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BY A. P. C.

E. PIQUEREZ

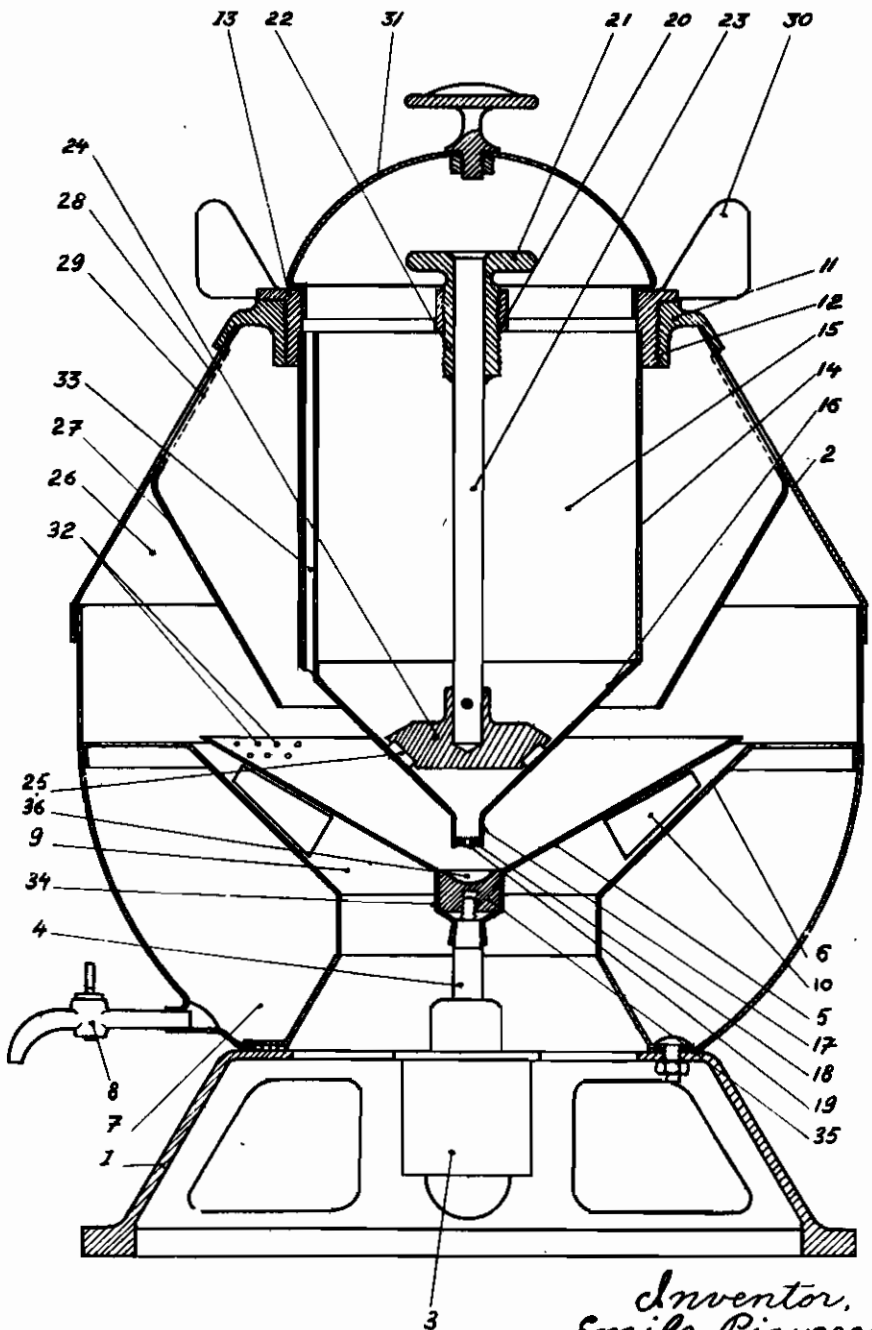
PROCESS AND APPARATUS FOR PLACING IN SUSPENSION IN AIR AN ULTRA-DISPERSED FLUID OR OTHER DRY PRODUCTS IN POWDER FORM

