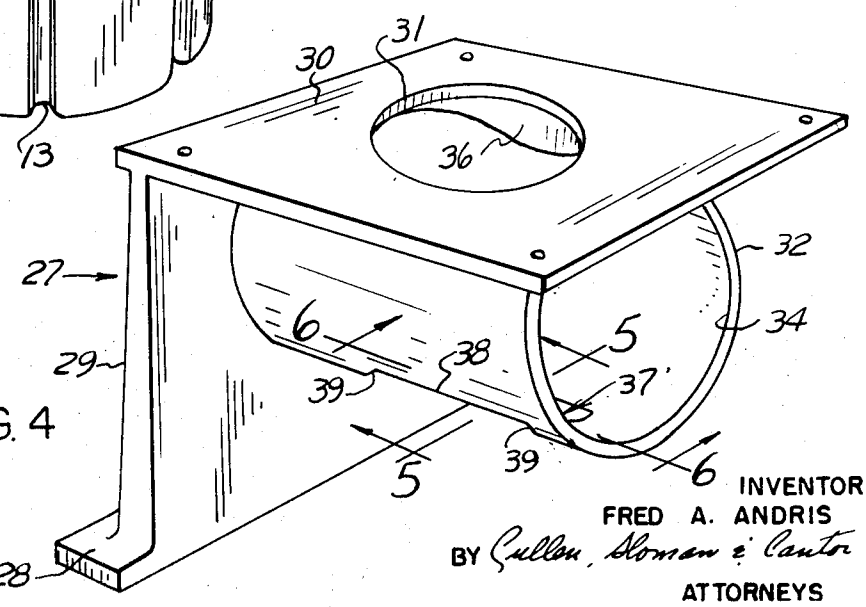



FIG. 4

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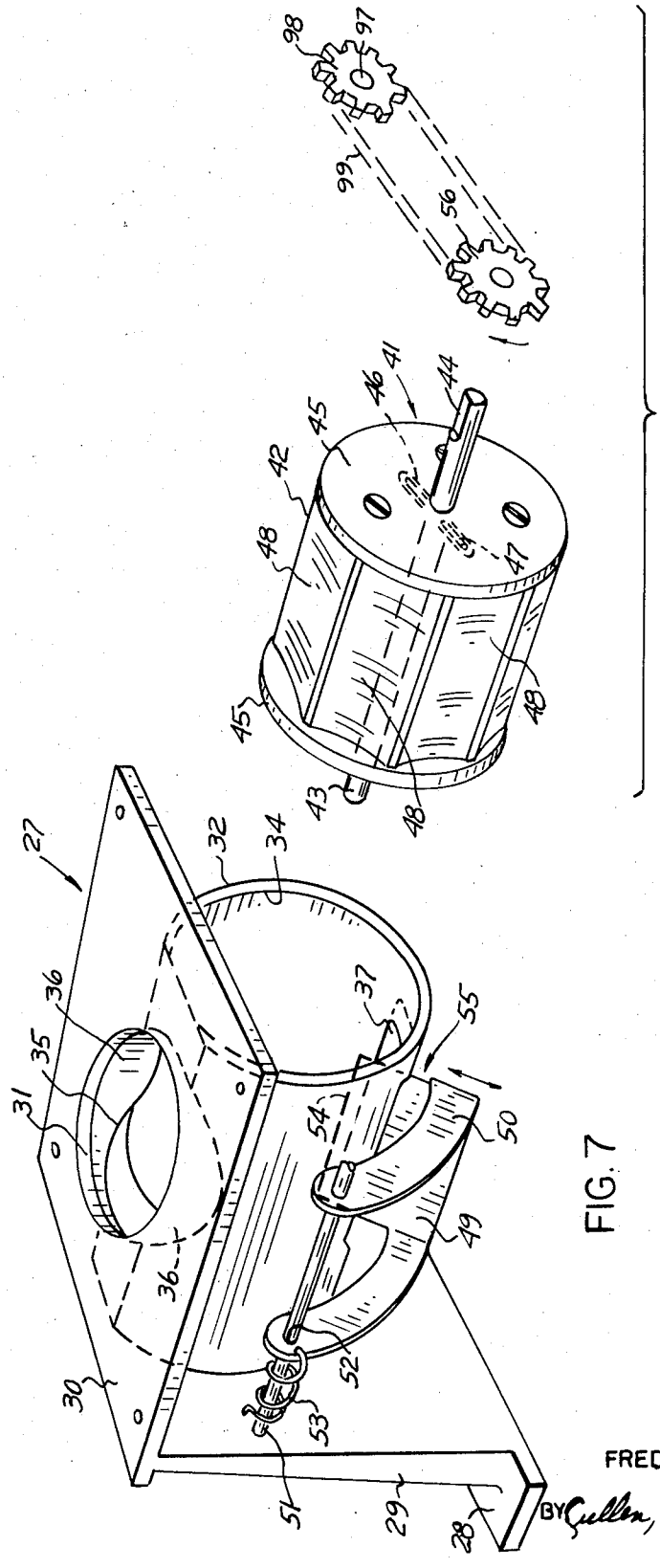



