Oct. 10, 1967 H. HEGE 3,346,192

ATOMIZING APPARATUS

Original Filed Dec. 18, 1963 4 Sheets-Sheet 1

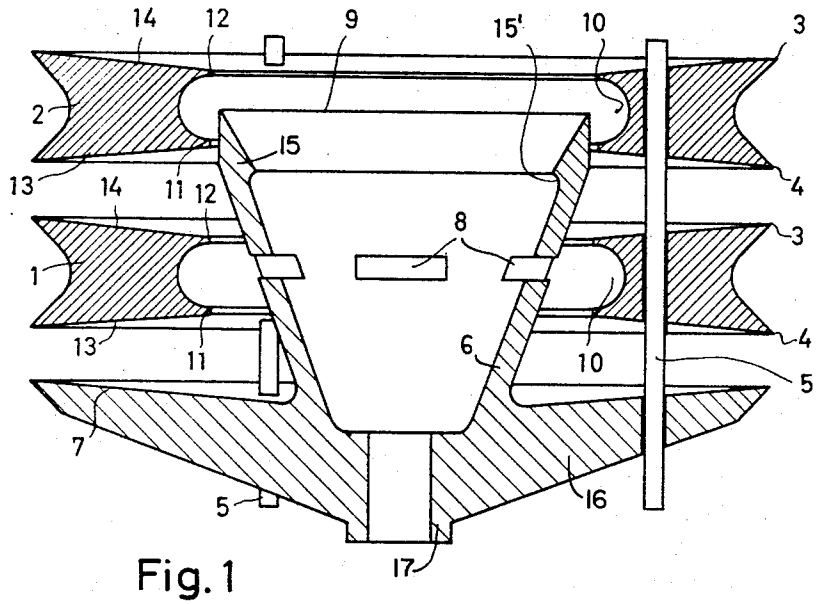


Fig. 1

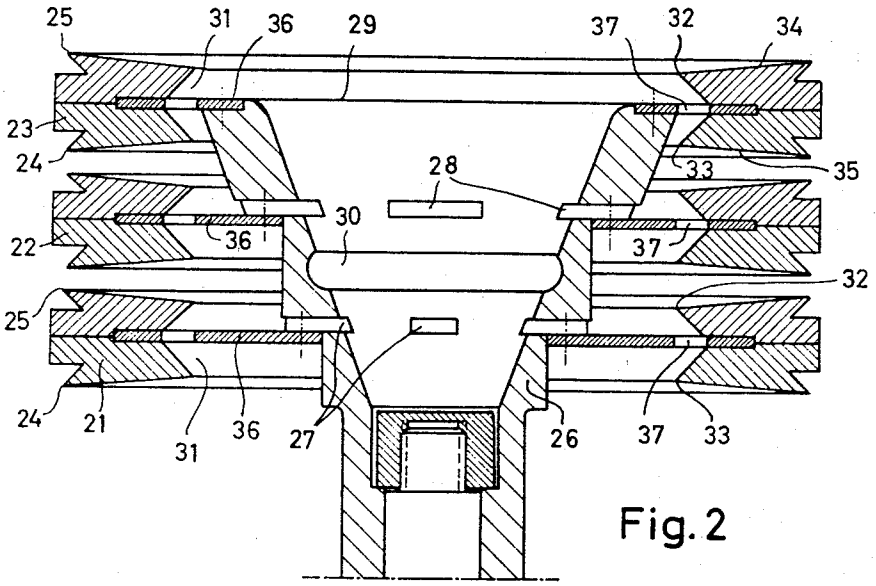


Fig. 2

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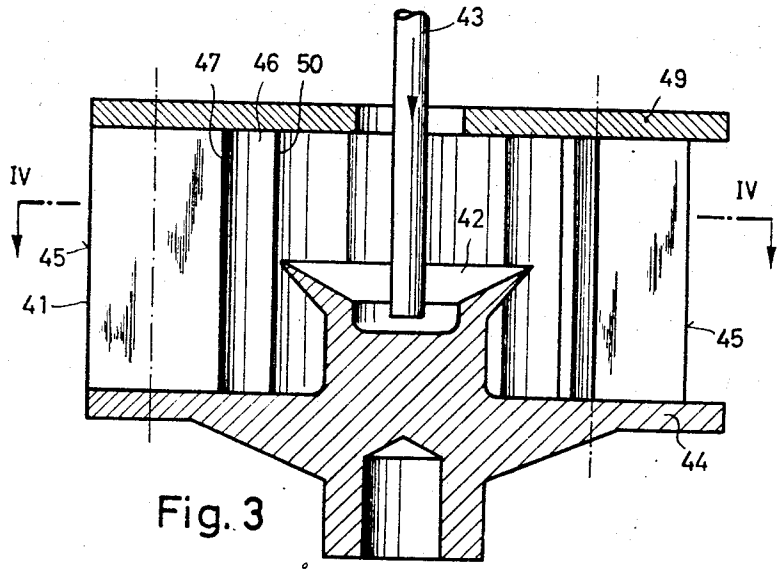


