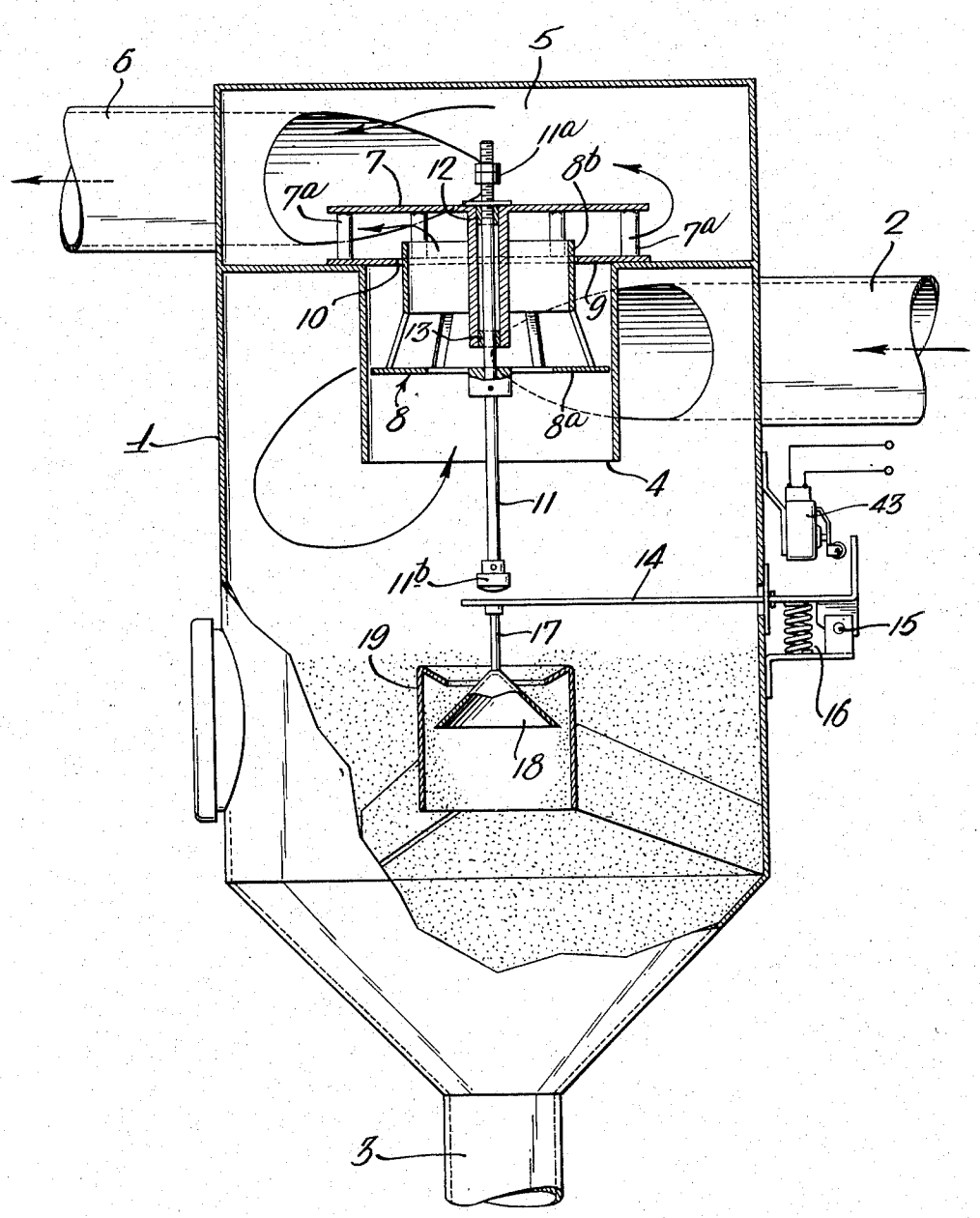
May 19, 1959 G. LARSSON ET AL 2,887,178

APPARATUS FOR SEPARATING PNEUMATICALLY CONVEYED MATERIAL

Filed Sept. 30, 1957



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United States Patent Office

2,887,178

Patented May 19, 1959

2,887,178

APPARATUS FOR SEPARATING PNEUMATICALLY CONVEYED MATERIAL

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Application September 30, 1957, Serial No. 687,278

3 Claims. (Cl. 183—41)

The present invention relates to improvements in apparatus for separating pneumatically conveyed material consisting of a cyclone having a tangential inlet, an outlet at the bottom for separated material and an outlet for the transporting medium in form of a tube (central tube) coaxially arranged in the cyclone casing.

In pneumatic conveying plants it is necessary to use some type of separating device for separating the material from the transporting air. Such devices are usually designed as cyclones, where the material is discharged at the bottom of the cyclone and the transporting air is discharged through an outlet tube arranged in the centre of the cyclone. In pneumatic conveying plants of this kind it is also desirable to be able to regulate the quantity of transporting air and for this purpose it has been the practice to use volume governors arranged in one of the pipes of the conveying system. It is an object of the invention to combine these separate means to one single apparatus.