FIG. 8

FIG. 7

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FIG. 9

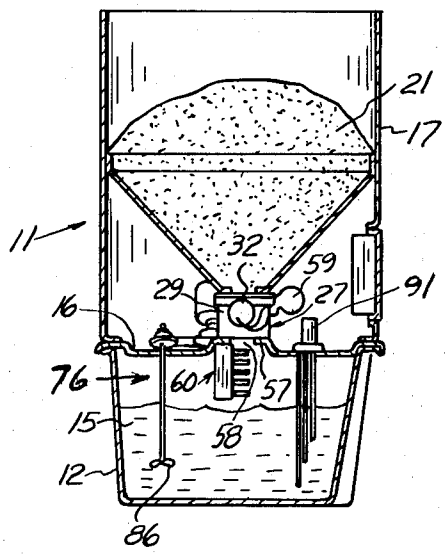



FIG. 10

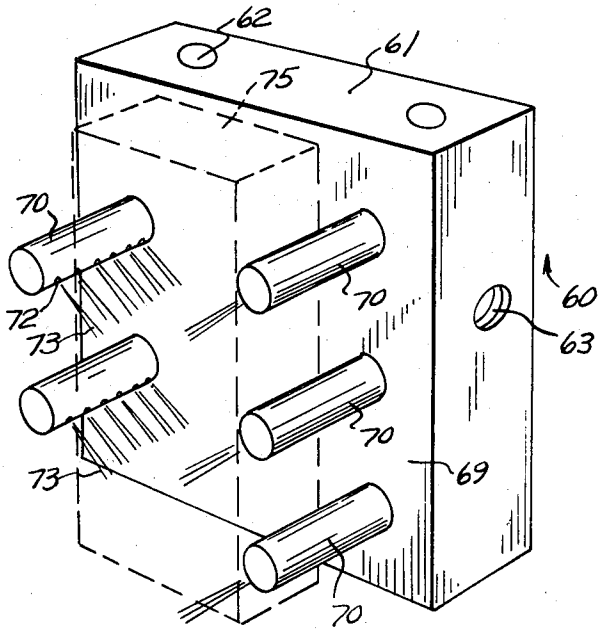
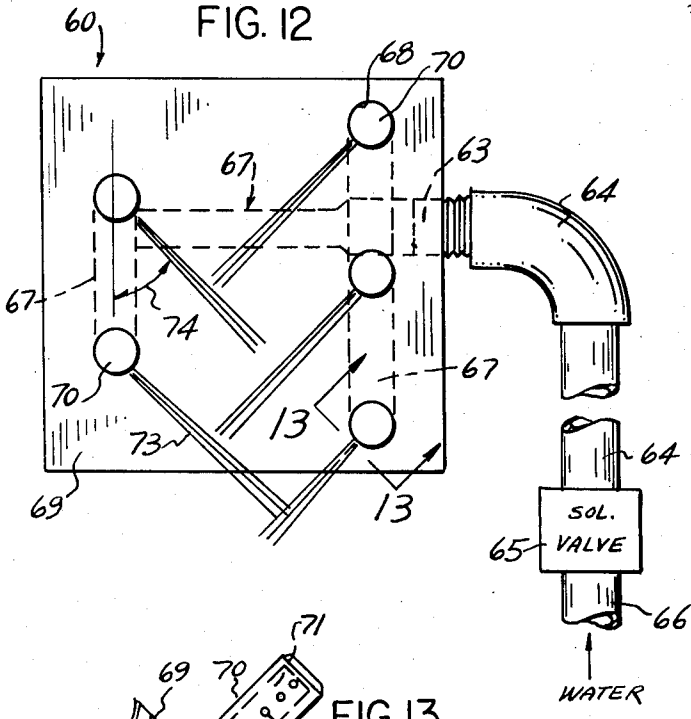



FIG. 12



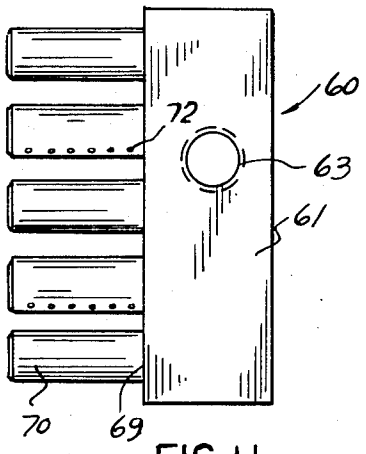




FIG. 11

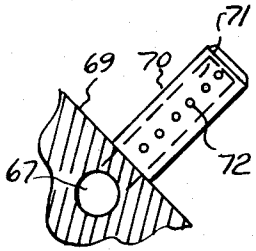



FIG. 13

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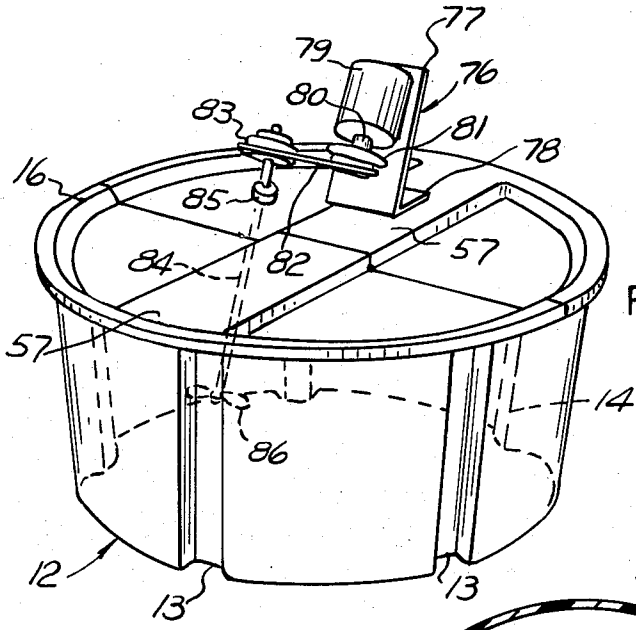