Fig. 3

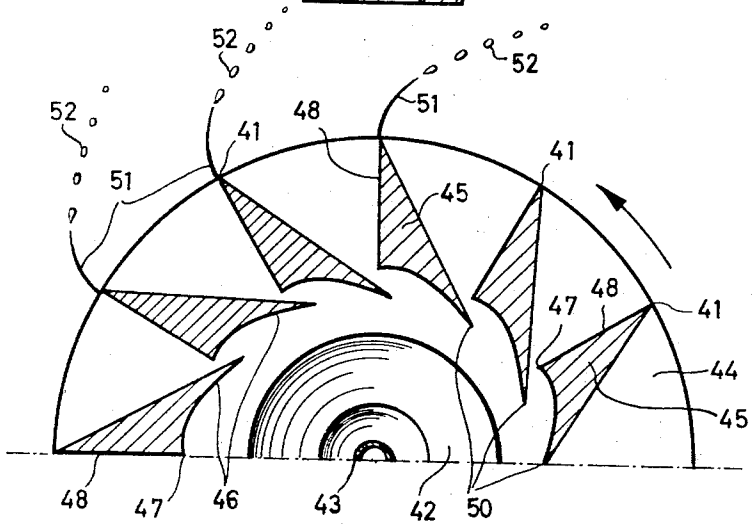


Fig. 4

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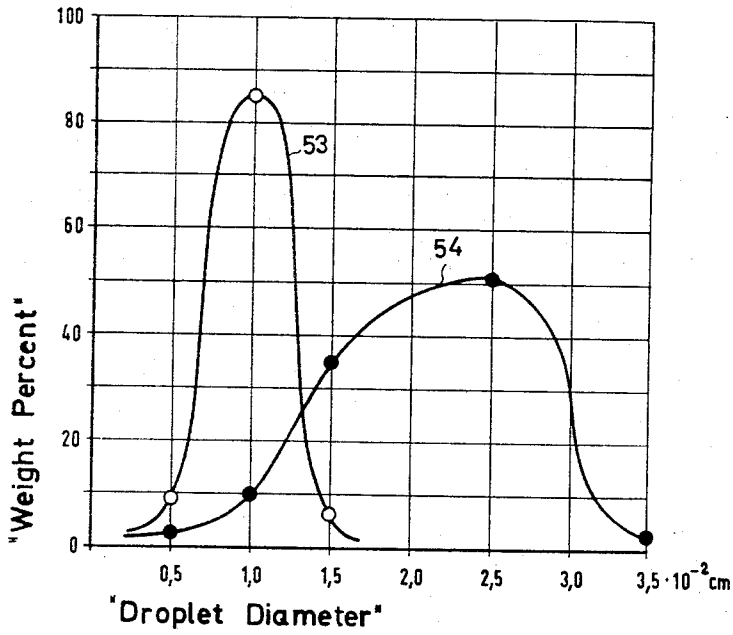


Fig. 5

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Fig. 6

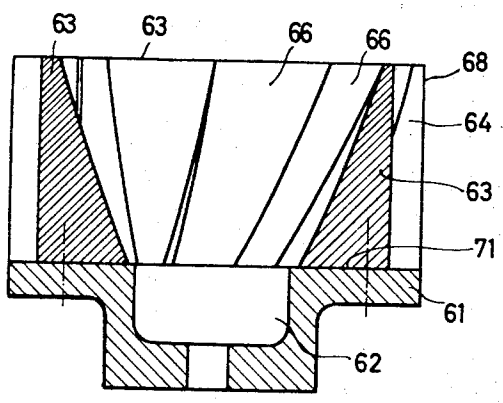


Fig. 7

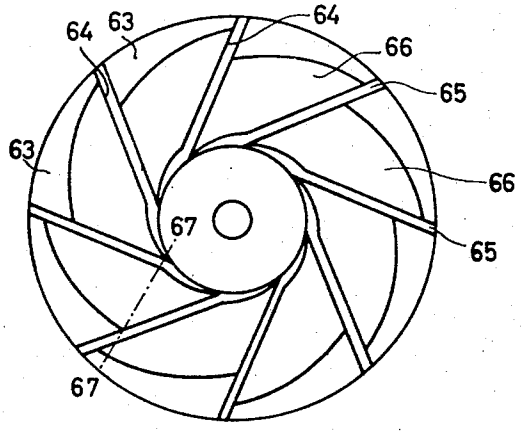
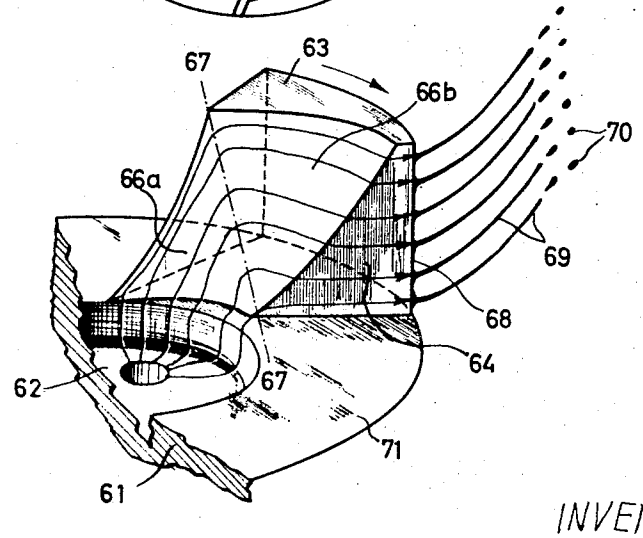


