Sept. 14, 1937. W. BOLK 2,093,028

APPARATUS FOR IMPARTING A GIVEN DENSITY TO SUBSTANCES IN POWDER FORM AND FOR FILLING UP LIMITED SPACES WITH CONTROLLABLE QUANTITIES OF THE SAID SUBSTANCES

Filed April 8, 1935

Fig. 1.

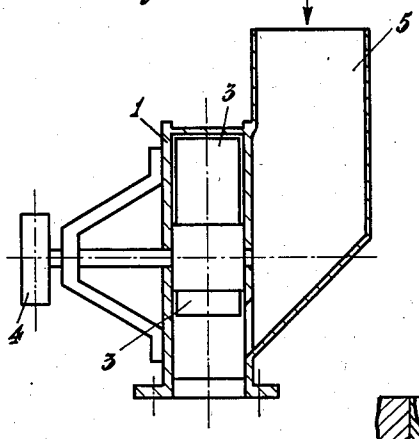


Fig. 2.

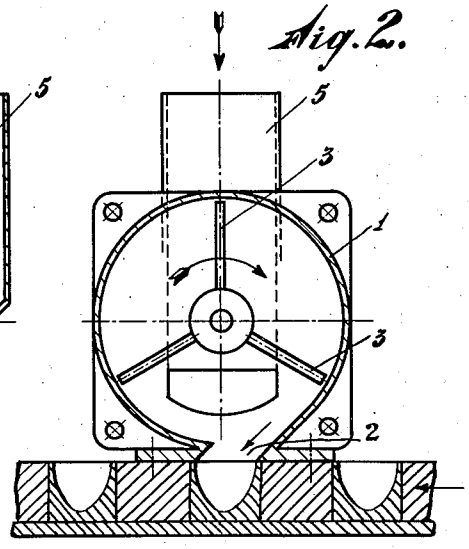


Fig. 3.

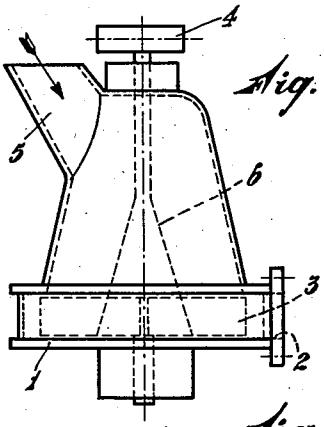


Fig. 4.

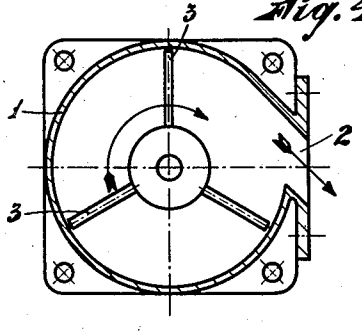
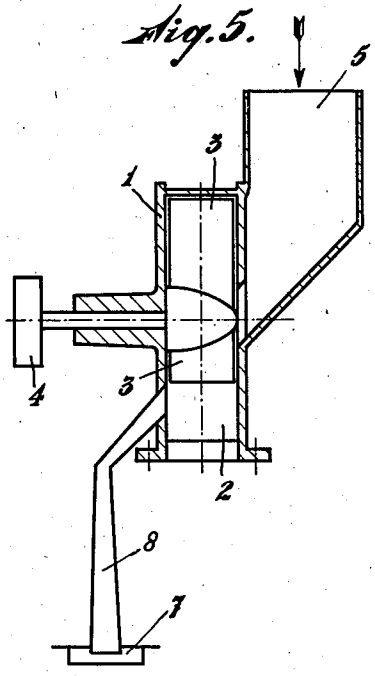


Fig. 5.



Inventor:
Willem Bolk
By E. F. Wendroth
Atty.

Patented Sept. 14, 1937

2,093,028

UNITED STATES PATENT OFFICE

2,093,028

APPARATUS FOR IMPARTING A GIVEN DENSITY TO SUBSTANCES IN POWDER-FORM AND FOR FILLING UP LIMITED SPACES WITH CONTROLLABLE QUANTITIES OF THE SAID SUBSTANCES

Willem Bolk, Arnhem, Netherlands, assignor to Naamlooze Vennootschap: Maatschappij tot Exploitatie van "ten Bosch Ostrooien N. V.", Arnhem, Netherlands

Application April 8, 1935, Serial No. 15,354
In Germany July 10, 1934

2 Claims. (Cl. 22—36)

My invention relates to a method and an apparatus for imparting a given density to substances in powder form and for filling limited spaces with controllable quantities of the said substances.

The density of substances in powder form depends on their kinetic condition (rest, mechanical or pneumatic displacement, vibration, etc.) and on the proportion of air or other gases present in the matter. This renders it difficult to fill spaces of a given capacity such as e. g. compression moulds with a given controllable quantity of a substance in powder form. The method, hitherto used for this purpose is very complicated, as the desired quantity of the material is first to be weighed out, after which it is to be forced into the mould or in the container by means of a press, in order to obtain the desired volume. This method not only is very complicated, but it also requires a considerable amount of time.

My invention provides a method and an apparatus for attaining the desired result in a very simple manner and with far less loss of time.

According to the invention the material is rotated in a closed room of a circular cross section at a rate of speed corresponding to the desired density of the said material.