FIG. 14

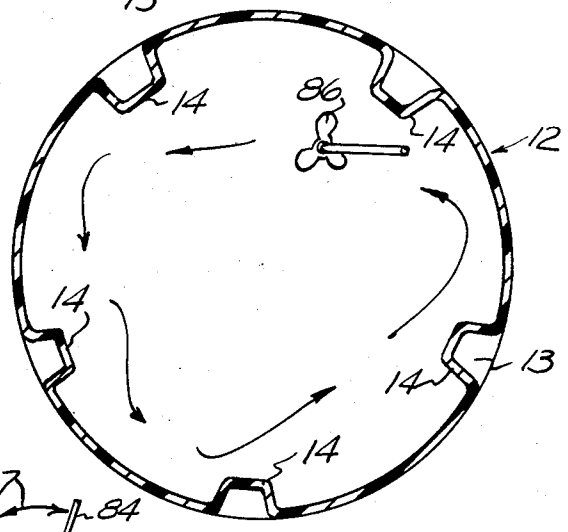



FIG. 16

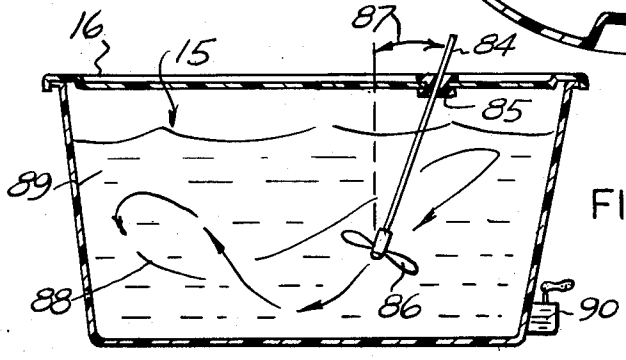



FIG. 15

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# AUTOMATIC VOLUMETRIC CHEMICAL MIXER

This is a continuation of U.S. Pat. application Ser. No. 865,009, filed Oct. 9, 1969, and now abandoned.

## BACKGROUND OF THE INVENTION

Heretofore, various mechanical devices have been provided for the purpose of mixing dry particulate chemicals or granular substances with water or other liquids for the primary object of producing homogenious solutions and wherein, considerable difficulty has been encountered in maintaining low costs and at the same time, production of efficient and homogenious mixing with accuracy as to concentration.

Heretofore, some of the dry particulate chemicals such as the polymers have been found difficult to mix into certain liquids without very involved mechanism.

## BRIEF DESCRIPTION OF THE INVENTION

It is an object of the present invention to provide an improved automatic volumetric chemical mixer by which very accurate mixing of dry granular chemicals with liquids may be provided in an automatic manner.

It is another object to provide a volumetric chemical mixer which assures great accuracy in the feeding of dry chemicals into a tank in predetermined amounts for a given time element and at the same time, the introduction of liquids to be mixed therewith in predetermined quantities for a given time element to thus, provide highly accurate compositions and mixtures.

It is another object to provide in conjunction with accurate feed metering of the particulate chemical of an improved prewetting device for the chemical before it drops into the mixing tank and thus assure a more even and uniform dissolution of same in the tank in a continuous mixing operation assisted by power operated agitator.

It is another object to provide an improved automatic volumetric chemical mixer of a plastic material such as polyethelyne or the like inherently inert to most chemicals together with a novel constructional arrangement between the mixing tank and its cover and the support of the upper mounting shroud thereon together with the specific mounting of the feed metering mechanism and the prewetting mechanism all in conjunction with controls for providing accurate mixing of granular chemicals and liquids.

It is another object to provide in conjunction with the mixing tank a floatless electronic liquid level control for activating the feed cycle including liquid and granular chemical when a predetermined low level has been reached and to deactivate said feeding cycle when a predetermined high level has been reached.

These and other objects will be seen from the following specification and claims in conjunction with the appended drawings.

## THE DRAWINGS

FIG. 1 is a front perspective view of the present automatic volumetric chemical mixer.

FIG. 2 is an elevational section thereof on a slightly reduced scale.

FIG. 3 is a schematic exploded and perspective diagram illustrating the tank cover assembly and shroud.

FIG. 4 is a front perspective view of housing and mounting for the feed metering mechanism.



FIG. 5 is a fragmentary section taken in the direction of the arrows 5—5 of FIG. 4.

FIG. 6 is a fragmentary section taken in the direction of arrows 6—6 of FIG. 4.

FIG. 7 is a front perspective view illustrating the detail of the feed metering device and cam scraper.

Bracketed FIG. 8 is a perspective view of the feed metering rotor with associated power drive therefore.

FIG. 9 is an elevational section of the present volumetric mixer showing the relationship of the feed metering device, prewetting device and liquid level control and agitator.

FIG. 10 is a front perspective view on an increased scale of the prewetting device.

FIG. 11 is a end elevational view thereof on a reduced scale.

FIG. 12 is a front elevational view corresponding to FIG. 11.

FIG. 13 is a fragmentary section taken in the direction of arrows 13—13 of FIG. 12.

FIG. 14 is a front perspective view of the chemical mixing tank and agitator.

FIG. 15 is a side elevational view partly broken away for illustration.

FIG. 16 is a plan view thereof.

FIG. 17 is a schematic diagram illustrating the relation of the circuit with the components of the present chemical mixer.

## DETAILED DESCRIPTION OF THE INVENTION

Referring to the drawings, FIGS. 1, 2, and 3, the present automatic volumetric chemical mixer, generally designated at 11, includes the base tank 12 which has a series of upright corrugations 13 formed in the wall thereof for defining a plurality of substantially parallel fluid obstructing vanes 14, FIGS. 14 and 16.

Said tank provides solution chamber 15, FIGS. 2 and 9 protectively enclosed by the formed annularly flanged plastic cover 16.

Said tank and cover as well as the shroud and its cover, hereafter described, are also formed of a relatively inert plastic material; as for example, polyethelene. The hopper hereafter described and the hopper cover are also constructed of this relatively inert plastic material, for illustration.

Cylindrically shaped plastic shroud 17 at its lower edge, FIG. 3, has an annular inwardly directed apertured flange 18 for securing to the tank cover 16 by a series of fasteners 19.

Plastic hopper 20 is adapted to store a quantity of dry chemical particles as at 21, FIGS. 2 and 9; cooperates with the interior of said shroud; namely, the hopper extension 22 for the storage of such chemical material.

A suitable screen 23 overlies the upper open end of said shroud which is covered by the removable plastic cover 24, which is of the same construction as cover 16 for simplicity of manufacture and reduced cost.

Hopper 20 at its lower end includes a base plate 25, FIGS. 2 and 9, centrally apertured at 26 providing an outlet for the dry granular material into the feed mechanism generally indicated at 27, FIGS. 4 through 8.