Fig. 8



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United States Patent Office 3,346,192
Patented Oct. 10, 1967

3,346,192

ATOMIZING APPARATUS

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Original application Dec. 18, 1963, Ser. No. 331,504, now Patent No. 3,250,473, dated May 10, 1966. Divided and this application May 6, 1966, Ser. No. 560,934
Claims priority, application Germany, Dec. 18, 1962, H 47,726
10 Claims. (Cl. 239—223)

This application is a division of my copending application Ser. No. 331,504 filed on Dec. 18, 1963, now Patent No. 3,250,473.

This invention relates to the atomization of a liquid film at a free edge of a rotating body, and more particularly to an atomizing apparatus which produces droplets of substantially uniform size.

The flow properties of a particulate solid produced by spray drying of a solution thereof are materially affected by the distribution of particle sizes in the dried product. Freest flow is achieved when the particles are of uniform size. Such particles can be obtained in the drying process only if the original droplets are of practically uniform size. Atomization of a liquid to form uniform droplets is also of advantage in the spraying of crops with solutions or dispersions of pesticides. A uniform droplet size makes the settling velocity of the pesticide fog uniform, thereby avoiding treatment of localized portions of the crop with an excess of pesticide. It is particularly important to avoid droplets exceeding a certain maximum size which tend to drop to the ground near the fogging apparatus.

Known atomizing devices rely on turbulence in a body of liquid for dispersing the liquid into a large number of droplets. The dimensions of the droplets produced are randomly distributed over a wide range according to the laws of probability.

It is known to atomize liquids by means of devices which rely upon contact of the liquid with a rapidly rotating rotor body, and such devices are frequently referred to as "centrifugal atomizers." Actually, such atomizers rely on centrifugal forces mainly for feeding a liquid stream to an orifice or free edge where turbulence is induced in the stream either by a sudden change in the configuration of a contacting solid surface or by frictional engagement with the ambient gaseous atmosphere. A broad spectrum of droplet sizes is produced. The maximum dimensions of the droplets are largely a function of relative velocity of the discharged liquid and of the atmosphere. It is not possible with the known devices to produce more than a small fraction of droplets within any one narrow range of dimensions.

The primary object of the invention is the dispersing of a body of liquid in a gaseous atmosphere in a multiplicity of substantially uniform droplets.

Another object is the elimination of turbulence in the liquid body during atomization.

An additional object is the atomization of a body of liquid to droplets of predictable and reproducible dimensions.

Other objects will become apparent as the disclosure proceeds.

I have found that a liquid can be thrown from the edge of a rotating body in the form of droplets by centrifugal forces alone in the absence of turbulence and independent of the friction of an ambient gas when the kinematic viscosity of the liquid is not higher than 0.03 cm.²/sec. Such droplets will be referred to hereinafter as primary droplets.

When the kinematic viscosity of the liquid is 0.05 cm.²/sec. or higher, a bead of the liquid first forms at the edge

of the rotating body, and the liquid can then be thrown from the edge by centrifugal forces alone in the shape of a string which reaches an ultimate length related to the viscosity of the liquid. The string has the approximate configuration of an evolvent of a circle before it distintegrates into droplets, hereafter referred to as secondary droplets.

I have found that the formation of primary and secondary droplets of very uniform dimensions is possible if the centrifugal acceleration applied to the liquid at the edge of a rotating body or rotor is related to the viscosity of the liquid in a critically important manner, and also depends on the rate at which liquid is fed or supplied to the edge.

Liquid flow to an atomizing edge cannot be controlled with the necessary precision unless the liquid is fed to the edge as a continuous film. The flow rate of the liquid in the film must be uniform, and all turbulence must be avoided. The thickness of the film should be as uniform as possible. The rotary speed of the body from which the liquid is to be thrown off must be sufficiently high to produce the necessary centrifugal forces, but it should be low enough to eliminate atomization by the influence of surounding air, and to avoid breaks in the film flowing toward the edge.

I have found that dispersion of a liquid from a free edge of a rotor can be controlled by the rotary speed of the rotor and the feeding rate of the liquid. If the viscosity of the liquid, the dimensions and rotary speed of the rotor, and the feeding rate of the liquid to the atomizing edge are correlated in a manner set forth in detail in the afore-mentioned patent, there are obtained practically uniform drops or droplets the dimensions of which can be predicted with great accuracy without trial.

