United States Patent

Ballu

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[54] DEVICE FOR SPRAYING TREATMENT PRODUCTS USED PARTICULARLY FOR FARMING

[72] Inventor: **Vincent Pierre Marie Ballu,** Epernay, France

[73] Assignee: **Tecnoma,** Epernay (Marne), France

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[30] **Foreign Application Priority Data**

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[52] **U.S. Cl.** **239/77,** 222/193, 239/143

[51] **Int. Cl.** **A01n 17/08**

[58] **Field of Search** 239/77, 143, 146, 172, 346; 222/193; 302/37, 46, 57

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Primary Examiner—M. Henson Wood, Jr.
Assistant Examiner—Edwin D. Grant
Attorney—Imirie & Smiley

[57] **ABSTRACT**

The device to atomize and spray liquid and pulverulent treatment products comprises a tank partly in the shape of a truncated cone, a turbine is placed in the bottom of the truncated part under a complementary shaped baffle-plate covering said turbine and an outlet nozzle is provided. The shaft of the turbine is passing through a panel delimited by the tank and protruding into the portion of the tank which is opposite to the truncated part.

15 Claims, 7 Drawing Figures

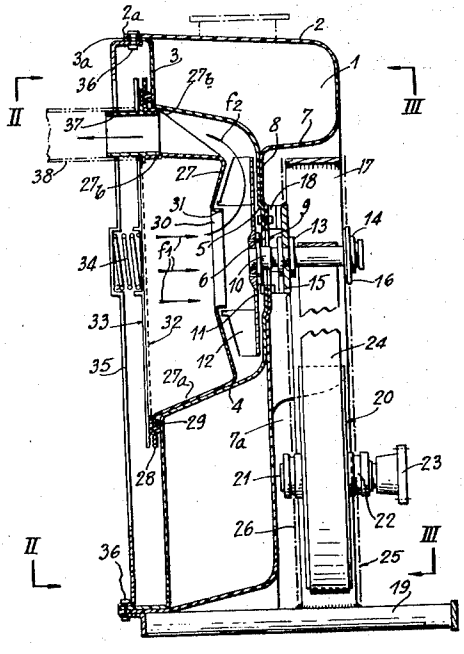


FIG. 4.

