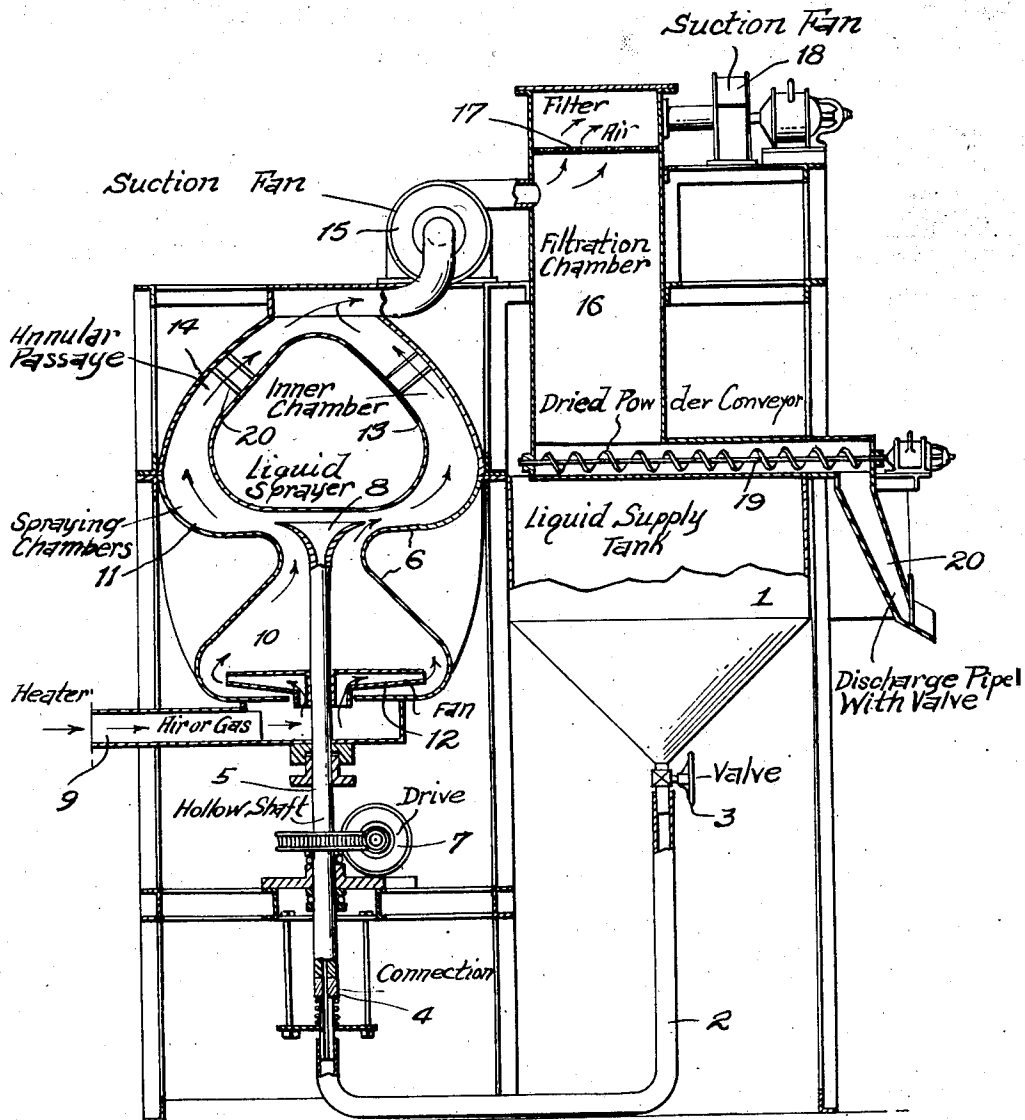


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APPARATUS FOR THE CONVERTING OF MILKY LIQUIDS, SOLUTIONS,  
DISPERSIONS, AND EMULSIONS INTO POWDER FORM BY DRYING  
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APPARATUS FOR THE CONVERTING OF  
MILKY LIQUIDS, SOLUTIONS, DISPERSIONS,  
AND EMULSIONS INTO POWDER  
FORM BY DRYINGMartinus Joannes Stam, The Hague,  
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3 Claims. (Cl. 159—4)

My invention relates to improvements in and relating to a method and apparatus for the converting of milky liquids, solutions, dispersions and emulsions into powder form by drying and is more particularly directed to improved means for the converting of such liquids and the like into powder form by means of spraying the liquid in a stream of heated air or gas. A further object of the invention is the providing of an improved apparatus for that purpose, whereby the liquids are treated in a very efficient manner and which enables the applying of a vaporizing or spraying chamber of only relative small dimensions.