Operating conditions marginally meeting the requirements set forth in said patent can be maintained with certain conventional atomizers of the so-called centrifugal type. Since the known devices are not intended for operation under such conditions, the rate of feeding that is possible with the available atomizing edge length is so low that it becomes very difficult or impossible to maintain the necessary uniform and undisturbed flow of a continuous liquid film toward the atomizing edge. It is not practical to increase the available edge length by increasing the rotor diameter in the known devices. While the length of a circumferential edge is directly proportional to the radius of the rotor, the optimal flow rate of liquid toward the atomizing edge increases only proportional to the square root of the radius. The strength of the available materials of construction also limits the size to which the rotor can be enlarged.

The invention, in one of its aspects, therefore resides in an atomizing device in which a rotor arranged for rotation about its axis carries a plurality of atomizer bodies, each having a film forming face extending radially away from the axis of rotation, and a free elongated atomizing edge on the portion of the face farthest removed from the axis. The several atomizer bodies are spaced from each other transversely of the direction of elongation of their edges. Liquid is being fed to the film forming faces at a substantially equal rate.

Other features and many of the attendant advantages of this invention will be readily appreciated as the same becomes better understood by reference to the following detailed description of preferred embodiments of apparatus for carrying out my method, when considered in connection with the accompanying drawings in which:

FIG. 1 is an axially sectional elevational view of the essential working elements of an atomizing device of the invention in which the atomizing edges are circumferential about the rotor axis;

FIG. 2 shows a modified form of the apparatus of FIG. 1;

FIG. 3 illustrates an atomizing device of the invention having atomizing edges parallel to the rotor axis, the view being in elevational axial section;

FIG. 4 shows one half of the device of FIG. 3 in radial section on the line IV—IV;

FIG. 5 is a diagram of the distribution of droplet weights in a dispersion of a liquid in air produced according to the invention, and includes a corresponding distribution curve characteristic of conventional apparatus and methods under otherwise equivalent conditions;

FIG. 6 shows yet another atomizing device of the invention in axially sectional elevational view;

FIG. 7 is a plan view of the apparatus of FIG. 6; and

FIG. 8 is a fragmentary perspective view of the apparatus of FIGS. 6 and 7 which illustrates the flow of liquid to the atomizing edge.

Referring initially to FIG. 1, there is seen a hollow rotor body **6** of upwardly flaring approximately frustoconical shape. The rotor body **6** is integral with a coaxial flange **16** and a drive hub **17**. The drive shaft normally received in the hub **6**, and the motor and variable speed transmission connected to the drive shaft are not shown since they may be entirely conventional, and are in themselves not relevant to this invention. It will be appreciated that a variable speed transmission is unnecessary if the apparatus is to be operated at all times under the same conditions, and therefore at the same rotary speed.

Several eccentric pins **5** parallel to the rotor axis are fastened to the flange **16** and to flat coaxial annular atomizing disks **1** and **2**. The disks are held in axially spaced fixed relationship to the flange **16**, and are radially spaced from the rotor body **6**. Each disk has two circular atomizing edges **3**, which are centered on the rotor axis and have the same diameter. The central portion of the outer circumferential face between the atomizing edges of each disk is recessed so as to form a groove. A similar groove **10** of approximately semicircular cross section is formed in the inner circumferential face of each disk between two axially spaced overflow edges **11** and **12**. For reasons which will presently become apparent, this inner face of the disk will be referred to hereinafter as a receiving face. Shallow conically dished annular film forming faces **13**, **14** extend radially outward from the overflow edges **11**, **12** to the atomizing edges **3**, **4**.

Radial passages **8** in the rotor body **6** have orifices in the inner wall of the rotor body in a radial plane which axially bisects the cavity of the rotor body. The orifices of the passages **8** in the outer wall of the rotor body are radially aligned with the receiving face of the atomizing disk **1**, and more specifically with the recessed center portion **10**. The orifices of the four passages **8** in the inner wall of the rotor body jointly extend over one half of the circumference of the conical inner wall. Only three orifices are visible in the drawing.

The disk **2** is so positioned that its receiving face, and more particularly the recessed portion **10** thereof, is radially aligned with the free edge **9** at the open top of the rotor body. A circumferential rib **15** closely subjacent the edge **9** in the rotor cavity has a sharp angular ridge and sloping flanks. One of the flanks blends arcuately with the conical lower portion of the inner wall of the rotor body so as to form an annular liquid retaining pocket **15'** under the ridge of the rib. The other flank of the rib **15** meets the outer wall of the rotor body **6** at a sharp angle at the edge **9**.

The flange **16** has a top face **7** which is conically dished in a manner similar to the top faces **14** of the atomizing disks **1**, **2**, and whose circumferential circular edge is formed by the bottom face of the flange meeting the top face at a sharp angle.

