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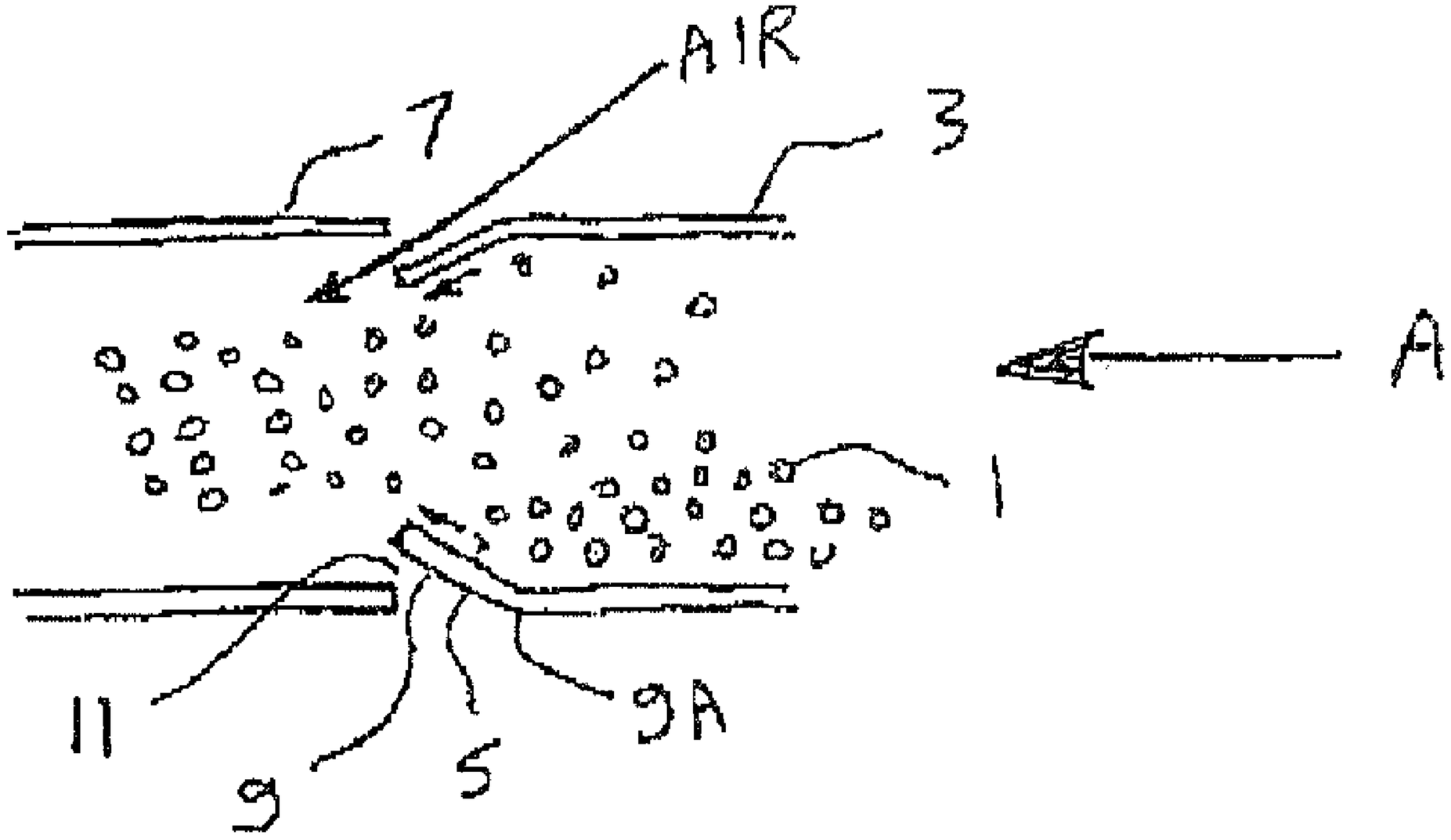


INTAKE NOZZLE FOR VACUUM PARTICULATE CONVEYOR

This invention is in the field of vacuum particulate conveyors such as are commonly used to convey granular material, and in particular an intake nozzle for such machines.

