

Aug. 2, 1932.

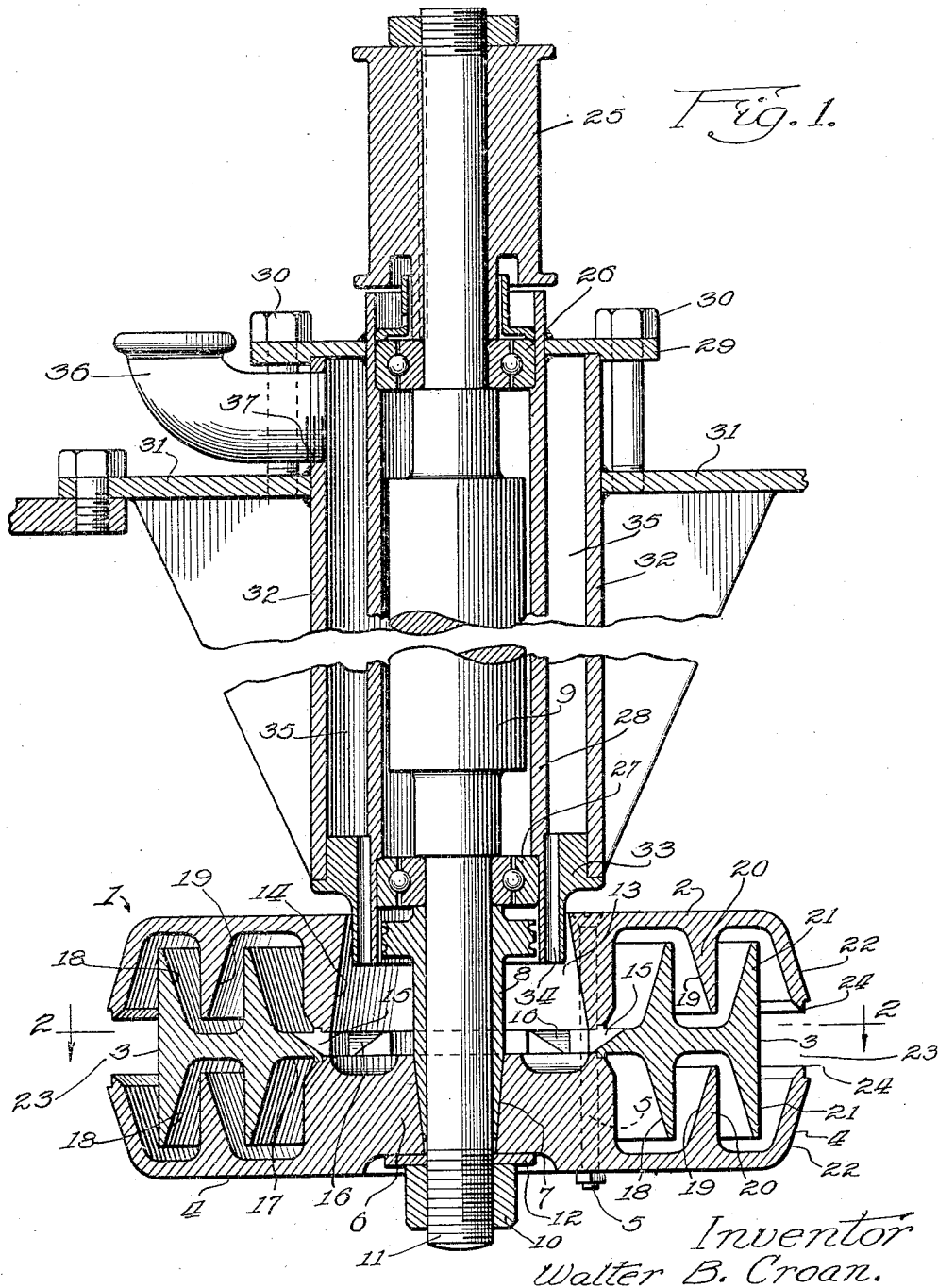
W. B. CROAN

1,870,099

ATOMIZER

Filed Sept. 1, 1930

2 Sheets-Sheet 1



Witness

Arthur M. Franke.