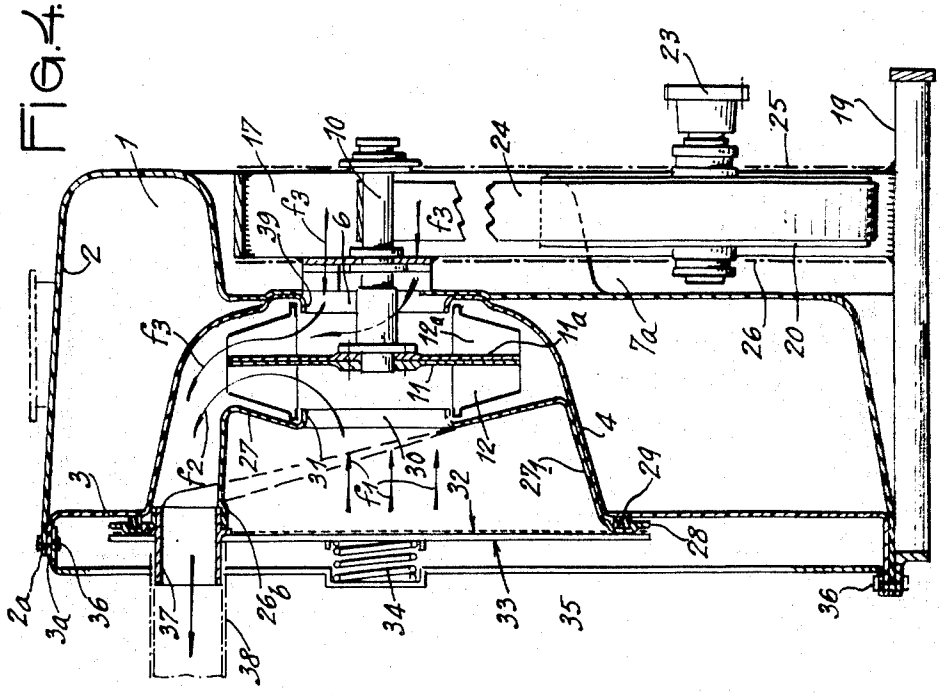
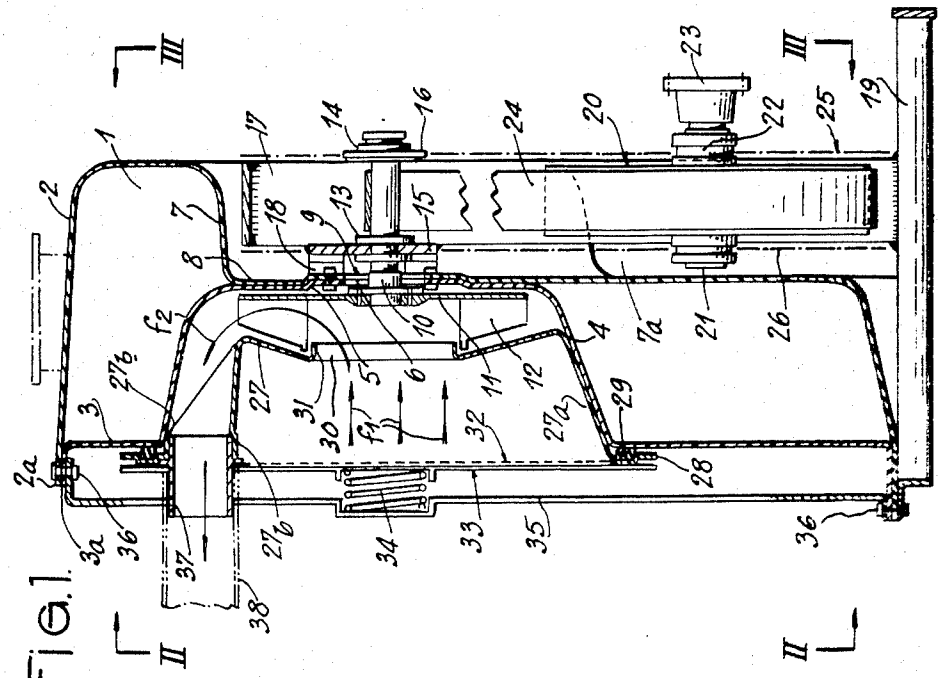


FIG. 1.



INVENTOR

VINCENT P. M. BALLU

Imirie & Smiley
Attys.

Fig.2.

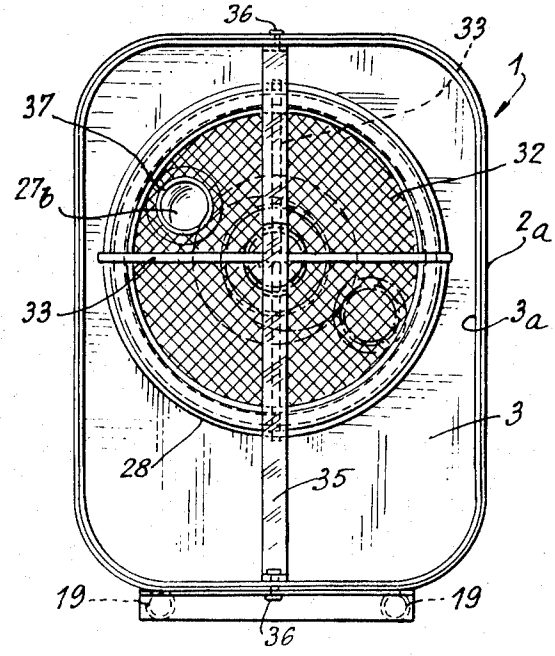
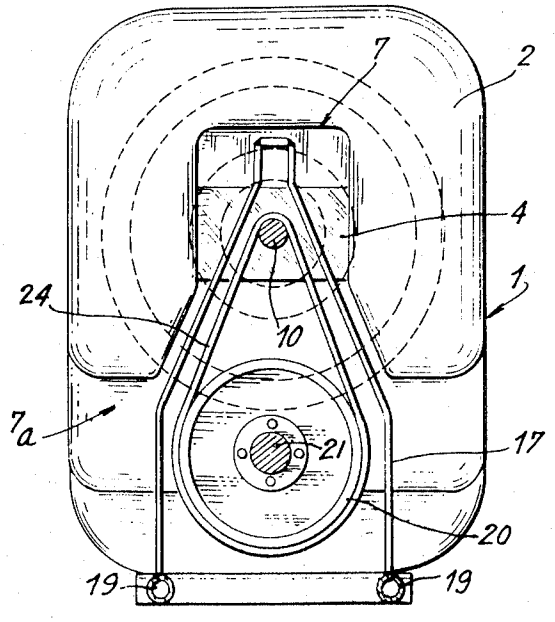