Filed June 13, 1941

Serial No. 397,993

4 Sheets-Sheet 1

FIG. 1



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4 Sheets-Sheet 2

FIG. 2

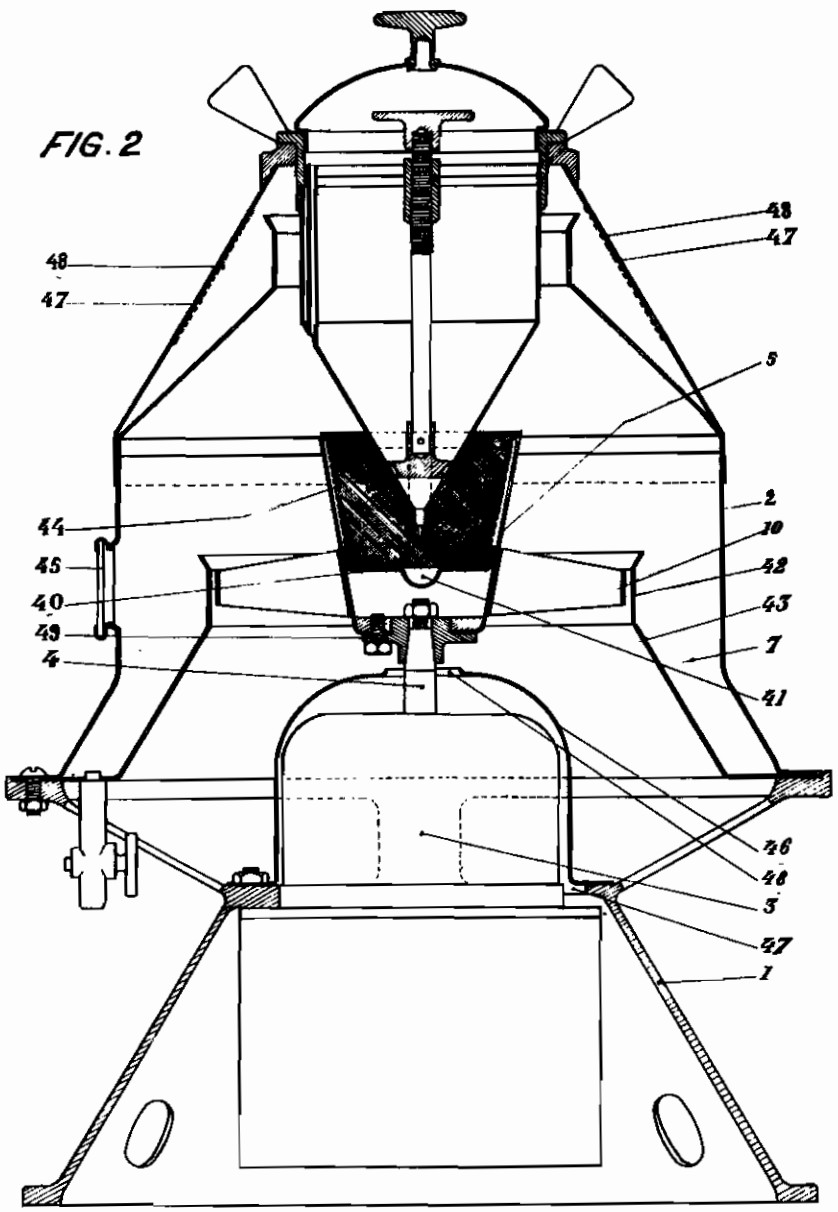

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FIG. 3

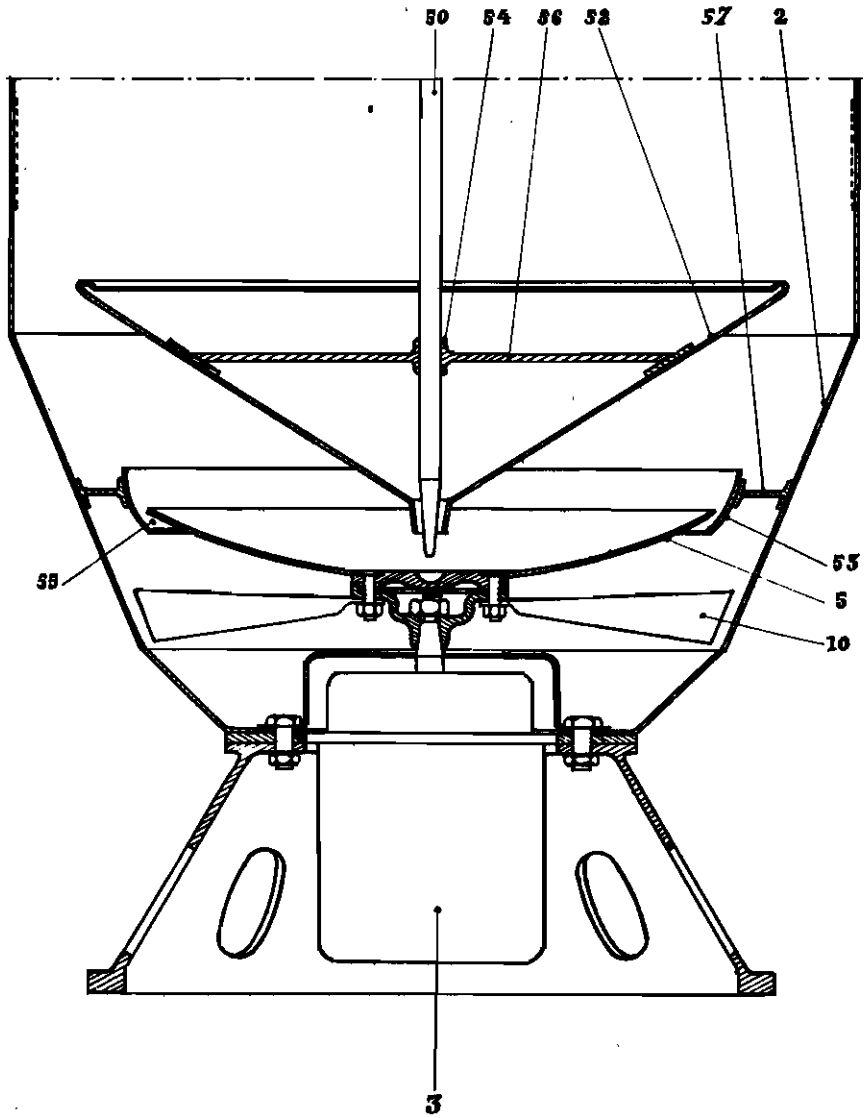

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FIG.4

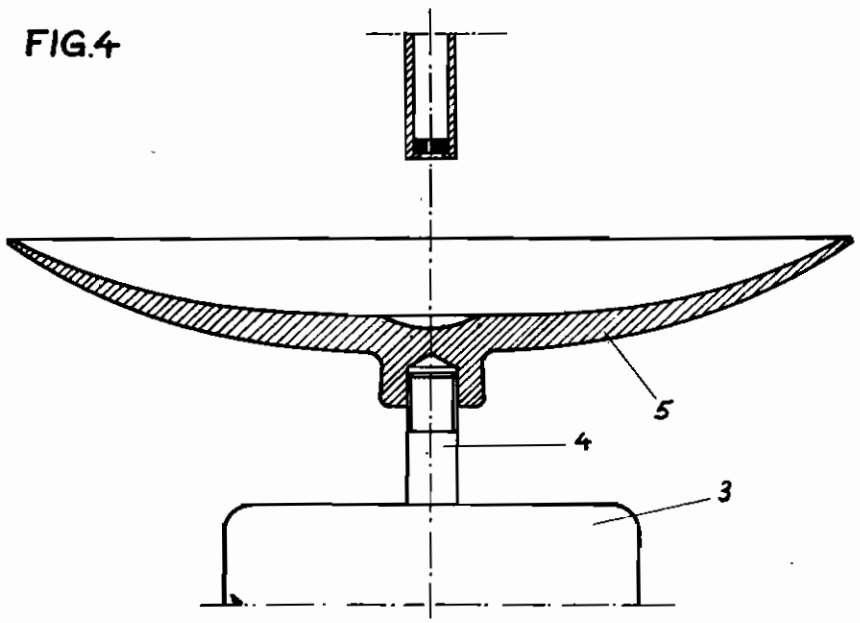


FIG.5

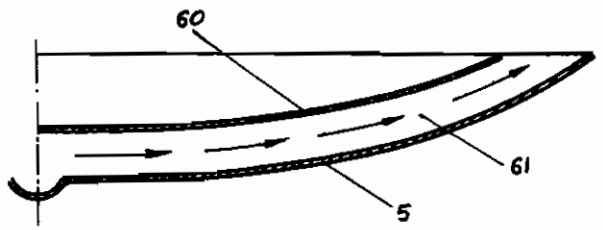
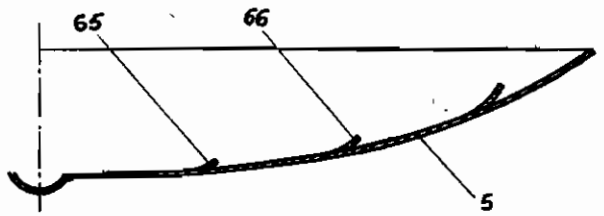


FIG.6



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ALIEN PROPERTY CUSTODIAN

PROCESS AND APPARATUS FOR PLACING IN SUSPENSION IN AIR AN ULTRA - DISPERSED FLUID OR OTHER DRY PRODUCTS IN POWDER FORM

Emile Piquerez, Saint-Cloud, France; vested in the Alien Property Custodian

Application filed June 13, 1941

The creation of an extremely fine film, from a fluid, is obtainable by pressure and by flowing through a passageway having a cross section equivalent in thickness to the fineness of the film. Such a realization necessitates high pressures and consequently involves fluid-tight devices which, in practice, are difficult to construct.