A supply tube for feeding a liquid to be atomized to the cavity of the rotor body **6** has been omitted from the showing of FIG. 1 for the sake of clarity. It will be understood that the tube will reach axially from above into the rotor body cavity to a level well below the passages **8** in the manner shown in FIG. 3, and that the bottom of the cavity will be sealed by the non-illustrated shaft fastened in the hub **17**.

The afore-described apparatus operates as follows:

Liquid is fed to the bottom of the cavity in the rotor body **6** while the rotor body **6** and the structure supported thereon are rotated by the hub **17**. At the speed of rotation necessary for operation of the device, the liquid is caused to rise along the inner wall of the cavity in a layer whose thickness is uniform in each radial plane. When the zone of passages **8** is reached, one half of the flowing liquid is diverted outward through the passages **8** whereas the remainder continues rising.

The liquid permitted to flow radially outward through the passages **8** in four separate streams is received in the groove **10** and spread out over the entire circumference of the groove. Centrifugal force holds the liquid in the groove **10**. As more liquid accumulates than the groove **10** can hold, liquid overflows over the edges **11**, **12**. The rate of flow over the two edges is the same since they are equally spaced from the rotor axis. The forces of gravity which would favor overflow over the lower edge **11** are insignificant as compared to the centrifugal force. The rate of overflow over each unit of length of the edges **11**, **12** is the same because of the symmetrical structure of the disks **1**, **2**.

The overflowing liquid is spread over the conically dished faces **13**, **14** in a film whose thickness is the same in any circular area about the rotor axis, but diminishes in a radially outward direction. As the liquid reaches the edges **3**, **4**, it is thrown off in primary droplets or in strings of liquid that disintegrate into secondary droplets depending on the viscosity of the liquid, and correspondingly chosen rotary speed and rate of liquid feeding.

The liquid which by-passes the orifices of the passages **8** in the rotor body **6** forms four rising streams which are collected in the annular pocket **15'** until the pocket is uniformly filled to the ridge of the rib **15**. The collected liquid then flows over the rib in a layer whose thickness is almost uniform over the circumference of the inner rotor body wall. The liquid ultimately reaches the edge **9** and is transferred therefrom to the groove **10** of the disk **2**. Liquid films are formed on the dished faces **13**, **14** of the disk **2** in the same manner as described with reference to the disk **1**, and are atomized from the edges **3**, **4** of the disk **2**. Any liquid accidentally dripping from the disks **1**, **2** is caught on the top face **7** of the flange **17**, and atomized therefrom.

Since the combined circumferential length of the passages **8** is one-half of the total circumference of the inner rotor body on the level of the passages, and since each groove **10** evenly distributes the liquid received between the two film forming faces of the atomizing disk, each unit length of the atomizing edges **3**, **4** is supplied with liquid at practically the same rate. When this rate and the rotary speed of the body **6** are properly selected, the atomized liquid consists of practically uniform droplets.

The modified atomizing device shown in FIG. 2 is closely similar in its function and operation to that illustrated in FIG. 1. It has a rotor body **26** on which three annular atomizing disks **21**, **22**, **23** are mounted in axially spaced relationship. Each disk consists of two identical halves which have respective exposed film forming faces **34**, **35** of conically dished shape, and atomizing edges **24**, **25** at the circumference of these edges.

Respective flat radial faces of the disk halves are superimposed and fixedly fastened to each other and to the outer circumference of an interposed supporting disk **36** which is fixedly fastened to the rotor body **26**. The faces of the disks **21**, **22**, **23** opposite the rotor body **26** slope from overflow edges **32**, **33** at the inner circumference of the film forming faces **34**, **35** toward the supporting disk **36** in a radially outward direction so as to form a

receiving groove **31** bisected by the disk **36**. Axial openings **37** through the disk **36** adjacent the receiving face of the associated atomizing disk provide a connection between the two halves of the grooves **31** for equal distribution of liquid between the atomizing edges **24**, **25** of each disk.

The rotor body **26** has four radial passages **27** therethrough whose outer orifices are aligned with the receiving face of the disk **21** and are located above and contiguously adjacent the associated supporting disk **36**. The inner orifices of the passages **27** extend over one-third of the circumferences of the rotor body **26** to drain one-third of a liquid supplied to the lower end of the rotor cavity to the disk **21**.

The remaining liquid rises along the inner wall of the cavity in four streams which are collected in an annular groove **30**, and liquid is discharged upward by overflow from the grove **30** in a layer which is approximately uniformly distributed about the circumference of the inner wall. One-half of this layer is drawn off to the atomizing disk **22** through passages **28** on a higher level of the rotor body. The passages **28** extend over one-half of the corresponding circumference of the inner rotor wall, but are otherwise closely analogous to the passages **27**.

The last third of the liquid originally supplied flows over the free top edge **29** of the rotor body **26** into the receiving groove **31** of the atomizing disk **23**. The associated supporting disk **36** is embedded in that edge and flush therewith. Liquid intended for atomization from the several atomizing edges thus flows from the rotor body to the receiving face of an atomizing disk initially along the top face of the associated supporting disk **36**.