Fig.3.

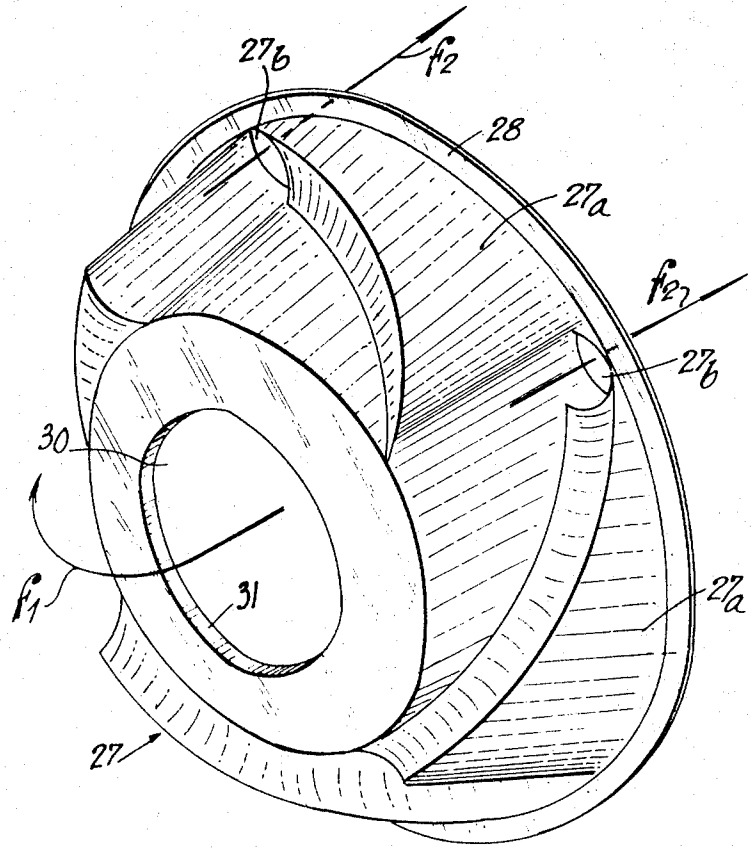


INVENTOR

VINCENT P. M. BALLU

Imirie & Smiley Attys.

Fig.5.



INVENTOR

VINCENT P. M. BALLU

Imirie & Smiley

Attys.

Fig.6.