## CHEMICAL FEED METERING DEVICE

Referring particularly to FIGS. 4, 5, 6, 7, 8, and 9, said feed mechanism includes a base flange 28 adapted for mounting and securing upon cover 16, FIGS. 2 and 9. Upright support plate 29 on said base flange terminates in the horizontally disposed top plate 30, FIGS. 4 and 7, which is adapted for cooperative retaining registry with respect to hopper bottom plate 25 so that the top plate aperture 31 is in registry with hopper outlet 26.

Cylindrically shaped feed metering housing 32 includes a top elongated flat portion 33 by which it is secured to the undersurface of top plate 30 and includes a corresponding aperture 35 adapted for registry with top plate aperture 31.

Metering housing 32 has a cylindrical bore 34 which communicates with aperture 31 and the intermediate connector part 36 which is in the form of a partial cylinder for providing a smooth connection and passageway for the dry materials passage down through aperture 31 and inlet 35 and into the interior of housing 32.

Upon the bottom surface of said housing, there is provided an elongated generally rectangular orifice 37 which along its sides is angularly chamferred downwardly and outwardly at 38 and at its ends angularly chamferred downwardly and outwardly at 39.

The chamfer angle in the illustrative embodiment is designated at 40, FIG. 6, and is in the range of approximately 15° to 75°. It is contemplated that this chamfer angle may vary as desired. The chamfer angle prevents a build up of residue chemicals which, otherwide, could restrict the flow of material flowing through metering housing 32. Enough metal must remain upon the housing at the orifice to avoid accessive wear. By avoiding such wear accurate metering of chemicals is assured.

It is contemplated, therefore, that the chamfer angle as designated at 38 and 39 could vary within the range of 15 to 75 degrees approximately.

The measuring rotor rotatively nested within housing 32 is preferably of cast aluminum, for illustration, and is designated generally at 41. The rotor includes body portion 42 with drive axle 43 journaled through a portion of the support plate 29 at one end and at its other end suitably journaled and having a drive end 44, FIG. 8, adapted to receive, for example, sprocket gear 56. This could be replaced by other drive means, such as a pulley or the like.

The rotor includes circular end plates 45 secured to the respective ends of the body portion 42 by suitable fasteners as shown in FIG. 8.

In the illustrative embodiment, shear pin 47 extends transversely through axle 43 and nests within a transverse slot 46 in the body portion 42 and is retained therein on assembly by the securing of the forward most end plate 45.

A series of generally rectangular and elongated concavities 48, concave in cross section are angularly related and formed into the exterior surface of the body portion of said rotor, FIG. 8, and are adapted to receive measured quantities of particulate granular chemical material.

In the illustrative embodiment, all of the cavities together have a capacity to hold, when full, 3 cubic inches of chemical material, keeping in mind that the rotor fits snugly, yet rotatively within feed metering housing 32.

As a part of the feed metering device, there is shown, FIG. 7, an elongated rectangular cam scraper 49 which forms an extension at the ends of a pair of parallel support arms 50 pivotally mounted at 52 upon pivot shaft 51 which projects from housing support plate 29. The purpose of the scraper is to clean out each cavity successively.

Coil spring 53 is shown schematically upon shaft 51 and bearing against scraper support arm 50; normally biasing the scraper plate 49 so as to movably project within housing orifice 37 for constant engagement with the cavity defining walls of body portion 42.

Particularly, the inner edge of the cam scraper 49 is adapted to register within the respective cavities 48 as the rotor 42 slowly rotates under power for the purpose of assuring removal from the respective cavities of the stored chemicals therein as each cavity is presented to the said scraper. Accordingly, scraper plate 49 has a forwardly arranged scraper edge 54 shown in FIG. 7 which is biased inwardly at all times so as to stay in contact with exterior surface portions of the metering rotor 42 and the metal thereof which forms the walls of the individual cavities 48.

FIG. 7 designates by double headed arrow the fact that during rotation of the rotor 42, the cam scraper 49 is continually moving inwardly and outwardly.

55 in FIG. 7 designates the angle attack of the scraper plate 49 which is arranged as shown in the drawing so as to prevent a build up of chemical residue during continuous power rotation of the rotor 42 within its housing 32. It is, therefore, important that there be a reasonable tolerent fit between said rotor within its housing to thus, assure precise volumes of chemical being delivered outwardly of the orifice 37.

With respect to FIGS. 7 and 8, it would appear that the rotor 42 assembled within said housing would be adapted for rotation, preferably in a clockwise direction. It is contemplated that under some circumstances, rotation may be counterclockwise.

In the illustrative embodiment of the invention the scraper angle of attack is approximately 45°, though this could be varied in the area between 15° and 75° for illustration; similarly, to the possible variation of chamfer angle at 38 and 39 and 40, FIGS. 5 and 6.

The scraper plate 49 cooperatively registers with portions of the chamferred walls which define orifice 37 and in normal operation, the forward edge 54 of said scraper plate projects into the bore 34 of said housing for cooperative engaging and operative registry with the respective cavities 48.

The central and thickened portion of the cover 16 is designated at 57 as a cover plate body for increased strength and is suitably apertured as at 58, FIG. 9, to permit the passage of chemicals through the cover and down into the tank chamber.

A suitable power operated or electronic vibrator 59, FIG. 9, is applied to the exterior of the feed metering assembly 27 to assist in the flow of the dry granular material therethrough.

Accordingly, with the present vibrator operating during the cycle of the machine, there will be a uniform flow of dry granular material into and through the feed metering device regardless of the extent to which the

hopper is filled with dry material as shown at 21, FIG. 9.

## PREWETTING MECHANISM

The present prewetting mechanism, generally indicated at 60, FIG. 9 and shown in detail in FIGS. 10, 11, 12 and 13 includes a block 61, preferably of a plastic material, such as lucite, which in the illustrative embodiment, happens to be transparent, and which includes a pair of interiorly threaded apertures 62 by which it is conveniently and fixedly secured to the undersurface of the central support portion 57 of cover 16 directly below the feed metering assembly as shown in detail in FIG. 9.