The present invention relates to a process for placing in colloidal suspension a fluid—or products in powder form—and to the apparatus by means of which an extremely fine film—or a vapour—can be created without it being necessary to use complicated fluid-tight devices of limited duration.

In accordance with the invention, the film—or the vapour—is created by the use of centrifugal force which by the adherent sticking of the fluid used (or of the powder) on the rotary member, converts said fluid—or said powder—into a film—or into a vapour; the film or the vapour following a path having a suitable curve so as to issue tangentially (horizontal sheets).

The ultra-dispersion produced, the particles of which are subjected to "Brownian" motion, depends on the superficial exciting effect of centrifugal force and the thinning of the film in formation on the rotary member produces, during the rotation, the desired superficial increase of the film.

The exciting can be increased by circulation of air or other gas and by heat exchange.

The apparatus provided for the production of said film is essentially characterised by the fact that it comprises a rotary receiver arranged in such a manner that the fluid—or the powder—to be treated falls therein by gravity or is projected therein.

In said apparatus the evaporation of the fluid resulting from centrifugal force due to the action of the rotary receiver is advantageously excited by means of any suitably directed current, the profile of the rotary receiver and the walls of the enclosure in which said rotary receiver is contained being taken into consideration.

The non reduced droplets or particles strike against a fixed surface of the apparatus and are recovered to be utilised over again.

The fluid—or the powder—to be treated, can fall from a reservoir on the rotating receiver, either approximately at the centre of the latter so as to start from a practically null speed and to acquire a uniformly accelerated peripheral speed; or, on any practically utilisable generatrix of said receiver, in which case the impact produced can be used without moreover modifying the general operation of the apparatus.