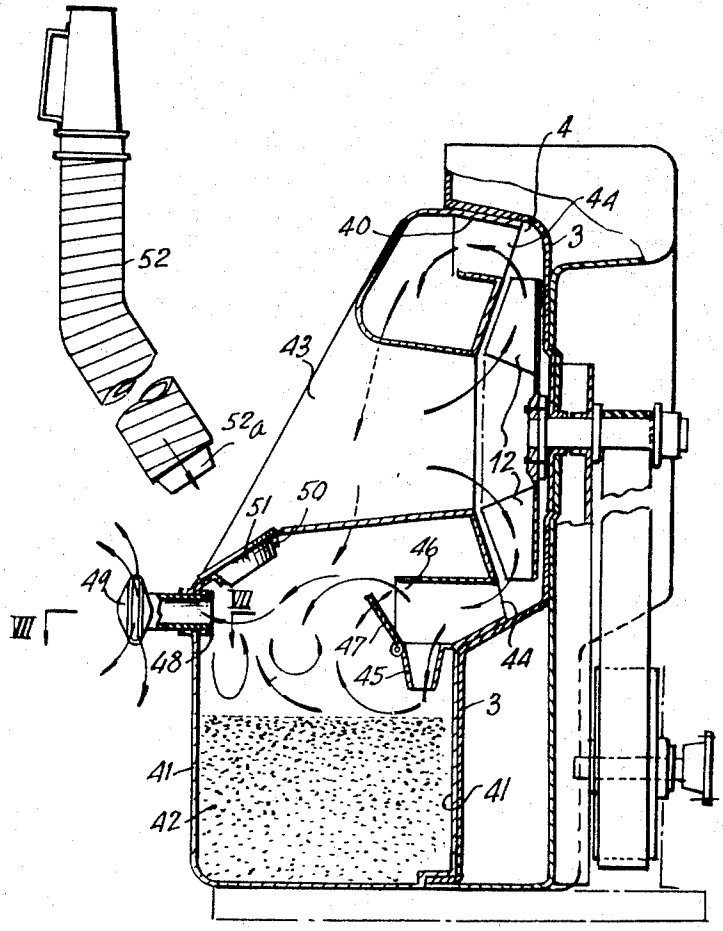
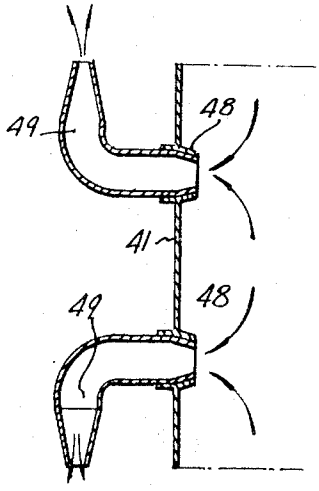


Fig.7.



INVENTOR

VINCENT P. M. BALLU

Dennise & Smiley
ATTYS.

DEVICE FOR SPRAYING TREATMENT PRODUCTS USED PARTICULARLY FOR FARMING

This invention relates to a new device for spraying treatment products used particularly for farming. Some of the existing apparatuses include turbines or blowers to blow air utilized to drain powders or sprayed liquids. The turbines or blowers, and also their driving means, are placed on a frame which, most of the time, is also utilized as a support for a tank containing the treatment products. Said apparatuses are comparatively bulky and not very strong because the mechanical units constituted by turbines or blowers and their driving means, are subject to various accidents when the device is carried on a trailer and is passing through plantations.

Besides, said mechanical units are generally not suitably protected, and it is then necessary to provide protective hoods making them heavier and very bulky.

This invention creates a new device, and the arrangement of the means constituting said device is far better suitable for the requirements of the farming than the apparatuses known up to now. Besides, with said arrangement, the user can adapt the device to any type of treatment.

Moreover, according to the invention, it has become possible, due to the resulting construction simplification, to appreciably reduce the manufacturing cost of such devices and to greatly standardize the manufacturing thereof.

According to the invention, the device comprises a tank, a side of which delimits a revolution concavity substantially in the shape of a truncated cone with revolution sectors, at least a turbine placed in the bottom of said concavity, a baffle-plate delimiting revolution complementary sectors to said concavity, at least a central opening coaxial to the turbine, and at least one volute and an outlet nozzle, said baffle-plate being also placed into said concavity and covering said turbine supported by a shaft passing through a panel delimited by the tank and protruding into a second concavity presented by said tank in the face thereof which is opposite to the face containing said turbine.

Other characteristics of the invention are shown in the following detailed description.

Embodiments of the invention are shown by way of none restrictive examples in the accompanying drawings.

FIG. 1 is a sectional view illustrating an embodiment of the device of the invention.

FIG. 2 is a front reduced elevation view made according to line II—II of FIG. 1.

FIG. 3 is also a reduced elevation view made according to line III—III of FIG. 1.

FIG. 4 is a sectional view, similar to FIG. 1, illustrating an embodiment of the invention.

FIG. 5 is an enlarged perspective view of one of the elements constituting the device of the preceding figures.

FIG. 6 is a diagrammatic sectional view illustrating another embodiment of the invention.

FIG. 7 is a partial sectional view made according to line VII—VII of FIG. 6.

In the embodiment shown on FIGS. 1 to 3, the device is provided with a tank generally designated by reference numeral 1; said tank being provided to contain the products, either liquids or powders, to be atomized or sprayed.