Ammer, Ammer & Woodworth

Attys:

Aug. 2, 1932.

W. B. CROAN

1,870,099

ATOMIZER

Filed Sept. 1, 1930

2 Sheets-Sheet 2

Fig. 2.

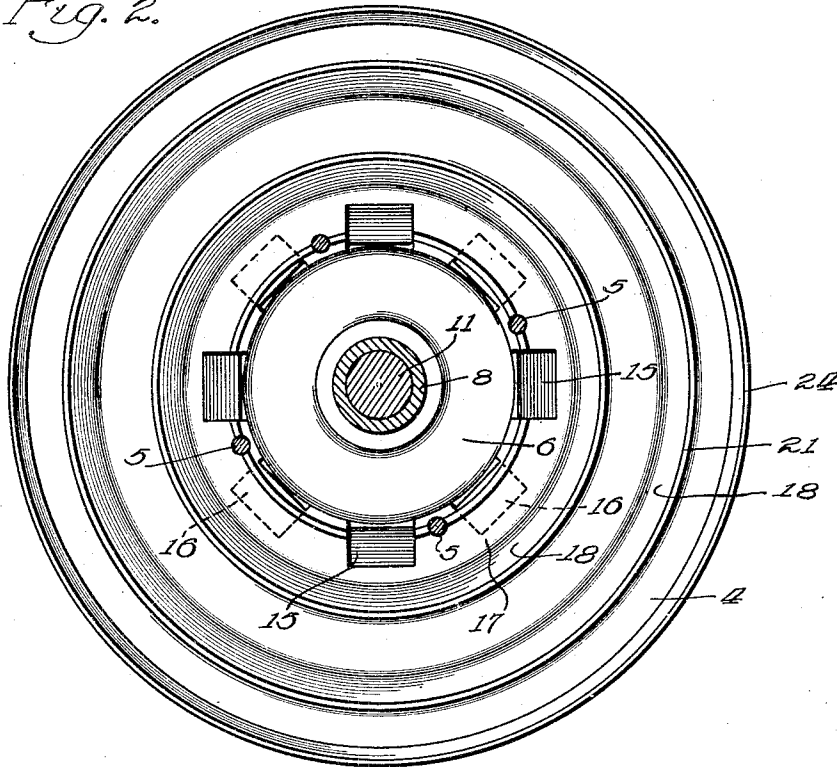
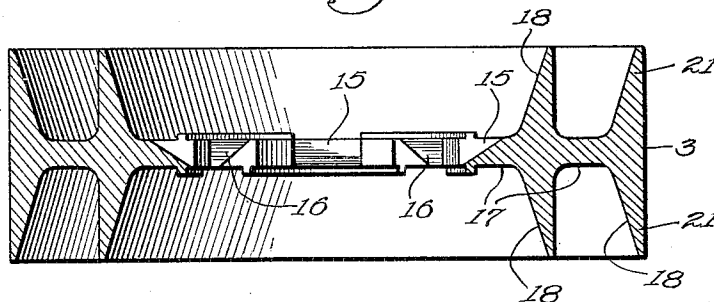


Fig. 3.



Inventor
Walter B. Croan.

Witness *Rumrider, Rumrider & Woodward*
Arthur M. Franke. *Attys:*

UNITED STATES PATENT OFFICE

WALTER B. CROAN, OF CHICAGO, ILLINOIS

ATOMIZER

Application filed September 1, 1930. Serial No. 479,114.

This invention relates to mechanical atomizing devices which are used in many different arts, for example, spray drying, humidifying, gas washing, mixing devices, etc.