An integral hub portion **38** of the rotor body **26** receives a drive shaft **39**. A nut **40** threadedly mounted on the shaft **39** has a polygonal outer axial face which is received in a conforming portion of the hub portion **38** for driving connection between the shaft **39** and the rotor body **26**. The nut **40** also seals the bottom of the rotor body cavity.

The operation of the modified atomizing device illustrated in FIG. 2 is closely analogous to that of the apparatus shown in FIG. 1. The total amount of liquid fed to the cavity of the rotor body **6** is divided into six equal parts which are supplied to the six atomizing edges **24**, **25** in the form of liquid films, and are atomized from the edges **24**, **25** at a uniform rate per unit edge length.

Further modifications of the apparatus of FIG. 1 will readily suggest themselves. The number of atomizing disks may be increased beyond the three illustrated in FIG. 2, and the necessary arrangements for uniform distribution of liquid between the disks may be patterned on those specifically disclosed.

If the axial openings **37** in the disks **36** are omitted from the apparatus shown in FIG. 2 in a manner not further illustrated, all liquid supplied to a disk will flow only to the upper film forming face **34**, and will be atomized from the corresponding edge **25**. The modification of the devices of FIGS. 1 and 2 in which each disk is provided with only one film forming face and a single atomizing edge is therefore within the scope of this invention. In the embodiment of the invention shown in FIG. 1, feeding of liquid to only one radial face of an atomizing disk is achieved by spacing one of the edges **10**, **11** farther from the rotor axis than the other in a non-illustrated manner analogous to that shown at **47**, **50** in FIG. 4, and more fully described hereinafter. It will further be evident that the two film forming faces of each disk may have such a configuration that they meet in a common atomizing edge, whereby liquid is supplied to the edge in two films which merge at the edge.

Atomizing edges at which two faces of an atomizing disk meet at a sharp angle have been shown in FIGS. 1 and 2, and are preferred. It will be understood, however, that such sharp edges are not necessarily employed, and that the edges may be rounded (not shown). It is more difficult, however, to produce rounded edges having the neccessary uniformity of contour. The operation of the apparatus is not affected by the edge contour, as long as it is uniform.

The atomizing edges of the devices shown in FIGS. 1 and 2 form closed circles about the rotor axis in respective radial planes. FIGS. 3, 4, 6, 7, 8 show embodiments of the invention in which the atomizing edges are elongated in an axial direction.

In the apparatus illustrated in FIGS. 3 and 4, the integral rotor body consists of a flanged hub portion **44** and a coaxial distributor portion **42**. The latter has an upwardly open axial recess the upper portion of which is bounded by a conical, outwardly flaring wall face **42'** that terminates in a free sharp edge. A supply tube **43** feeds the liquid to be atomized to the apparatus from a non-illustrated container through a pump (not shown) whose output can be precisely adjusted, and is constant when adjusted. The orifice of the tube **43** is adjacent the bottom of the recess in the distributor portion **42**.

Twelve atomizing vanes **45** are fixedly fastened to the flange of the rotor portion **44**. They are equiangularly spaced about the distributor portion **42**. Each vane has three straight edges **41**, **47**, and **50** which are parallel to the rotor axis. The edges **41** rise from the circumference of the flange **44** and constitute the atomizing edges of the apparatus. The overflow edge **47** and the trailing edge **50** bound a receiving face **46** of each atomizing vane **45** opposite the rotor axis and the distributor face **42'**. The receiving face **46** is of concavely arcuate cross section. The portion of each vane **45** adjacent the trailing edge **50** is radially interposed between the rotor axis and the portion of the receiving face on an adjacent vane which includes the overflow edge **47** of the latter. The edge **47** of each receiving face **46** is therefore radially farther from the rotor axis than the trailing edge **50**. The film forming faces **48** of the vanes **45** extend in respective common planes with the rotor axis from the coordinated overflow edge **47** to the atomizing edge **41**.

The top ends of the vanes **45** are fixedly connected by an annular cover disk **49** whose outer diameter is equal to that of the flange on the rotor portion **44**, and whose inner diameter is sufficient to permit passage of the tube **43**.

The apparatus illustrated in FIGS. 3 and 4 is operated as follows:

The liquid to be atomized is pumped through the tube **43** into the recess of the distributor portion **42**. The liquid is forced upward in the recess by centrifugal forces, spreads over the rotating face **42'**, and is thrown from the edge of the face toward the receiving faces **46** of the vanes **45**.

The liquid received by each face **46** and held thereagainst by centrifugal force is spread over the axial length of the face until it is present in an amount sufficient for overflow over the edge **47** into the film forming face **48**. The uniform height of the face **48** from the edge **47** to the atomizing edge **41** favors equalization of any residual unequality of film thickness which may have existed at the edge **47**, and a film of uniform thickness is atomized from the edge **41**.

The portion of each vane **45** adjacent the trailing edge **50** constitutes a baffle which prevents liquid to be thrown from the rotating distributor face **42'** directly outward between adjacent vanes **45**. The baffle also prevents liquid from being received on a portion of a receiving face **46** which is closely adjacent the overflow edge **47**. This arrangement ensures adequate uniformity of axial liquid distribution over the receiving face **46**.