The placing in suspension in the atmosphere of various products necessitates, in accordance with this process and with the apparatus allowing it to be carried into practice, only very small quantities of said products, comparatively to the known atomization process. Furthermore, the extremely divided products have a much greater activity than when they are in vapour form.

The scope of application of the invention is very wide since in practice it can extend from a private room or a hospital ward for obtaining in such enclosures air which is chemically and bacteriologically pure, up to the creation of smoke allowing for instance to camouflage warships.

This scope includes among others the creation of widespread protection zones against attacks by asphyxiating gases or bacteriological war, the same results being obtained on a smaller scale in private or public shelters.

The invention will moreover be better understood by referring to the accompanying drawing by way of example and in which:

Fig. 1 illustrates in vertical axial section an apparatus according to the invention.

Fig. 2 is a view similar to Fig. 1 of a first constructional modification.

Fig. 3 is a view similar to Fig. 1 of a second constructional modification.

Fig. 4 is a diagrammatic view of a device of high output.

Fig. 5 shows a rotary receiver combined with a complementary blowing device.

Fig. 6 shows a rotary receiver with stages.

In the embodiment of the apparatus according to Fig. 1, a base 1 is shaped so as to carry the body 2 of the apparatus and to support a propeller 3 the driving shaft 4 of which is axially and upwardly extended within the body 2 of the apparatus.

On the projecting end of the driving shaft 4 is secured, by any suitable means, the receiver 5 which, in this case, has a conical shape.

A partition 6 also secured on the base 1 is so shaped as to create, below the disc 5, an annular enclosure 7 for the recovery of the non reduced fluid. A cock 8 is arranged at the lower part of the enclosure 7 for extracting, in view of its re-utilisation, the non reduced fluid.

The annular space 9 left available between the disc 5 and the partition 6 is used for housing the blowing device 10.

According to the form of construction chosen,

the vanes of the blowing device 10 are directly secured on the back of the working disc 5.

At the upper part of the body 2 of the apparatus is secured a ring 11 reinforcing said body when the latter is made of sheet metal and comprising an internal screw thread 12 intended to receive a second screw threaded ring 13 carrying a reservoir 14 of cylindrical shape containing the liquid 15 to be treated.

The bottom of the reservoir 14 is of conical shape, at 16, terminating in a portion 17 of reduced diameter carrying a nozzle 18 having a calibrated hole 19 for the passage of the liquid 15 issuing from the reservoir 14.

The screw threaded ring 13 is so constructed as to provide, at the centre, a vertical hub 20 internally threaded for receiving an operating hand-wheel 21 comprising a screw threaded sleeve 22. The hand-wheel 21 carries a rod 23 the lower end of which is provided with a conical closing valve 24. The fluid-tightness of the conical valve on the cone 16 of the reservoir 14 is reinforced by a washer made of suitable material 25 secured on said valve 24.

Above the recovery enclosure 7 is arranged a reducing enclosure 26 limited by the disc 5, the inner surface of the body 2 approximately located at the level of the disc 5 and a tubular conical partition 27 secured within the body 2; the apex of the truncated cone 27 being directed towards the lower part of the apparatus.

Directly above the upper level of the cone 27, openings 28 are perforated in the body 2 and extend practically up to the edge of the annular reinforcing ring 11. Said openings through which the ultra-dispersions produced in the form of a film can issue from the apparatus are provided with suitable cloth filters 29 intended to protect the internal mechanism from external agents.

The screw threaded ring 13 is provided with wings 30 facilitating the screwing of the reservoir 14 for the liquid to be treated, in the apparatus.

A cover 31 is placed on the ring 13 so as to ensure a sufficient fluid-tightness so that no leakage to the atmosphere is possible.

The disc 5 has series of perforations 32 for the passage of the air delivered by the blowing device 10.