In the example represented, the tank 1 is constituted by two complementary housings 2 and 3, preferably made of reinforced synthetic resin, for example of polyester resin reinforced with glass fibers. The edge 2*a* of housing 2 is shaped to delimit a jointing surface for a ring-shaped clamp 3*a* shaped by the corresponding edge of housing 3.

The back-side of housing 3, when taking into consideration the usual way the device is moving, delimits a revolution concavity 4, for example shaped as a truncated cone. Said concavity includes, according to embodiment shown in FIG. 1, a bottom 5 in which a hole 6 is bored, said hole 6 being coaxial to the axis of said concavity 4. In a similar way, the housing 2 delimits a concavity 7, the bottom 8 of which is complementary shaped to the bottom 5 of concavity 4 in such a way that

said bottoms 5 and 8 are bearing against each other, thus constituting a reinforcement used to connect the two housings 2 and 3 between each other and, eventually, to the mechanism hereinbelow described, in order to make rigid the device.

When housings 2 and 3 are made of reinforced resin, the bottoms 5 and 8 are copolymerized between each other, as also the clamp 3*a* and the jointing edge 2*a*. Thus is obtained that tank constitutes a one-piece unit. Bottom 8 and bottom 5 have a hole 9 enabling passage of a shaft 10 supporting the reinforcing piece 11 of a centrifugal turbine 12 which is placed into the revolution concavity 4.

The shaft 10 is supported by bearings 13 and 14. Bearing 13 is supported by struts 15, and bearing 14 is supported by a plate 16. Said struts and plate are fixed to a stirrup-shaped iron-plate 17 embedded into concavity 7 of housing 2, said concavity, as shown on FIGS. 1 and 3, communicating with a hollow portion 7*a* in front portion of housing 2.

It is advantageous that struts 15 supporting the bearing 13 be provided with lateral collars 18 (FIG. 1) bearing on bottom 8 of concavity 7 of housing 2 assembled to bottom 5 of housing 3. The whole assembly is bolted in order to prevent any relative move of iron-plate 17, forming stirrup and support, in relation with the tank 1. The iron plate 17 is supported by a base 19 on which is also placed the lower portion of the tank 1. The interval delimited by the stirrup-shaped iron-plate 17 is also utilized as a housing for a driving wheel 20, the shaft 21 thereof being supported into bearings 22, supported with no difference by said iron-plate 17 or base 19. The shaft 21 is provided with coupling 23 enabling the connection of the same to a driving hook, for example to the driving hook of a farming tractor, eventually through a connecting shaft (not represented).

As it appears from above and from the drawings, the driving wheel 20 is connected to shaft 10 by means of a belt 24, and said belt is thus included inside the support delimited by the stirrup-shaped iron-plate 17 which is entirely placed into concavity 7 and housing 7*a* of the tank 1, only the coupling clutch 23 protruding from said tank.

To prevent any accident, the arms of the iron-plate 17 can be connected together through one or several grate-shaped or perforated metal sheets represented in mixed lines as 25 and 26 on FIG. 1, whereby the shaft 10, driving wheel 20 and belt 24 are entirely covered.

The revolution concavity 4 is used to place a turbine baffle-plate 27. The baffle-plate 27 includes one or several revolution sectors 27*a* (FIGS. 1 and 5) being applied directly against concavity 4 and thus ensuring the centering of said baffle-plate in relation with said concavity. Besides, said baffle-plate delimits volutes of which the ends thereof are provided with nozzles 27*b* with circular openings, one of them appearing on FIG. 1. The number of nozzles 27*b* is determined by the utilization of the device, said number can be, for example, within the range of 1 to 6. The drawings show that the turbine baffle-plate 27 is only placed by jointing into concavity 4. A peripheric edge 28 is designed all around baffle-plate 27 to constitute in some way a collar, and a seal-tight gasket 29 is placed between said edge and the corresponding portion of the back-side of housing 3.

FIGS. 1 and 5 also show that the baffle-plate 27 delimits, in the bottom thereof, an opening 30 delimited by a cylindrical edge 31 next to the inner edge of the turbine blades 12. Thus, when the turbine is driven from coupling 23, said turbine sucks-up some air according to the direction of arrows f_1 and exhales said air after compression into the nozzle(s) 27*b* according to the direction of arrow f_2.