BACKGROUND

Machines for conveying particulate or granular material using a vacuum are well known, for example for use in conveying grain. These machines allow pickup of granular material with a flexible hose that allows considerable freedom of movement. A fan or air pump is used to establish a flow of air from the intake end of the hose through the machine to a discharge. An intake nozzle at the end of the hose is placed in the granular material, and the air being sucked into the intake end carries picks up granular material and establishes a stream of mixed air and granular material that is carried through the hose. Typically the hose is in turn attached to a rigid tube, with the tube and hose forming a conduit between the vacuum conveyor and the intake nozzle. Sections of tube are added or removed, depending on the distance between the vacuum conveyor and the granular material.

When the intake end of the nozzle is placed into a pile of granular material, the flow of air is substantially blocked, and so a vent is provided on the intake nozzle so that air can enter the nozzle and maintain the flow of granular material. Such vents typically

comprise one or more slots cut into the wall of the nozzle, although numerous variants are known. Typically a baffle is also provided to vary the area of the vent that is open, and so allow an operator to regulate the flow of air in through the vents in accordance with the particular material being conveyed, and other operating conditions.

SUMMARY OF THE INVENTION

When conveying granular material from a storage bin with a vacuum conveyor substantial portions of the conduit will typically be oriented generally horizontally. Until the bin is drained down somewhat, the intake nozzle will as well be oriented generally horizontally as well. In such a horizontal position the granular material tends to enter the bottom of the nozzle and remains there while traveling through the conduit, held down by gravity. There is thus frictional resistance between the granular material and the walls of the conduit and as well the speed of the air stream is less near the sides of the conduit.

Capacity is improved in the conveyor of the invention by moving the granular material off the bottom of the conduit toward the middle thereof where it can mix with the air stream. Ramps are provided at intervals along the bottom of the intake sloping inward and downstream from the wall of the nozzle. It may also be advantageous, especially where the conduit is lengthy, to install such ramps at intervals along the entire conduit if desired. For convenience, so that the sections do not have to be oriented so that the ramp is on the "bottom", ramps can be placed entirely around the interior of the conduit or

nozzle. This has the further advantage of moving granular material from all edges of the conduit toward the center where the air velocity is greater.

In an intake nozzle, the centralizing action of the ramp can be accentuated by providing a vent in conjunction with the ramp so that the air comes into the nozzle under the ramp. The incoming air helps to move the granular material toward the center of the nozzle as it comes off the downstream end of the ramp.

Conveniently the ramps are provided by making a cut through a portion of the wall of the intake nozzle, leaving the cut portion attached to the wall at an upstream end thereof. The cut portion of the wall is pushed inwards to form a ramp sloping inward and downstream from the wall, leaving a hole in the wall. In this way the air vents that are required in all nozzles for allowing air to enter the nozzle are economically provided at the same time as the ramps are provided. A plurality of such cuts are made to provide ramps and vents around the nozzle wall. A baffle can be added to open or close the air vents as required.

Thus it is an object of the present invention to provide an intake nozzle for vacuum particulate conveyors that overcomes problems in the prior art. It is a further object of the present invention to provide such an intake nozzle that includes a ramp portion extending upward and downstream from the conduit or nozzle wall. Advantageously, air vents are provided in the intake nozzle in conjunction with the ramps.

DESCRIPTION OF THE DRAWINGS:

While the invention is claimed in the concluding portions hereof, preferred embodiments are provided in the accompanying detailed description which may be best understood in conjunction with the accompanying diagrams where like parts in each of the several diagrams are labeled with like numbers, and where:

Fig. 1 is a schematic cross-sectional side view an intake nozzle embodying the invention;

Fig. 2 is a perspective view of the intake nozzle of Fig. 1;

Fig. 3 is a schematic cross-sectional side view of an alternate embodiment of an intake nozzle of the invention.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS:

Fig. 1 schematically illustrates the air stream of a vacuum conveyor flowing in the direction A carrying granular material 1through a horizontally oriented intake nozzle 3. As illustrated, due to gravity the granular material 1 tends to enter the bottom of the nozzle 3 and remains there while traveling through the conduit.