Said block is provided with a suitable water inlet 63, FIG. 12, adapted to receive a conduit and associated fitting as at 64 which connects with the solenoid controlled valve 65, FIG. 3 and FIG. 12. Said valve includes a suitable water inlet 66 to which city water is supplied at a pressure of 20 to 45 pounds per square inch. Normal pressure is approximately 25 to 35 pounds per square inch.

Said valve, available on the market, is constructed for presetting to assure, regardless of pressure of water or other liquid, a flow of, for example, 3 gallons per minute, in the present embodiment. The valve could be set for any other desired flow for a particular feed of chemicals.

The prewetting support block 61 includes formed upon its interior a manifold 67 generally of H-shape, for illustration, terminating in a plurality of spaced outlets 68 which extend through the front face 69 of said block and are arranged in at least a pair of parallel spaced rows as best shown in FIG. 12.

A series of parallel spaced spray heads 70 of cylindrical form and having a suitable bore 71 are projected into the respective outlets 68 and secured therein for communication with the liquid manifold 67.

Each of the spray heads 70 has formed therethrough on one side thereof a row of longitudinally spaced jet outlets 72 which are normally inclined angularly inward and downward to provide angular sprays of intersecting character as shown at 73, FIGS. 10 and 12 in order to bracket and to uniformly apply prewetting solution at a predetermined angle of attack 74 so as to inercept the falling path of particulate chemicals designated by diagram at 75, FIG. 10.

Accordingly, the orifice 37 for the feed metering device is in such registry with the prewetting device that the particulate chemical will fall in the elongated pattern 75, rectangular in cross section, between the respective rows of spray heads 70 for a uniform prewetting of the chemical materials.

In the illustrative embodiment, the angle of attack is approximately 45° inwardly and downwardly for a uniform prewetting. It is contemplated that whereas the jets would be less effective if horizontally disposed or vertically disposed, there is an area between these two ranges where the angle of attack could be varied between the range, for example, of 15° to 75° for illustration to provide for the most efficient prewetting of the chemical as it drops past the prewetting device down into the solution chamber 15, FIGS. 2 and 9.

## AGITATOR

Once the measured chemical material has dropped through the prewetting device and down into the tank chamber 15 to form a homogenious solution, this is assured and completed by the use of the power operated agitator 76 shown generally in FIG. 9 and in detail in FIGS. 14, 15 and 16.

The agitator includes a suitable bracket 77 with anchor 78 mounted on to the reinforced portion 57 of cover 16 and secured thereto and holding electric motor 79 whose output shaft 80 mounts a suitable pulley 81 to drive belt 82.

Secondary pulley 83 is secured to agitator shaft 84 which extends through suitable bearings 85 on said cover and terminates at its lower end in the impeller or paddle 86. Belt 82 interconnects variable speed pulleys 81–83.

In the illustrative embodiment, the impeller shaft 84 extends downwardly at an acute angle forwardly and outwardly with respect to X and Y coordinates and is so disposed as to be located adjacent the interior wall of the tank and off center therefrom as best shown in FIGS. 15 and 16.

The impeller is adapted for power rotation within the range of 575 to 1,800 R.P.M. as desired. In the case of mixing polymers, a slower agitation or rotation is contemplated within the range of 600 R.P.M. to 1,200.

While the angle of attack of shaft 84 is shown at 87 as approximately 28° with respect to the vertical, extending forwardly and laterally outward, it is contemplated that this angle may be modified in the range of about 28° to 40°, approximately, depending upon the particular mixing problem, ie whether readily dissolvable chemicals are employed or chemicals which do not readily dissolve, such as some of the polymers.

The arrangement of the impeller or agitator 86 in cooperation with the inwardly directed vanes 14 which normally obstruct uniform movement, provides a motion path as designated at 88, FIG. 15 for the solution 89 of water and chemical.

While the angle of attack of impeller shaft 84 is variable as desired for a particular job, the speed of rotation is also variable, using multiple pulleys shown schematically in FIG. 14.

Adjacent to lower end of the tank 12, is a suitable outlet 90 for the delivery of the chemical solution which may be controlled by a suitable valve which may be manual or controlled by a suitable timer for regulating the flow of chemical solution for a particular usage.

## LIQUID LEVEL CONTROL

The present volumetric chemical mixer is rendered automatic in its operation by employing a floatless liquid level control generally indicated at 91, FIGS. 2, 3, and 9 which includes a holding coil and relay generally designated at 107, FIG. 17.

The detail of construction of the electronic liquid level control is not repeated since such devices are available on the market. Suffice it to explain that the control includes ground probe 92, low level probe 93 and high level probe 94, the said probes 93 and 94 controlling the electronic holding coil and relay which forms a part of the electrical circuit for controlling the operating cycle; namely, the feeding of prewetting fluid

and the simultaneous feeding of measured chemicals, as hereafter explained.

Accordingly, in operation, when the fluid within chamber **15** reaches minimum low level such as is half full so that low level probe **93** is out of contact with the fluid, the cycle of operation is automatically activated. On the other hand, during the operation of the cycle when the liquid within the solution chamber comes into engagement with the high level probe **94**, the cycle will be automatically deactivated.

## POWER DRIVE FOR FEED METERING DEVICE

In conjunction with the diagram of FIG. **17**, and as shown in FIGS. **2** and **3**, there is provided a suitable DC electric motor **95** which is mounted upon cover **16**, through a reducer **96** of conventional construction and its output shaft **97**, drives a sprocket **98**, which could be a pulley and said sprocket in turn through chain **99**, FIG. **8**, is in driving engagement with the sprocket **56** upon the rotor shaft **43**.

As shown in the control panel and diagram designated at **100**, FIG. **17**, there is included an "off" and "on" switch **101** connected to a source of AC power, such as 115 volts.

There is also provided a switch **102** for activating the agitator or mixer motor **79** and a third manual switch **103** for activating the feed cycle which includes operation of the motor drive for the feed metering device as well as the activation of the solenoid controlled valve **65** to permit the flow of measured quantities of water into the prewetting device.