The blowing device 10 creates, within the enclosures 7 and 26, a pressure which, during the operation of the apparatus, that is to say when the closing valve 24 is open, acts in antagonism to the emptying of the reservoir 14; it is therefore necessary that the latter should comprise a means for balancing the pressures since the reservoir is closed to the atmosphere by the cover 31.

This balancing is obtained by arranging within the reservoir 14 a pipe 33 which, leading from the bottom of the reservoir, rises up to a level higher than that of the liquid, thus putting the empty space located above the liquid 15 in a state of suitable equilibrium allowing the emptying of the liquid to be treated through the calibrated orifice 19.

According to this embodiment the centre of the calibrated orifice 19 through which the liquid issues from the reservoir to fall on the disc 5 is located on the axis of the apparatus which is mingled with the axis of rotation of the disc 5.

The disc 5 presents, at the centre, a tubular housing 34 intended to receive a cylindrical block 35 on the upper face of which is milled a cup 38 for the reception of the liquid to be treated falling from the reservoir 14.

For using the apparatus described—the reservoir 14 being previously filled with liquid to be treated up to a level which does not reach to the top of pipe 33—the cover 31 is removed and the valve 24 is slightly lifted from its seat, located on the conical part 16 of reservoir 14, by causing the hand-wheel 21 to rotate in the required direction, the propeller 3 is simultaneously set in action, and, through its driving shaft 4, rotatively drives the working disc 5.

The liquid to be treated which, after having passed about the valve 24 issues from the reservoir 14, through the calibrated orifice 19, falls in the cup 36 of the rotating disc 5, in a zone from which the liquid starts at a practically null speed and acquires on the disc a uniformly accelerated speed. The extremely thin film which forms follows a path according to a curve of the second degree to escape tangentially.

As the ultra-dispersions must be subjected to "Brownian" motion and must depend on the superficial exciting, their thinning has already allowed an increase of surface.

The blowing device 10 being synchronised with the rotation of disc 5, the air stream sent by said device allows of obtaining an increase of the exciting by circulation and by heat exchange.

The ultra-dispersions are then in the enclosure 26 and escape from the apparatus through the openings 28, after having passed between the inverted truncated cone 27 and the reservoir 14.

The non reduced liquid strikes, in the form of droplets, the inside of the body 2 above the level of disc 27 and adheres on said surface of the body 2 from which it falls into the recovery enclosure 7.

From said recovery enclosure 7 the non reduced liquid can be taken up again through the cock 8 to be subsequently placed again in the reservoir 14.

In the embodiment illustrated in Fig. 2, the receiver 5 has the shape of a tumbler the bottom 40 of which has, in its centre, a cavity 41 equivalent to the milled cup 36 of Fig. 1.

The tumbler 5 extends below the bottom 4 to be secured at 49 on the driving shaft 4 of the propeller 3 which, as in Fig. 1, is supported by the base 1.

The blowing device 10 which is carried by the lower part of tumbler 5 is housed in the cylindrical part 42 of a sheet metal hoop 43 of frustum shape which diverges downwardly from the cylindrical part.

This hoop 43 arranged within the body 2 allows of obtaining the recovery enclosure 7, as in Fig 1.

The part of the tumbler 5 which is above the level of the blowing device 10 has outlet openings 44 for the ultra-dispersions, a fine mesh system being arranged inside said tumbler.

A fluid-tight inspection hole 45 mounted at a suitable level on the body 2 allows the inside of the apparatus to be seen.

The propeller 3 being protected by a casing 46, circular openings 47 and 48 are provided, respectively in the base 1 and in the upper central part of the casing 46, so that the air draught from the blowing device 10 passes around the propeller 3 for ensuring the cooling thereof.

All the other parts of the apparatus fulfill the same functions as in the embodiment according to Fig. 1, the ultra-dispersions being compelled to follow a slightly different path to issue from

the apparatus; the outlet finally taking place through openings 47a protected by networks of meshes 48a.