It is possible to impart the desired densities to the material by selecting the corresponding velocities of rotation. As long as the outlet opening is closed, the material is given a uniform rotating motion e. g. by means of rotating blades (radial projections arranged on a shaft). This will subject the material to the influence of the centrifugal force, the strength of the said force depending on the speed of rotation. It is evident that with a greater degree of velocity of rotation the material by means of the centrifugal force will be more tightly compacted than will be the case with a lesser rate of speed and that in this way any desired degree of density may be obtained within a short time. If the outlet is opened the material is hurled out tangentially, while retaining the density imparted to the same, as no other forces are acting thereon. By placing a container of limited dimensions, e. g. a compressing mould in front of the outlet opening, the said container may be filled with the desired quantity of the material by keeping the outlet aperture open during a given period of time.

Although it is desirable for the perfect functionating of a device of this nature that a quantity of powdered material equal to that which is being withdrawn, be continually fed into the cylindrical space, this requirement is hard to meet in actual practice and since too small a supply of material to the cylindrical space is obviously out of the question, it will be found in practice that the quantity of material fed to the cylindrical space always will more or less exceed the quantity withdrawn from the same.

Consequently the cylindrical space will become overcrowded in the long run and finally get clogged. In that case an excessive amount of energy will be needed to rotate the substance in powder form present in the cylindrical space with the aid of the blade-wheel member.

It is also the aim of the invention to obviate this drawback.

For this purpose according to the invention an overflow line, opening into the cylindrical space is connected to one of the end walls of the said space, which overflow line is provided with a device for regulating the current of air passing through the same. This controlling device may consist of a dished member into which the other end of the overflow line is opening.

The invention will now be further explained with the aid of the accompanying drawing on which two embodiments of the same are represented. In this drawing

Fig. 1 is a longitudinal section,

Fig. 2 is a cross section,

Fig. 3 a side elevation of a modified embodiment.

Fig. 4 a horizontal section through the device shown in Figure 3.

Fig. 5 is a longitudinal section of a modified embodiment.

The casing 1 has a circular cross section, interrupted by a tangentially directed opening 2 which is adapted to be closed. Inside the casing 1 blades 3 are rotatably arranged. The said blades are driven by a controllable driving means 4. The material is fed by means of a conveying worm into the supply chute 5 by which it enters the casing. When the opening 2 is closed and the blades 3 start to rotate, the material is given a rotating motion and is moved by the centrifugal force in the direction of the wall of the casing 1. The greater the velocity of rotation, the greater will be the force with which the material is pressed against the wall of the casing and the greater the density it will thus obtain. After the blades have rotated a certain number of times, the material will have obtained the density belonging to that given speed of rotation.

If the tangentially directed aperture 2 is then

opened, the material will be hurled out while retaining the same density, as it is not subjected to the action of other forces. The gas separated from the material inside the casing may escape centrally.

During operation care should be taken to keep the aperture 2 after it has been closed again, shut for a sufficient period of time before opening the same anew, so that the fresh charge fed through the supply chute may be brought to the desired degree of density.

In the construction according to Figures 3 and 4 the blades 3 are arranged on a vertical shaft, instead of on a horizontal one, from which shaft the portion 6 has a conical form in order to guide the material arriving from the supply chute 5 into the spaces between the blades 3.

With the embodiment according to Fig. 5 an overflow line 8 is connected to the casing 1, so that if either temporarily or continually more material is fed into the casing 1 than it is possible to withdraw therefrom during the same period of time, the surplus material may escape through this overflow line. In the said line 8 an air current is created by the rotation of the bladewheel 3 by which air current a part of the powder dust present in the cylindrical space inside the casing 1 is carried along and removed.

In order to prevent that too great a quantity of the material is carried off through the overflow line 8, this line is provided with a device for controlling the air current flowing through the line.

According to the embodiment as illustrated this controlling device comprises a dished member 7 into which the overflow line opens. The material escaping from the casing 1 will collect in this dished member 7 and close up the open end of the line 8. In this manner the velocity of the air current through the line 8 is limited to the rate which is required for carrying off the surplus of material fed into the house. The material entering the member 7 after this member is entirely filled, will run off over the edge of the same, so that a uniform restraining action is effected on the current of air in the line 8 and no more material is withdrawn from the casing 1 than is exactly needed to prevent its getting overcrowded.

It is evident that apart from the embodiment described above, the device for controlling the rate of speed of the air current passing through the line 8 may also be formed in a different manner, e. g. by means of a valve.

I claim:

1. An apparatus for densifying substances in powdered form and for filling limited spaces with controllable quantities of such substances comprising a receptacle of circular cross section, radial blades rotatable around the longitudinal axis of the receptacle and movable along the circular wall of said receptacle, the receptacle having a central supply opening and discharge openings arranged tangentially in said circular wall, means for closing the latter openings, an overflow line connected with the interior of said receptacle near its center and means associated with said overflow line controlling the current of air passing therethrough.

2. An apparatus for densifying substances in powdered form and for filling limited spaces with controllable quantities of such substances comprising a receptacle of circular cross section, radial blades rotatable around the longitudinal axis of the receptacle and movable along the circular wall of said receptacle, the receptacle having a central supply opening and discharge openings arranged tangentially in said circular wall, means for closing the latter openings, an overflow line connected with the interior of said receptacle near its center and means associated with said overflow line controlling the current of air passing therethrough, said means comprising a dished member located at the free end of said overflow line.

WILLEM BOLK.