Upon the panel there is provided a manually operable rheostat **104** which functions in conjunction with a solid state rectifier **105** for delivering variable DC current to the motor **95** schematically shown for providing an effective and efficient control to the speed of operation which is a characteristic of DC motors through the simple operation of the manual controlled rheostat of FIG. **17**.

A suitable timer **106** is provided as a part of the arrangement which may be employed in conjunction with the cycle for deactivating the same if desired in an automatic manner.

The control valve **65**; namely, the solenoid control valve of FIGS. **3** and **17** also includes a low pressure switch **108** connected into the circuit so that should there be a falling off of fluid pressure, the entire operating cycle may be deactivated and at the same time, the buzzer **109**, energized to thus give a signal. By this construction, should there be a failure of the water supply, the complete cycle and all mechanism is shut down until the water supply has been reestablished.

## OPERATION

The operation of the present automatic chemical mixer is particularly clear with respect to FIG. **17** wherein with buttons **101**, **102** and **103** activated, the mixer continuously is operating; namely, the agitator **86** as is also the vibrator **59**.

The cycle is initiated so that the motor **95** driving the feed metering device is started and continues at a predetermined speed, depending upon the setting of the rheostat **104** and at the same time, the solenoid control valve **65** is opened to permit the flow of predetermined water or other liquid into the prewetting device. Accordingly, the material accurately measured, drops from the measuring device through the prewetting device and into the tank for further mixing in a solution to provide a uniform consistency which mixing continues using the agitator as above described.

All liquids from the source **66**, FIG. **17**, pass through the preset flow regulating valve **65**, and through the prewetting device **60** and through cover aperture **58** down into tank chamber **15**.

Solenoid operated valve **65** is also connected to the electronic liquid level control **91**. Chamber **15** is normally maintained one-half full, outletting at **90**, FIG. **15**. If the fluid solution level is below low level probe **93**, the cycle is automatically activated and will automatically deactivate when the chamber refills until the fluid in said chamber contacts high level probe **94**.

Thus, if the fluid is between these two levels, the level control **91** is operative to maintain solenoid operated control valve **65** open. Should there be a water supply failure, or a fall off of pressure below the designed limits of the mixing device, low pressure responsive switch **108**, FIG. **17** will de-energize the liquid level control circuit and actuate buzzer **109**.

Timer **106**, FIG. **17** may be connected into the circuit to preset the period of automatic operation of the mixer, and cause automatic turn off.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

**1.** In an automatic volumetric chemical mixer; a base tank having a solution chamber adapted to receive and mix liquids, and having an outlet; a removable cover on said tank; a power operated mechanical agitator mounted on said cover and extending into the liquid within said chamber; an electronic liquid level control mounted on said cover including low and high level probes extending into said chamber; and having control means to initiate and deactivate the fluid feed and chemical feed cycle; an upright open ended cylindrical shroud overlying said cover and secured thereto; a hopper within said shroud merging with its interior at one end and having an apertured outlet plate at its lower end spaced above said cover; adapted to hold a dry chemical; a power operated feed metering mechanism mounted on said cover intermediate and secured to said cover and outlet plate for delivering predetermined quantities of dry chemical to drop through a corresponding aperture in said cover and into said chamber; a prewetting device secured to and depending from said cover and being in the path of fall of said dry chemicals; adapted for connection to a source of liquid under pressure and to deliver a spray of liquid into the path of said falling dry chemicals for uniform prewetting thereof; a preset liquid flow control valve connected to a source of liquid under pressure for delivering a predetermined volume of liquid per minute; a conduit interconnecting said valve and said prewetting device; and a circuit interconnecting an electric power source with said feed mechanism, agitator and said liquid level control.

**2.** In the chemical mixer of claim **1**, an electronic vibrator on and connected to said feed metering mechanism to assure uniform flow of dry chemical material into said feed metering mechanism regardless of the amount of dry chemicals stored in said hopper and shroud.

3. In the chemical mixer of claim 1, there being a series of spaced upright inwardly directed corrugations formed in said tank defining a series of fluid obstructing vanes upon the interior of said chamber cooperating with said agitator for providing a homogeneous solution of chemical and liquid in a continuous mixing operation.

4. In the chemical mixer of claim 1, said agitator including a bracket mounted motor on said cover; a shaft journaled through said cover and extending at acute angles on X and Y coordinates to the vertical; and an impeller blade on said shaft normal thereto and located adjacent the tank wall for swirling the solution in said chamber and agitating the same.

5. In the chemical mixer of claim 4, there being a series of spaced upright inwardly directed corrugations formed in said tank defining a series of fluid obstructing vanes upon the interior of said chamber cooperating with said agitator for providing a homogeneous solution of chemical and liquid.

6. In the chemical mixer of claim 4, said acute angle being in the range of about 25° to 40° approximately.

7. In the chemical mixer of claim 1, said liquid level control means including a holding coil and relay in said circuit adapted to initiate the cycle when the low level probe is out of contact with the solution and to deactivate the cycle when the high level probe is in contact therewith.

8. In the chemical mixer of claim 1, said shroud having an apertured inwardly directed annular flange at its lower end in registry with said cover; and fasteners interconnecting said flange and cover.

9. In the chemical mixer of claim 1, said feed metering mechanism including an upright support plate on and secured to said cover; a centrally apertured top plate extending from the support plate in registry with and connected to said hopper outlet plate with their apertures in registry; a cylindrical metering housing underlying and secured to said top plate having a top inlet and a bottom outlet orifice; and a power rotor slidably and rotatably nested in said housing and having in its outer periphery throughout its length a series of uniform angularly related particle receiving and measuring cavities, adapted on rotation for delivering predetermined quantities of dry chemical through said orifice.

10. In the chemical mixer of claim 9, said rotor cavities being of elongated rectangular shape in plan; said orifice being of similar shape adapted to receive a mass of falling chemical particles in a corresponding cross sectional shape.