The operation takes place in an absolutely identical manner as that described with reference to the apparatus illustrated in Fig. 1.

In the embodiment illustrated in Fig. 3, the receiver 5 has the shape of a basin. The product to be treated is admitted through a conduit 50 on which is provided a cock, not shown, for adjusting the outflow.

At a certain distance above the receiver 5 is arranged a conical cap 52 the apex of which is directed towards the receiver and which is supported by the arms 56 of a ring 54 secured on the conduit 50.

The operation according to this embodiment is different from that described with reference to Figs. 1 and 2. The difference results from the fact that the film which escapes tangentially from the receiver 5 strikes against the perfectly polished inner surface of a ring 53 which is supported by means of arms 57 secured, on the other hand, within the body 2 of the apparatus.

This fixed ring 53 completes, with a gap, the profile of the receiver 5; an annular space 55 constituting the gap.

The horizontal sheet therefore leaving the rotary receiver 5 tangentially, strikes, as already indicated, against the polished internal surface of a fixed ring 53; whereas the pressure of the air draught arising from the blower 10 through the gap 55 completes the exciting and tends to direct the ultra-dispersions against the opposite surface of the conical cap 52 which acts as a screen facilitating the evacuation of the ultra-dispersions, to the exterior. The nonreduced liquid passes over the cap 52 which, constituting a funnel, brings it back to the place of utilisation.

The more the surface of the fixed ring 53 is polished, the better is the result obtained owing to the fact that the risks of adherence are avoided.

In Fig. 4 has been shown, more or less diagrammatically, the essential part of an apparatus which is particularly suitable for the production of ultra-dispersions—smoke—in such quantities that they allow the camouflage, either of warships, or of land positions.

The large receiver 5 rotatively driven by the shaft 4 of a sufficiently powerful propeller 3 has a shape resembling that of a flat plate and the thickness of which relatively great at the centre gradually thins towards the slightly turned up edges of the periphery so as to reduce as much as possible the peripheral weight; whereas the material to be treated—liquid solution or pulverulent product—is emptied on said receiver through an orifice calibrated or not at a rate, litres per hour, relatively important.

In Fig. 5 a rotary receiver 5 has been shown of the type of that illustrated in Fig. 3. According to said figure, at a certain distance above the receiver 5 is arranged a disc 60 having approximately the same profile so that a real pump 61 is created resulting from the action of the blowing device illustrated in Figs. 1 to 3. The function of said pump is to complete the formation of the ultra-dispersions and to facilitate their evacuation towards the atmosphere, result which can be combined or not with the result described relatively to the polished surface of ring 53.

In Fig. 6 has been shown a rotary receiver according to which the ultra-dispersions are created in a stepped manner.

At a certain radius more or less remote from the centre of the rotary receiver 5 is arranged a first flared ring 65 of relatively small height which constitutes a first stage of work. The material to be treated falling at the centre of the receiver 5 begins to thin and the film in formation escapes tangentially from the ring 65. The thinning accentuates up to a second stage 66 of slightly greater height and so on according to the number of stages provided and the film finally leaves the rotary plate 5 as in the preceding examples.

In certain cases this arrangement allows of increasing the limit of resilient distortion of the film in formation.

It is to be understood that the embodiments illustrated have been described only by way of explanatory examples and not in a limiting sense, and that all modifications can be made therein without changing the nature of the invention. Thus, for instance, the reducing receiver can have any shape other than those shown, for instance the shape might extend from the flat shape to the various concave or convex shapes. The working stages, instead of being secured in position might be constituted by concentric undulations of the receiver itself. The blower might be of any known type and arranged in any other place in the apparatus and even outside the latter. The air draught might also be replaced by any injection under pressure of gas or of vapours. The vanes of the blowing device instead of being secured on the receiver, might be constituted by alveoles made in the receiver itself. The dropping zone for the product to be reduced, on the receiver might be located on a radius more or less remote from the axis of rotation.

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