A principal object of the invention is to provide an improved method of centrifugally atomizing a fluid. Another object of the invention is to provide improvements in the construction of the driven element of an atomizer wherein the path of the liquid which is to be atomized is so arranged because of the design of the atomizing unit that suitable resistance to the radial flow of the liquid is encountered to retard the velocity of the liquid in this direction while allowing the angular speed of the liquid to approach the peripheral speed of the spraying head. A further object of the invention is to provide an arrangement for utilizing the liquid which is fed to the atomizer head for protecting parts of the mechanism, such as the bearings, from the effects of the heat of the surrounding atmosphere. A still further object of the invention is to provide an improved construction of spraying or atomizing head wherein the surfaces thereof which are wet by being in contact with the fluid passing through the atomizer, are all internal and therefore not subject to the temperature of the surrounding atmosphere in which the liquid is sprayed.

A construction for carrying out the invention is illustrated in the drawings, wherein: Figure 1 shows a longitudinal sectional view of the atomizer.

Fig. 2 is a plan section taken on the line 2-2 of Fig. 1.

Fig. 3 is a sectional detail of the central element of the atomizer.

The method of atomizing herein disclosed consists briefly in causing the fluid to travel radially outward in concentric waves, at comparatively low radial speeds, while causing the waves to move at high speed circularly around the common center and at progressively increasing rates from the center outwardly. Resistance is offered to the outward travel of the waves while the circular or angular motion thereof is increased to a high

rate, and when the outermost wave of fluid is released into the surrounding atmosphere, the fluid is projected in highly attenuated form, while the radial speed delivery of the fluid is far less than is generally the case with atomizing methods wherein the fluid is caused to assume more or less disc form as it is thrown through an atomizer by centrifugal action.

The general arrangement of atomizing means to which this invention relates includes a high speed spindle arranged within a sleeve carrying bearings therefor, and surrounding this sleeve is a sleeve of sufficiently larger diameter to provide the necessary space between the sleeves for conducting liquid to the atomizer, the latter being carried at one end of the spindle to rotate therewith. The liquid in flowing to the atomizer serves to prevent heat from outside reaching the bearings of the spindle. The atomizer consists of a plurality of annularly flanged elements, each carrying a plurality of such annular flanges, and the flanges of one element overlapping those of another, with space between the same. The surfaces of the annular flanges are suitably inclined outwardly on the side against which the liquid impacts for the purpose of reducing the rate of the flow of the liquid in a radial direction while its flow in the direction of rotation of the spray head is built up from zero to practically the peripheral speed of the spray head.

With this arrangement the friction between the fluid and the spray head is increased to cause the fluid to flow around with the spray head before being released to the atmosphere.

Referring to the drawings, the spray head 1, as shown, is made in three parts, 2, 3, and 4, which are secured together by bolts 5 and the part 4 has a hub 6 with a tapered hole 7, whereby the member 4 may be securely fitted to sleeve 8 and rotate with sleeve 8 and the spindle 9. The spray unit is forced into tight engagement with the tapered end of sleeve 8 by means of the nut 10, on the threaded end 11 of spindle 9. A washer 12 serves to transmit the thrust from the nut 10 to the

spray unit. A receiving pocket 13 for the liquid to be sprayed is formed in the spray head and its surrounding wall 14 is inclined upwardly toward the axis of the spindle, so that the liquid flowing therein will not escape at the upper opening of the pocket, but by centrifugal action is carried downwardly and passes through the oppositely inclined openings 15 and 16 in the chamber wall 14 of the spray head. Thus the liquid to be sprayed is equally divided into a plurality of streams so that one-half of it passes above and the other half below the web 17, and impinges against annular flanges 18 carried by the member 3. The inner walls of the flanges 18 are inclined upwardly and outwardly so that while the radial velocity of the liquid is greatly retarded by these flanges, the impact of the fluid against the flanges brings about considerable frictional contact which induces the fluid to travel circularly with the flanges.

This rotary motion of the fluid is further increased as it spills over the edges of flanges 18 and impinges against the inclined walls 19 of similar but oppositely disposed flanges 20 on the members 2 and 4 of the atomizing head. Flanges 21 which may be the same as flanges 18, and are also integral with the member 3, still further serve to increase the rotary speed of the fluid while retarding the outward flow thereof. The peripheral flanges 22 of the members 2 and 4 finally receive the fluid from over the edges of flanges 21 and guide it downwardly toward the outlet space 23, surrounding the outer edge of the member 3 and between the ends of flanges 22. By the time the fluid spills over the sharp ridges 24 formed on the edges of flanges 22, the fluid has substantially the same velocity in a circumferential direction as the peripheral velocities of the members 2 and 4.