When operated with a liquid of low viscosity, the apparatus shown in FIGS. 3 and 4 produces primary drops at the atmoizing edges **41**. FIG. 4 illustrates the strings **51** of liquid which are released from the edges **41** when the rotor turns in the direction of the arrow. The strings **51** have the approximate shape of an evolvent of a circle, and

separate into individual secondary droplets **52** at a uniform distance from the rotor circumference.

While twelve axial atomizing edges **41** are provided in the apparatus illustrated in FIGS. 3 and 4, the number of vanes may be varied to suit specific operating conditions, particularly the desired output of the apparatus. Similar considerations govern the axial length of the edges. The spatial relationship between the atomizing edges and the rotor axis may also be varied without affecting the operational characteristics of the apparatus. More specifically, the atomizing edges need not be parallel to the axis, nor it is necessary that the film forming faces of the vanes be arranged in axial planes. The free edge of the distributor face **42'** is preferably located in a radial plane equally spaced from the flange **44** and the disk **49**. A more complex distributor system may be needed for liquids of high viscosity or for liquids containing suspended matter. The distributor portion **42** may be replaced under such conditions, in a manner not specifically shown, by a structure substantially identical with one of the rotors shown in FIGS. 1 and 2, and suitably dimensioned to fit between the vanes **45** and to provde them with a liquid discharged from several axial levels against the receiving faces **46**.

FIG. 5 illustrates the distribution of droplet sizes in a liquid dispersed in an atomizing apparatus of the nventon operatng under the conditions set forth in the aforementioned patent as compared to the droplet size disribution obtained by conventional apparatus relying on turbulence for atomization.

Droplet diameter is plotted in units of 0.01 centimeter against weight percent of the atomized liquid. The three measurement points determined in a liquid atomized according to this invention are connected by a curve **53**. The measurements made on a conventionally atomized liquid are connected by a curve **54**.

As is evident from curve **53**, more than 80% of the droplets produced according to the invention have a diameter between 0.75 and 1.25×10^{-2} cm. Not quite 10% have a diameter of $0.5\pm0.25\times10^{-2}$ cm., an even smaller portion of the liquid is dispersed in droplets having a diameter of $1.5\pm0.25\times10^{-2}$ cm.

The conventionally dispersed liquid is distributed in sizes respectively centered on 0.05, 0.10, 0.15, 0.25, and 0.35×10^{-2} cm. in amounts of less than 5, 10, 35, 50 and less than 5 percent. Eighty percent of the material is spread over a diameter range at least three times as wide as in the otherwise comparable dispersion produced according to this invention.

Apparatus which partly relies upon overflow of liquid from concavely arcuate receiving faces is not well suited for atomizing relatively coarse dispersions or suspensions as are frequently encountered in the manufacture of detergent compositions. The dispersed solid tends to be retained by the overflow edges. A modified embodiment of the invention capable of handling suspensions of relatively coarse crystalline material in an aqueous medium is illustrated in FIGS. 6, 7 and 8.

The main operating elements of the atomizing apparatus shown in FIGS. 6 to 8 are a rotor body **60** and eight identical atomizing bodies or vanes **63**. The atomizing bodies are mounted on a flange portion **61** of the body **60** and extend upwardly therefrom. They are of sufficient mechanical strength not to require a connecting member at their upper axial ends.

The central portion of the rotor body **60** has an axial recess **62** of approximately cylindrical shape. The eight atomizing bodies **63** are equiangularly spaced about the upper rim of the recess **62** on the top surface **71** of the flange **61**. Each atomizing body **63** has flat radial top and bottom faces, and four axially extending faces which connect the top and bottom faces. The outer circumferential face **72** is cylindrical about the rotor axis. A leading face **64** and a trailing face **73** extend radially inward from the outer face **72** in respective planes parallel to the rotor axis, but not passing therethrough. The leading face **64** constitutes the film forming face of the atomizing body. It meets the outer circumferential face **72** along an atomizing edge **68**.

The receiving face **66** of the atomizing body **63** is of arcuate cross section in axial and radial planes. It has the shape of a four-sided portion of a cylindrical surface about an axis which is inclined relative to the rotor axis. The lower corner of the receiving face adjacent the trailing face **73** is located at the rim of the recess **62**, and the receiving face **66** slopes from this corner away from the rotor axis both in an axial and in a radial direction. In the portion **66*a*** of the receiving face **66** near the aforementioned lower corner, the slope away from the rotor axis is much steeper in an axial plane than in a radial plane. In a portion **66*b*** of the receiving face **66** near the top corner adjacent the film forming face **64**, the slope away from the rotor axis is steeper in a radial direction than in an axial direction. The two portions of the receiving face **66** meet along a diagonal line **67** drawn through the other two corners of the four-sided face **66**.