11. In the chemical mixer of claim 10, the metering housing adjacent said orifice at its sides and ends being chamferred downwardly and outwardly at an acute angle to prevent residue building up and subsequent restriction of material flow through said orifice.

12. In the chemical mixer of claim 11, said chamfer angle being in the range of about 15° to 75° approximately.

13. In the chemical mixer of claim 9, an elongated scraper cam plate pivotally mounted upon said feed metering mechanism and adapted to movably extend through said orifice throughout its length into and cam against the bottom surfaces of the cavities respectively as the rotor rotates; and spring means continuously urging said scraper plate into sweeping engagement with said rotor.

14. In the chemical mixer of claim 9, a drive shaft projected axially through said rotor journaled on said support plate; and at one end projected from said feed meter housing adapted for connection to a power drive for rotation at a uniform predetermined rate.

15. In the chemical mixer of claim 14, a shear pin extending transversely through said shaft and nested and mounted within said rotor.

16. In the chemical mixer of claim 1, said prewetting device including a block secured to said cover and having therein a liquid manifold, an inlet and an upright front face spaced just rearwardly of the path of falling dry chemicals; there being a series of variably spaced outlets in a pair of spaced rows extending into said front face to said manifold; and a corresponding series of parallel elongated cylindrically shaped heads secured in said outlets and projecting from said front face; said rows of heads being upon opposite sides of said path of falling dry chemicals; and a series of longitudinally spaced jet outlets formed in said heads along their length extending downwardly and inwardly at an acute angle to homogeneously prewet the falling dry granular chemicals.

17. In the chemical mixer of claim 16, the angle of attack of said water jets being in the range of about 15° to 75° approximately.

18. In the chemical mixer of claim 16, the angle of attack of said water jets being approximately 45°.

19. In the chemical mixer of claim 1, a solenoid control for said flow control valve; a low pressure switch in said circuit adapted to interrupt the cycle of operation upon an appreciable fall of water pressure supply; and an audible or visible signal in said circuit connected to said switch.

20. In the chemical mixer of claim 1, said feed metering mechanism including a DC motor drive; a control rheostat to regulate the speed of rotation of said motor, and a rectifier in said circuit connected to said rheostat.

21. In an automatic volumetric chemical mixer; a tank having a solution chamber adapted to receive and mix liquids, and having an outlet; a removable cover on said tank; a power operated agitator extending into the liquid within said chamber; a liquid control low and high level control extending into said chamber having control means to initiate and deactivate the fluid feed and chemical feed cycle; a housing including a hopper having an outlet and adapted to hold a dry chemical; a power operated feed metering mechanism below and in communication with said hopper outlet, for delivering predetermined quantities of dry chemical to said chamber; a prewetting device within said chamber above the liquid therein in the path of said chemicals adapted for connection to a source of liquid under pressure and to deliver a spray of liquid into the path of said falling dry chemicals for uniform prewetting thereof; a preset liquid flow control valve adapted for connection to a source of liquid under pressure for delivering a predetermined volume of liquid per minute to said prewetting device; and an electric circuit adapted to connect a power source to said feed mechanism, agitator, liquid level control, and said flow control valve.

22. In the chemical mixer of claim 21, there being a series of spaced upright inwardly directed corrugations formed in said tank defining a series of fluid obstructing vanes upon the interior of said chamber cooperating

with said agitator for providing a homogeneous solution of chemical and liquid.

23. In the mixer of claim 21, said liquid level control including a holding coil and relay and high and low level probes connected into said circuit adapted to automatically initiate the cycle at low level of fluid in said chamber and deactivate the cycle at high level.

24. In the mixer of claim 21, said feed metering mechanism including an upright support plate on and secured to said cover; a centrally apertured top plate extending from the support plate in registry with and connected to said hopper outlet plate with their apertures in registry; a cylindrical metering housing underlying and secured to said top plate having a top inlet and a bottom outlet orifice; and a power rotor slidably and rotatably nested in said housing and having in its outer periphery throughout its length a series of uniform angularly related particle receiving and measuring cavities, adapted on rotation for delivering predetermined quantities of dry chemical through said orifice.

25. In the mixer of claim 24, an elongated scraper cam plate pivotally mounted upon said feed metering mechanism and adapted to movably extend through said orifice throughout its length into and cam against the bottom surfaces of the cavities respectively as the rotor rotates; and spring means continuously urging said scraper plate into sweeping engagement with said rotor.

26. In the mixer of claim 21, said prewetting device including a block secured to said cover and having therein a liquid manifold, an inlet and an upright front face spaced just rearwardly of the path of falling dry chemicals; there being a series of variably spaced outlets in a pair of spaced rows extending into said front face to said manifold; and a corresponding series of parallel elongated cylindrically shaped heads secured in said outlets and projecting from said front face; said rows of heads being upon opposite sides of said path of falling dry chemicals; and a series of longitudinally spaced jet outlets formed in said heads along their length extending downwardly and inwardly at an acute angle to homogeneously prewet the falling dry granular chemicals.

27. In the mixer of claim 21, a solenoid control for said flow control valve; a low pressure switch in said circuit adapted to interrupt the cycle of operation upon an appreciable fall of water pressure supply; and an audible or visible signal in said circuit connected to said switch.

28. In the chemical mixer of claim 21, a timer for controlling said agitating means.

29. In the chemical mixer of claim 28, said timer being operable to preset a period of automatic operation of said agitating means and cause automatic turn off thereof.

30. In an automatic volumetric chemical mixer, a base tank having a solution chamber adapted to receive and mix liquids, and having an outlet; a removable cover on said tank apertured to receive therethrough fluids and dissolvable chemicals; an upright open ended cylindrical shroud overlying said cover and secured thereto; a hopper within said shroud merging at its upper end with the shroud and having an apertured outlet plate at its lower end spaced above said cover aperture; adapted to hold a dry chemical for feeding into said tank; and a power operated feed metering mechanism mounted on said cover intermediate and secured to said cover and outlet plate for delivering predetermined quantities of dry chemical to drop through the cover aperture into said chamber.