The atomizing head 1 and the spindle 9 which carries it are rotated at high speed either by means of a coaxial motor or turbine or the pulley 25 splined to the upper end of the spindle as shown in the drawings.

The spindle 9 rotates within the bearings 26 and 27, which are carried by a sleeve 28 surrounding the spindle and which is fixed against rotation. Near its top the sleeve 28 is welded to a ring 29. This ring has a screw connection 30 to a supporting frame structure 31, which is also rigidly connected with the ring 29 by cylinder 32, to which the frame member 31 is welded. The sleeve 28 and the cylinder 32 at their bottom ends are joined together by part 33, which has fluid outlet apertures 34 therein. The fluid to be treated is fed to the space 35 by the sleeve 28 and the cylinder 32 through the pipe fitting 36 having threaded engagement with the cylinder 32 at the aperture 37 therein. The heat from the surrounding atmosphere is prevented from unduly affecting the bearings by the

sleevelike column of fluid passing downwardly in the space 35 between the sleeve 28 and the surrounding cylinder 32.

In the operation of the atomizer, the fluid in its travel from the pipe fitting 36 to the outlet throat 23 of the spray head does not come into contact with the outer exposed surfaces of the atomizer, and there is therefore no wet surface thereon which is exposed to the temperature of the surrounding atmosphere which in spray drying may be between 250° to 800° F.

The downward flow of the fluid to be treated around the sleeve 28 serves to keep the bearings cool, and as it spills downwardly out of the apertures 34, it is caught in the pocket 13 and then divided between the apertures 15 and 16 as the fluid is thrown out under centrifugal action. The radial motion of the fluid is much retarded by the flanges formed on the members 2, 3 and 4 of the spray head, and a rapid annular flow of the fluid with the spray head is induced because of the frictional contact and impact of the fluid with the annular flanges on the spray head. The fluid which is being atomized is finally thrown into the throat 23 in the form of mist, but the radial motion of the fluid is of far less velocity than its motion in the direction of rotation of the spray head. The inclination of the different surfaces of the flanges on the spray head is varied according to the rate at which it is desired to retard and distribute the flow of the fluid in a radial direction. The largest component of the centrifugal force applied to the fluid is that which causes flow thereof in the direction of rotation of the spray head. The atomization of the fluid is complete and rapid, and there is no place in the spray head where the fluid may collect even for an instant, and therefore, solid particles in the fluid cannot be baked to or adhere to the walls of the spray head.

In carrying out this method of atomizing the fluid is divided into a plurality of corrugated disklike sheets, the particles of the fluid slowly traveling up and down and outwardly in concentric waves away from a common center while a rapid circular motion is imparted thereto around the same center at a gradually increasing speed. The rate of flow of the fluid becomes very great in the circular path before the particles thereof are released.

Although but one specific embodiment of this invention is herein shown and described, it will be understood that certain details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claim.

I claim:

An atomizer comprising a rotatably mountable shaft having a head secured there-

to, said head comprising end members, and
an intermediate member, said intermediate
member being clamped between the said end
members, one of said end members having
5 a hub by means of which the head is secured
to the shaft, said hub having a central de-
pression and said intermediate member and
the opposite end member being centrally hol-
low for forming a receiving pocket for liquid
10 to be sprayed, said intermediate member hav-
ing apertures all in the same transverse plane
arranged for guiding and delivering the liq-
uid received by the pocket to opposite sides
of said intermediate member between it and
15 the end members, said intermediate member
having concentric oppositely projecting an-
nular flanges, and said end members each be-
ing provided with inwardly extending annu-
lar flanges inter-spaced with the flanges on
20 the end members.

Signed at Chicago this 29th day of August
1930.

WALTER B. CROAN.

25

30

35

40

45

50

55

60

65