For the converting of liquids as mentioned above up till now in general two methods have been followed. The first one consists in the spraying of the liquid by blowing the same by means of compressed air through a nozzle into a space or chamber which has been heated. A disadvantage of this method however is that the grains thus obtained are very irregular. According to a second method the liquid is dropped on a rapidly rotating disc located in a space in which or through which streams of heated air or gas are passed preferably in the direction of the down-falling powder. In this case it will be difficult to get the supplied liquid sufficiently regularly divided on the disc. Moreover by this method large chambers are required to prevent the sprayed liquid from touching the wall and sticking thereto.

In order to overcome these objections, it has already been proposed in such apparatus to blow air or gas into the sprayed liquid in the same direction as in which the spraying takes place, but even in that case a fine division of the powder has not been obtained. Indeed the particles which are sprayed will be pressed again together as the stream of air or gas will never have exactly the same velocity as the particles of the sprayed liquid.

Now the principal object of the invention is to provide an apparatus in which a more uniform supplying of the liquid takes place in such way that all particles will be equal in size after the spraying, thus a very uniform powder will be obtained.

The invention originates with the idea that this result will be obtained in the best way by means of a centrifugal spraying whereby the particles in a gradually and regularly divided condition are supplied to the edge of a rapidly rotating body from which they are thrown away by the high peripheral speed. Moreover the power of the stream of gas which has to take up the particles thereby must be constantly proportional

to the power by which the spraying takes place and therefore according to the invention both are derived from one and the same source. More particularly for this purpose the speed of the rotating body will be most applicable then, in this way a constant ratio always will automatically be obtained.

In order to have the particles dried regularly and as effectively as possible, the stream of air or gas should be directed in nearly the same direction of the centrifugalized particles to insure a closest and longest possible contact viz. tangential to the circumference of the rotating body and radially from the center thereof. At the same time the stream of air or gas should be directed in such manner as to remove those particles gradually, thus the same stream will be adapted to serve as a transport medium. This method enables the providing of a much smaller spraying chamber as hitherto customary, while it is not necessary that the particles cannot reach the wall as a result of their own retardation of speed, on the contrary they will be deflected and removed directly from their original direction before they can reach said wall.

A characteristic of the invention is, that in the new apparatus the liquid is sprayed in a heated stream of air or gas, which is forced to move along the wall of the spraying chamber and thus gradually carries off the powdered particles drying them simultaneously. Therefore the centrifugal body by means of which the liquid is sprayed, is located in a chamber, the walls of which chamber trend from a point beneath the conveniently shaped lower side of the body in accordance with the contour of the same and therefore have such an inclined outline that the stream of air or gas is forced to move just along said wall in the same direction as the sprayed liquid thereby carrying off the centrifugalized particles. Consequently the powdering thus can take place in a relatively small space.

As a means for spraying the liquid, in this case a rotating body is provided. When a certain quantity of liquid is put in such a body so that it is not entirely filled up, this liquid will be forced upwardly as a thin film along the wall by the centrifugal force and upon reaching the upper edge of the body will be sprayed as a fine mist. As a result of this, the peripheral speed of the rotating body needs not to be as great as e. g. in the case of a flat disc in order to obtain equally fine particles.

These very fine particles are now carried off with a heated stream of air or gas, which is so

strong and effective that the particles remain floating in said stream. The vapour from the liquid thereby will also be carried off by the stream of air or gas until the latter shall be retarded to such an extent e. g. by widening the outlet tube or by debouching into a wider space, that the powder drops down and the stream of air or gas loaded with the vaporized liquid can be removed at the same time.

The liquid may be supplied into the rotating body from above or from below viz. through the hollow shaft around which or to which the body is rotated. Now still a further object of the invention is to utilize the self-evident high number of revolutions of the rotating body to produce the over-pressure of the streaming air or gases by which at the same time will be obtained that the force of the stream of air and the nature and speed of the sprayed liquid are both dependent on the same source of power and consequently will decrease or increase simultaneously.