The apparatus according to the invention consists of a cyclone having a tangential inlet, an outlet at the bottom for separated material and an outlet for the transporting medium in form of a tube (central tube), being coaxially arranged in the cyclone casing and is characterized by a volume governor arranged in said central tube and provided with a floating body, actuated by the discharging transporting medium. The governor operates automatically to regulate the quantity of transporting medium being discharged, and when it is in a position corresponding to a predetermined minimum quantity of the transporting medium it actuates a breaking means or switch, which in turn controls the feed means for supplying material to the pneumatic conveying system. A suitable embodiment of the apparatus is characterized in that the volume governor is designed in accordance with the Swedish patent specification 133,723 and the corresponding U.S. Patent No. 2,765,812, and consists of a transverse partition arranged in the central tube at its outlet end and having a central opening with a tubular floating body therein. The body is mounted for vertical movement in the opening and substantially seals against the edges of the opening. The body is provided with an annular plate facing the medium current and is operable to be moved by the dynamic pressure of the medium current to a greater or lesser extent towards a fixed plate spaced above the outlet of the central tube and which functions as a valve seat for the tubular body.

According to still another feature of the invention, there is a second tube fixedly mounted in the lower part of the cyclone. A suitably conical valve disk is mounted within the second tube for closing the upper end of the tube, said valve disk being movably suspended and arranged to be forced downwards by material which may, on occasion, accumulate in the cyclone. The downward movement is opposed by the action of a biasing force tending to keep the disk in its closing position, and, in its lower limit position, actuates said circuit breaking means.

The invention will now be described more in detail with reference to the accompanying drawing, illustrating by way of example one embodiment of an apparatus according to the invention.

In the drawing, a cylindrical casing **1** of a cyclone is provided with an inlet **2** for the mixture of material and transporting air and with an outlet **3** for separated material. The transporting air discharges through a central tube **4** which terminates in a chamber **5** arranged above the cyclone and provided with a preferably tangential outlet **6**. In said chamber there is a disk **7** spaced at some distance above the outlet of the central tube, said disk being fastened by means of rods **7***a* to the roof of the cyclone proper.

A volume governor is mounted in the tube **4**. The floating body **8** of the volume governor, which is designed in accordance with the U.S. Patent 2,765,812, is mounted for vertical movement in an opening **10** of a disk **9**. The body **8** consists of a horizontal annular disk **8***a* and a cylindrical tubular part **8***b* joined with said disk. By the dynamic pressure of the discharging transporting air acting upon the disk **8***a*, the floating body **8** will approach to a greater or lesser extent the disk **7** and thereby regulate the outlet opening between said disk and the upper end of the cylindrical part **8***b* of the floating body. The floating body is guided by means of a rod **11**, which is supported in bushings **12** and **13** fastened to the disk **7**. The upper end of the rod **11** is equipped with a stop nut **11***a*, which suspends the floating body, when the latter is not influenced by the transporting air. The floating body of said volume governor is arranged to actuate a lever **14** by means of the lower end **11***b* of said rod when the body is in a position corresponding to a predetermined minimum quantity of air. The lever in the illustrated embodiment is pivoted at the point **15** outside the casing **1** of the cyclone and is arranged to actuate a microswitch **43** or similar breaking means inserted in a control circuit for the driving means of the device for feeding the material into the transporting medium.

In the lower part of the cyclone there is a conical disk **18** mounted for vertical movement in a cylinder **19**. The disk will be pressed downwards by the material which may, on occasion, accumulate in the lower part of the cyclone. A rod **17** suspends the disk **18** from the above mentioned lever **14**, so that it may operate the switch **43** in the same manner as the volume governor. In order to counteract the weight of the disk **18**, the lever **14** is held in a neutral position by means of a spring **16**.

In the described apparatus the quantity of air passing through the cyclone, by means of the volume governor, may be maintained constant or may be varied in accordance with variations in the quantity of material supplied to the apparatus, and the supply of material will furthermore by cut off if the quantity of transporting air by any reason should decrease so that its velocity falls below a suitable value for conveying said material. One form of apparatus for controlling and/or cutting off the supply of material to the cyclone is disclosed in our copending patent application, Serial No. 687,275, filed September 30, 1957. Furthermore the interruptions caused by supplying too much material or by defects in the operation of the discharge device will be prevented by the operation of the disk **18**.

What we claim is:

1. In a pneumatic material-conveying system, a cyclone for separating the material from the transport medium comprising an upright cylindrical casing, a tangential inlet in the upper portion of said casing for said medium and the entrained material, a central tube mounted coaxially in the upper portion of said casing and depending below said inlet to constitute an exhaust outlet for said transport medium, an outlet at the bottom of said casing for the

material separated from said transport medium, and a volume governor in said tube having a floating body supported for movement between upper and lower limit positions by the medium flowing through said exhaust outlet and means cooperable with said body to regulate the flow of said medium in accordance with the position of said body so as to maintain the flow of said medium substantially constant, and switch means operated by said volume governor when the body is in its lower limit position.

2. Apparatus according to claim 1 wherein the volume governor consists of a transverse partition mounted in the central tube at its upper end and provided with a central opening, and a tube-like member carried by said floating body and vertically displaceable in the opening in substantially sealing engagement with the edges of the opening, said body having an annular plate facing the medium current and being operable to be moved vertically by the dynamic pressure of the medium flowing therethrough, and a transverse plate mounted above the outlet of the central tube cooperable with said tube-like member as a valve seat so as to regulate the flow of the medium in

accordance with the clearance between said tube and said plate.

3. Apparatus according to claim 1 including a vertical tube mounted in the lower part of the casing and having an annular upper end wall, and a conical valve disk mounted in said tube and cooperable with said end wall to close the upper end of the tube, bias means tending to keep the disk in its closing position, said valve disk being suspended for vertical displacement to be forced downwards by material accumulated in the cyclone against said bias means, and connections to said switch means to operate the same when the disk is in its lower limit position.

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