The several atomizing bodies **63** are separated from each other by narrow slots **65** which extend between the film forming face **64** of each body **63** and the trailing face **73** of an adjacent body. The slots **65** are approximately tangential to a cylindrical surface defined by the axial wall of the recess **62**.

The drive shaft which normally is received in an axial opening of the rotor body **60** and downwardly seals the recess **62** and a liquid feeding tube whose discharge orifice normally is located in the recess **62** having been omitted from the showing of FIGS. 6 to 8 in order not to crowd the drawing. The apparatus operates as follows:

The liquid to be atomized is fed to the bottom of the recess **62**, and travels radially outward therefrom when the rotor body revolves. The liquid therefore rises in a layer of approximately uniform thickness along the cylindrical wall of the recess **62**, and is thrown radially outward from the rim of the recess. Because of the tangential disposition of the slots **65**, the liquid cannot directly enter the slots. It first makes contact with the lower edge of the receiving face **66** which is entirely in the portion **66*a***, and travels upward thereon as indicated by flow lines. Near the diagonal line **67** the slope of the receiving face changes from a predominantly axial direction to a predominantly circumferential direction, and the original upward flow of the liquid is diverted toward the adjacent film forming face **64**. On that face, liquid flow is horizontally outward toward the atomizing edge **68** where the liquid film is dissolved into strings **69**, which in turn disintegrate into secondary droplets **70**.

The construction of the specific embodiment of the invention shown in FIGS. 6 to 8 requires relatively simple shaping operations. All surfaces of the apparatus are either plane or cylindrical, but it will be appreciated that such surfaces, while easy to shape by machining or by other methods, are not critical to the operation of the apparatus, and may be modified without departing from the spirit of this invention.

It is evident that the configuration of the outer circumferential face **72** is relevant to the function of the device only to the extent that it contributes to the shape of the atomizing edge **68**. The latter, while preferably elongated in a direction parallel to the rotor axis, may be obliquely inclined to some extent. The film forming face **64** need not necessarily be tangential relative to the rim of the recess **62**. The receiving face **66** need not be cylindrical about an inclined axis, but may be conically tapered at a small angle about such an axis without material change in the flow pattern shown in FIG. 8.

It should be understoood, therefore, that the foregoing disclosure relates to only a preferred embodiment of the invention, and that it is intended to cover all changes and modifications of the example of the invention herein

chosen for the purpose of the disclosure which do not constitute departures from the spirit and scope of the invention set forth in the appended claims.

What I claim is:

1. A device for atomizing a liquid comprising, in combination:

(a) a rotor body having an axis and being formed with a cavity, said body having an annular face about said axis in said cavity, said face including edge means exposed in a radially outward direction;

(b) means for rotating said body about said axis; and

(c) a plurality of atomizer bodies mounted on said rotor body,

(1) each atomizer body having a receiving face, an overflow edge, a film forming face, and an atomizing edge,

(2) said receiving face being radially aligned with said edge means, and

(3) said overflow edge and said film forming face defining a path of liquid flow from said receiving face to said atomizing edge in a radially outward direction, said overflow edge connecting the receiving and film forming faces, and said film forming face extending between said overflow edge and said atomizing edge.

2. A device as set forth in claim 1, wherein said edge means include a plurality of edge portions circumferentially spaced about said axis, said annular face being formed with an annular groove about said axis, said groove being spaced from said edge portions.

3. A device as set forth in claim 1, further comprising a plurality of disc members radially extending from said rotor body beyond said edge means, said disc members respectively carrying said atomizer bodies, respective portions of each atomizer body axially extending from the associated disc member in opposite directions.

4. A device as set forth in claim 3, respective portions of the receiving face of each atomizer body extending on axially opposite sides of the associated disc member, the disc member being formed with an axial opening connecting the portions of the receiving face.

5. A device as set forth in claim 1, wherein said receiving face is of concavely arcuate cross section.

6. A device as set forth in claim 1, wherein a portion of a first atomizer body adjacent said axis is radially aligned with a portion of a second atomizer body remote from said axis in such a manner that said portion of said first atomizer body is radially interposed between said edge means of the rotor body and the overflow edge of said second atomizer body.

7. A device as set forth in claim 1, wherein a first portion of each atomizer body remote from said axis and contiguously adjacent said overflow edge thereof is radially aligned with a second portion of another atomizer body near said axis in such a manner that said second portion is radially interposed between each portion of said overflow edge and the edge means of said rotor body.

8. A device as set forth in claim 1, wherein each receiving face has a first portion near said axis and a second portion more remote from said axis, said receiving face being of arcuate cross section in intersecting axial and radial planes, the radial spacing of said first portion from said axis increasing more in an axial direction than in a circumferential direction, and the radial spacing of said second portion from said axis increasing more in a circumferential direction than in an axial direction.

9. A devce as set forth in claim 1, wherein said atomizing edge is elongated, and each longitudinal portion thereof is equidistant from said axis.

10. A device as set forth in claim 1, wherein said annular face is of circular cross section transversely of said axis.

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