According to the invention this may be done by providing a helicoidal moving device or a fan-propeller on the shaft so that said device, fan or the like will suck the heated air and press it upwards so that the same is adapted to convey the sprayed liquid.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawing on which a form of execution of the invention is illustrated.

From a supply tank 1 the liquid is delivered through a pipe 2 controlled by a valve or cock 3 to a connecting piece 4, which connects the supply pipe 2 to the hollow shaft 5 which is rotated by means of any well known motive power 7 and when rotating, the supplied liquid will be thoroughly sprayed in the funnel-like nozzle or upper part 8 of the hollow shaft 5, which terminates in a restricted portion of the barrel about midway between its ends.

The heated air or gas is let in through a pipe 9 into the lower part 10 of the barrel 6, the upper part of which forms a spraying chamber 11, and in said lower part 10 a fan propeller 12 is provided, secured on the hollow shaft 5. In the upper part of the barrel and within the spraying chamber 11 an inner chamber 13 is provided, connected by means of ribs, lugs 20 or otherwise to the outer one, its side walls being coincident with the outer wall of the chamber 11, thus forming therebetween an annular passage 14 for leading the air or gas and the sprayed liquid to the top of said chamber 11. The bottom of the inner chamber 13 is substantially horizontal and forms a baffle above the nozzle 3.

The fan 12 forces the air or gas upwards to the bell-shaped underside of the nozzle 3 in the barrel 6 and from this point the outer-wall of the spraying chamber 11 trends adjacent and conformable to the contour of said underside, thus the upwardly pressed stream of air or gas is forced to pass through the narrowed part of the barrel and from there in the same direction as the sprayed liquid first outwardly in radial direction and then upwardly through the annular space 14 along the inclined walls between the inner and

outer chambers to the top of the outer one 11, thereby carrying off the particles of the sprayed liquid. At the top of the chamber the vapour, air and powder is sucked by means of a fan 15 and pressed into a filtration-chamber 16, provided in the upper part with a filter 17. In this chamber the stream slows down so much, that the powder, now dried by the heated stream of air, is separated from the liquid and drops down, while the air together with the vapour of said liquid may be removed at the highest point e. g. by means of a motor driven fan 18. The dried powder falls upon a conveyor 19 mounted at the bottom of the chamber 16 and thus may be conveyed to a valve-controlled outlet pipe 20, in order to be removed from the apparatus so far as will be necessary.

The nozzle 8 can either be made as an integral unit with the hollow shaft 5 or connected thereto in any known manner. An important feature of the invention is that when mounting the hollow shaft adjustable in vertical direction, a varying of the position of the funnel-like upper part or nozzle 8 with respect to the walls of inner and outer shell of the spraying chamber may be accomplished thus regulating the speed of the upward stream of air or gas and assuring a very effective conveying of the sprayed particles by the same.

From the description as stated above, it already appears that the entire apparatus requires only a very little power and is adapted to operate wholly automatically. Furthermore such an apparatus more particularly may be used for the powdering of milky vegetable juices, such as latex for the production of rubber, other latices, solutions of salt, emulsions etc.

What I claim is:

1. Apparatus for converting milky liquids, solutions, dispersions and emulsions into powder form by drying aided by centrifugal force, comprising a barrel, having a constricted middle portion dividing the barrel into an upper and a lower chamber, a baffle body within the upper chamber having a substantially flat bottom and having its sides substantially parallel to the sides of the upper chamber, thus providing a narrow annular passage around said body terminating in an outlet opening at the top of the upper chamber, means conveying a heated stream of gas through said constricted portion and through said passages, a centrifugal spraying element in said upper chamber beneath the bottom of the baffle adapted to spray the liquid into the gas and mingle therewith, thereby gradually carrying off the resultant powdered articles and drying them.

2. Apparatus in accordance with claim 1 in which said centrifugal spraying element constitutes a hollow shaft terminating with a nozzle, and said conveying means including a fan propeller on said shaft.

3. Apparatus as described in claim 1 in which said nozzle is adjustable in said restricted portion of the barrel thereby permitting adjustment of the stream of heated gas.

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