31. In an automatic volumetric chemical mixer having a base tank adapted to receive and mix liquids and having an outlet; removable cover on said tank; an upright open ended shroud mounted over said cover and secured thereto; a hopper in said shroud having an apertured outlet plate at its lower end spaced above said cover, and adapted to hold a dry chemical; a power operated feed metering mechanism mounted on said cover intermediate said cover and outlet plate and secured thereto for delivering predetermined quantities of dry chemical to drop through a cover aperture into said chamber; said feed metering mechanism including an upright support plate on and secured to said cover; a centrally apertured top plate extending from the support plate in registry with and connected to said hopper outlet plate with their apertures in registry; a cylindrical metering housing underlying and secured to said top plate having a top inlet and a bottom outlet orifice; and a power rotor slidably and rotatably nested in said housing and having in its outer periphery throughout its length a series of uniform angularly related particle receiving and measuring cavities, adapted on rotation for delivering predetermined quantities of dry chemical through said orifice.

32. In the automatic chemical mixer of claim 31, said rotor cavities being of elongated rectangular shape in plan; said orifice being of similar shape adapted to receive a mass of falling chemical particles in a corresponding cross sectional shape.

33. In the automatic chemical mixer of claim 31, an elongated scraper cam plate pivotally mounted upon said feed metering mechanism and adapted to movably extend through said orifice throughout its length into and cam against the bottom surfaces of the cavities, respectively, as the rotor rotates; and spring means continuously urging said scraper plate into sweeping engagement with said rotor.

34. In the automatic chemical mixer of claim 31, a drive shaft projected axially through said rotor journaled on said support plate; and at one end projected from said feed meter housing adapted for connection to a power drive for rotation at a uniform predetermined rate.

35. In the automatic chemical mixer of claim 34, a shear pin extending transversely through said shaft and nested and mounted within said rotor.

36. In an automatic volumetric chemical mixer having a base tank adapted to receive and mix liquids and having an outlet; removable cover on said tank; an upright open ended shroud mounted over said cover and secured thereto; a hopper in said shroud having an apertured outlet plate at its lower end spaced above said cover, and adapted to hold a dry chemical; a power operated feed metering mechanism mounted on said cover intermediate said cover and outlet plate and secured thereto for delivering predetermined quantities of dry chemical to drop through a cover aperture into said chamber; a prewetting device secured to and depending from said cover and being in the path of fall of

said dry chemicals; adapted for connection to a source of liquid under pressure and to deliver a spray of liquid into the path of said falling dry chemical for uniform prewetting thereof, said prewetting device including a block secured to said cover and having therein a liquid manifold, an inlet and an upright front face spaced just rearwardly of the path of falling dry chemicals; there being a series of variably spaced outlets in a pair of spaced rows extending into said front face to said manifold; and a corresponding series of parallel elongated cylindrically shaped heads secured in said outlets and projecting from said front face; said rows of heads being upon opposite sides of said path of falling dry chemicals; and a series of longitudinally spaced jet outlets formed in said heads along their length extending downwardly and inwardly at an acute angle to homogeneously prewet the falling dry granular chemicals.

37. In the chemical mixer of claim 36, the angle of attack of said water jets being in a range of about 15° to 75° approximately.

38. In the chemical mixer of claim 36, the angle of attach of said water jets being approximately 45°.

39. Mixing apparatus comprising: a tank, a hopper for containing non-liquid material; feed metering means for delivering non-liquid material from said hopper to said tank at a predetermined rate; prewetting means connected with a source of liquid for delivering liquid to said tank and for prewetting the non-liquid material delivered from said hopper as the non-liquid material enters said tank; flow control means controlling the flow of liquid to said prewetting means and hence to said tank; agitating means in said tank for mixing liquid and non-liquid material received in said tank; and level sensing means controlling said flow control means and feed metering means; said level sensing means being operable when the liquid in said tank is at a predetermined low level to activate said flow control means and feed metering means, said level sensing means being operable when the liquid in said tank is at a predetermined high level to deactivate said flow control means and feed metering means.

40. Apparatus as claimed in claim 39 including a timer for controlling said agitating means.

41. Apparatus as claimed in claim 39 including a timer operable to preset the period of automatic operation of said agitating means and cause automatic turn off thereof.

42. Apparatus as claimed in claim 39 including a plurality of corrugations formed in the wall of said tank defining fluid obstructing vanes cooperating with said agitating means.

43. Apparatus as claimed in claim 39 wherein said feed metering mechanism comprises a support plate; a centrally apertured top plate extending from the support plate in registry with and connected to said hopper outlet plate with their apertures in registry; a cylindrical metering housing underlying and secured to said top plate having a top inlet and a bottom outlet orifice; and a power rotor slidably and rotatably nested in said housing and having in its outer periphery throughout its length a series of uniform angularly related particle receiving and measuring cavities, adapted on rotation for delivering predetermined quantities of dry chemical.

44. Apparatus as claimed in claim 39 wherein said prewetting means comprises a block having liquid manifold therein; and a plurality of spaced jet outlets for spraying non-liquid material being delivered from said hopper by said feed metering means.

45. Mixing apparatus comprising: a tank having a solution chamber defined therein; an agitator extending into said chamber for mixing material received therein; a hopper for containing dry chemical; feed metering mechanism operable to deliver dry chemical from said hopper to said solution chamber; prewetting means in said chamber in the path of dry chemical being delivered from said hopper for prewetting the dry chemical as it enters said chamber and for delivering liquid to said chamber; level sensing means operable to activate said feed metering mechanism and prewetting means when the liquid is at a predetermined low level in said chamber and operable to deactivate said feed metering means and prewetting means when the liquid in said chamber is at a predetermined high level; and means for automatically controlling the period of operation of said agitator.

46. Apparatus as claimed in claim 45 wherein said last named means comprises a timer operable to preset the period of operation of said agitator and cause automatic turn off thereof.

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