Ramps 5 are provided at intervals along the intake nozzle 3 sloping inward and downstream from the wall 7 of the nozzle 3. The ramps 5 are provided by making a cut through a portion of the wall 7, leaving the cut portion or flap 9 attached to the wall at the upstream end 9A thereof. The flap 9 is pushed inwards to form the ramp 5 sloping inward and downstream from the wall, leaving a vent hole 11 in the wall that acts as the air vent required in intake nozzles for allowing air to enter the nozzle. A plurality of such cuts are made to provide ramps 5 and vent holes 11 around the nozzle 3, as illustrated in Fig. 2.

A baffle can be added to open or close the air vents as required. For example in Fig. 2 a sleeve 13 can be configured to slide up and down the nozzle 3 to cover or open vent holes 11. Alternately, a door 15 can be configured to slide over each vent hole 11. Other baffle configurations and mechanisms are known and contemplated as well.

As illustrated in Fig. 1, the granular material 1 moving along the bottom of the intake nozzle 3 is directed toward the center of the nozzle 3 by the ramps 5. The granular material 1 thus moves off the bottom of the nozzle 3 toward the middle thereof where it

can mix with the air stream. Also as illustrated in Fig. 1, granular material 1 moving along the top of the nozzle 3 is also directed toward the center. With ramps 5 oriented around the nozzle 3 as shown in Fig. 2, granular material 1 is directed from the edges toward the center.

This centralizing action of the ramps is accentuated by providing the vent holes 11 in conjunction with the ramps 11 so that the air comes into the nozzle 3 under the ramps 5. The incoming air helps to move the granular material 1 toward the center of the nozzle 3 as the granular material 1 comes off the downstream end of the ramps 5.

The illustrated manner of making the ramps 5 and vent holes 11 by cutting and pushing flap 9 toward the center of the nozzle 3 is convenient and economical, and also orients the vent hole 11 and ramp 3 to advantage.

Fig. 3 schematically illustrates an alternate embodiment comprising a ramp 25 that is formed by a collar around the inside of the nozzle 23. Vent holes 31 are punched through the nozzle wall just at the downstream end of the ramp 25

It may also be advantageous, especially where the conduit is lengthy, to install such ramps at intervals along the entire conduit if desired.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous changes and modifications will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly, all such suitable changes or modifications in structure or operation which may be resorted to are intended to fall within the scope of the claimed invention.