To keep into place the baffle-plate 27 and to prevent foreign materials to be brought into the turbine, it is provided to cover the whole front portion of said baffle-plate with a grate 32. Said grate 32 is, for example, made of expanded metal and maintained by struts 33 which are kept against the peripheric edge 28 of the baffle-plate by a spring 34, bearing against a bar 35, the folded ends thereof being fixed by screws, fasteners or any other fixing means 36, connecting the same to

the collar 3*a* and to the jointing edge 2*a*. Grate 32 which is preferably substantially rigid can be also utilized to maintain connecting tips 37 engaged into openings of nozzles 27*b* and protruding in order to enable the fixing of tubes or pipes 38 which send the air towards spraying devices (not represented).

From the above mentioned, it is to be noticed that, according to the work to be performed by the above described device, it is possible, for the user, to very easily change the baffle-plate 27 since he has only to unlock the bar 35 thus ensuring the immediate removal of struts 33 from grate 32 and ensuring consequently the effective and simple removal of the turbine baffle-plate to be replaced by another one having more nozzles, or, on the contrary, less nozzles.

It is noticeable that all the components of the turbine, and even the tips 37, are also embedded into the volume delimited by the tank. All these components are consequently protected against impacts, the tank 1 forming a protective element. As a result also the whole device is not bulky and the adaptation of the same to any kind of work is very simple, as it has just been explained.

The above described construction enables the realization of very powerful apparatuses. As a matter of fact, as shown on FIG. 4, when providing that the bottom 5 of the revolution concavity 4 formed by housing 3 will delimit — around the opening 6 — an edge 39, it is possible to place, into said concavity 4, two coupled turbines 12 and 12*a*, the reinforcements 11 and 11*a* thereof being both fixed on the end of shaft 10. It is thus possible as already described to obtain a sucking-in according to the direction of arrows f_1 and also a sucking-in according to the direction of arrows f_3 for turbine 12*a*, the air being pushed-back by the two said turbines according to the direction of arrow f_2.

On FIG. 6, the concavity 4 of housing 3 is utilized for centering a collector 40 formed by a container 41 filled with a load of powder 42. The drawings show that collector 40 is then substituted to the turbine baffle-plate 27.

Preferably, container 41 forming collector 40 is made of synthetic resin via moulding by rotation, thus enabling said container to be made in one piece.

The inner wall of collector 40 delimits a sucking-in nozzle 43 for the air which is sucked-in according to the direction of the arrows by the centrifugal turbine 12. The air, exhaled according to the direction of arrows by turbine 12, enters the collector through one or several openings 44.

On the lower portion thereof, the collector 40, at least forms a first tube 45 directed towards the powder 42 and a second tube 46 which can be more or less closed by a flap 47. The front portion of the container 41 has tubular bases 48 for placing plugs or bent atomizers 49, preferably in the number of two, and they can thus be directed towards many directions in view of directing, in the best possible way, the powder which is to be atomized, and according to the cultures to be treated.

Also as an addition, the container 41 is provided with a filling opening 50, usually closed by a plug 51, to which can be substituted the base 52*a* of a flexible atomization gun 52.

As it appears from above, the air which is sucked by turbine 12 through nozzle 43 is pushed-back into collector 40 through the opening (s) 44 and is directed towards the inside of the container. The air coming-out from collector 40 substantially follows a cyclonic motion. The air coming-out from tube 45 and also from tube 46 causes a disturbance causing the powder 42 to be progressively put into suspension into said air and becomes fluidized. The so-fluidized powder is then atomized through either atomizers 49 or gun 52.

From the above mentioned, it is to be noticed that the device of FIGS. 1 to 4 can either be utilized to spray liquids and atomize powders with not other modification than replacing diffuser 27 by container 41.

The invention is not restricted to the embodiments shown and described in detail, for various modifications thereof can moreover be applied to it without departing from the scope of the invention as defined in the appended claims. Particularly, it is obvious that filling, draining and pumping devices, and also atomization or spraying devices are associated to the tank which can also be provided with mixing devices to homogenize the products suspensions contained in said tank, said product being either aqueous or pulverulent. The tank can also be made of thermoplastic synthetical resin moulded by rotation or it can eventually be made of metal.

I claim:

1. Device to atomize and spray liquid and pulverulent treatment products used particularly for farming, comprising a tank of which a side delimits a revolution concavity substantially in the shape of a truncated cone, at least a turbine placed in the bottom of said concavity, a baffle-plate delimiting revolution sectors having a shape complementary to the truncated shape of said concavity, at least a central opening coaxial to the turbine, and at least one volute and an outlet nozzle, said baffle-plate being also placed into said concavity and covering said turbine which is moreover supported by a shaft passing through a panel delimited by the tank and protruding into a second concavity presented by said tank in the face thereof which is opposite to the face containing said turbine.

2. Device, as set forth in claim 1, wherein the baffle-plate of the turbine is only housed into the concavity of the back-side of tank in which said tank is maintained by pressure means applying said revolution sectors against the revolution concavity of the tank and pressing a seal-tight gasket between the back-side of the tank and a peripheric edge of said baffle-plate.

3. Device, as set forth in claim 1, wherein the tank is constituted by two complementary-shaped housings which are fitted each other, whereby the bottoms of the concavities provided in the front and back-sides of said tank are fixed together and whereby a joining edge of one of the housings contains an edge forming collar for the other housing.

4. Device, as set forth in claim 3, wherein the concavity opening into the front side of the tank contains an iron-plate which is substantially stirrup-shaped and is fixed on a base supporting the tank, said iron-plate moreover surrounding the driving shaft of the turbine and the driving means thereof which are entirely embedded into said tank.

5. Device, as set forth in claim 3, wherein the bottoms of concavities delimited by the two housings constituting the tank, have an opening similar to the one of the turbine baffle-plate, and wherein two centrifugal action turbines are coupled to each other.

6. Device, as set forth in claim 4, wherein the substantially stirrup-shaped iron-plate is supporting the turbine driving shaft by means of bearings to which said shaft is connected by struts forming additional bearing surface fixed on the common wall of the concavity of the back and front-sides of the tank.

7. Device, as set forth in claim 1, wherein the turbine baffle-plate is maintained into the back-side of the concavity of the tank by means of a grate applied against the peripheric edge of said nozzle through struts against which at least one spring is operating, said spring bearing against a bar, and the tips of said bar being fixed to the edge by the collar and the jointing edge of the two housings constituting the tank.

8. Device, as set forth in claim 4, wherein at least one sheet of protective grate is fixed to the substantially stirrup-shaped iron-plate to cover the driving means of the shaft of the turbine.

9. Device, as set forth in claim 1, wherein the baffle-plate, forms a collector at the upper portion of a container, said container having a load of powder and being bored, in the front-side thereof, with apertures for the selective placing of components directing, into the collector above the mass of powder, the flow of powder which is set into suspension into the air blown through the turbine.

10. Device, as set forth in claim 9, wherein the container is constituted by an hollow part delimiting, at the central portion of the collector that it forms, a sucking nozzle for the centrifugal action turbine exhalating the air by at least one opening communicating with the inside of said collector, whereby the

air into said collector is moved with a substantially cyclonic motion.

11. Device, as set forth in claim 9, wherein the container forms, from the collector, in the lower portion of the same, at least a first additional nozzle directed towards the surface of the powder, whereby air is also blown towards said powder while perturbating the cycloning move of the air coming from the collector.

12. Device, as set forth in claim 9, wherein a second additional nozzle is opening into the container substantially at the lower portion of the collector, said second additional nozzle being directed towards the outlet apertures of said container, and an adjustable flap being placed in front of said second additional nozzle.

13. Device, as set forth in claim 12, wherein the apertures, provided at the front-side of the collector, form tubular bases for placing bent diffusers.

14. Device, as set forth in claim 9, wherein a filling opening is provided into the container close to the inlet of the nozzle formed by the same, said opening being closed by a plug.

15. Device, as set forth in claim 9, wherein a filling opening is provided into the container close to the inlet of the nozzle formed by the same, said opening being closed by an articulated spraying gun.

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