FIG.1

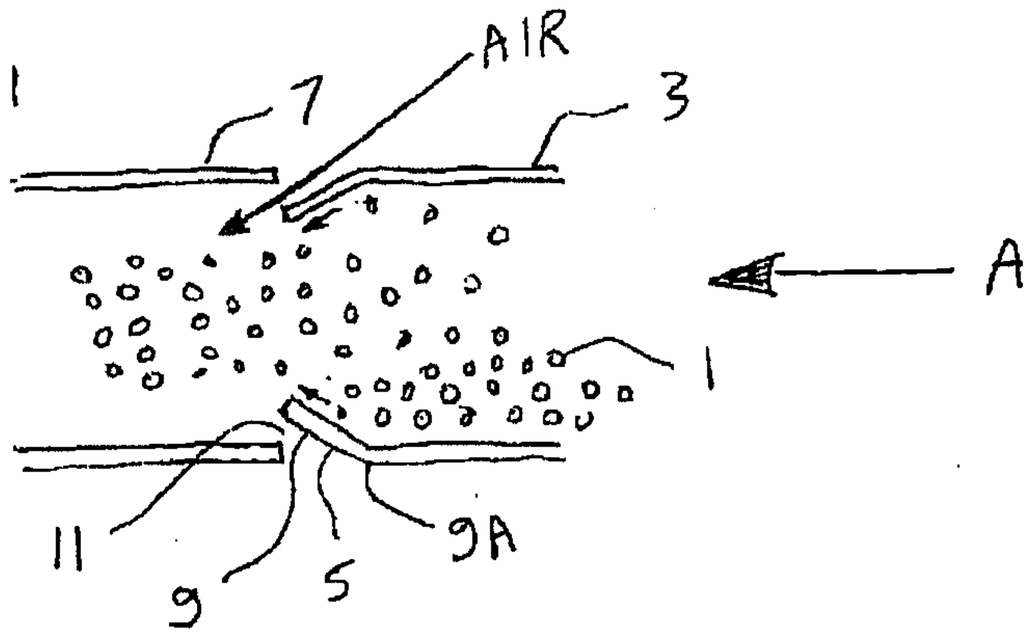


FIG.2

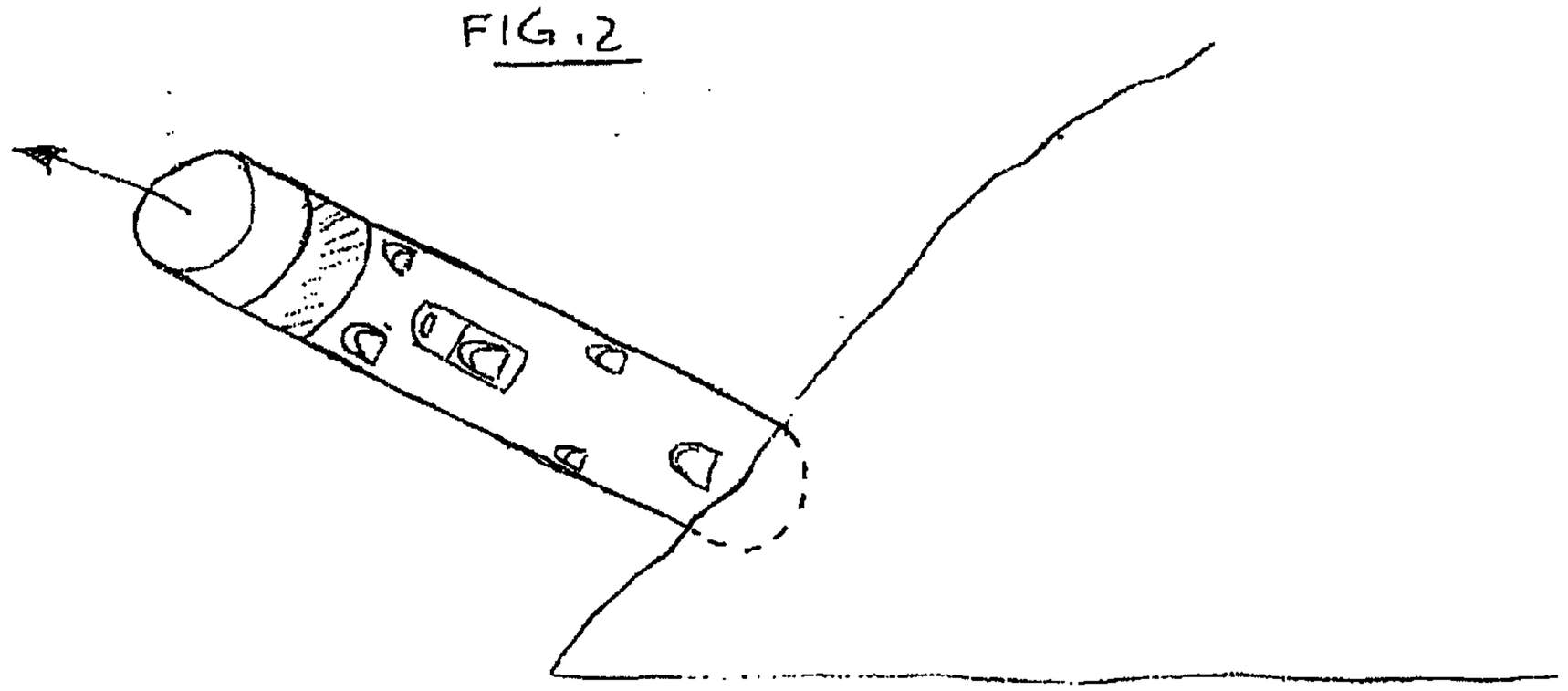
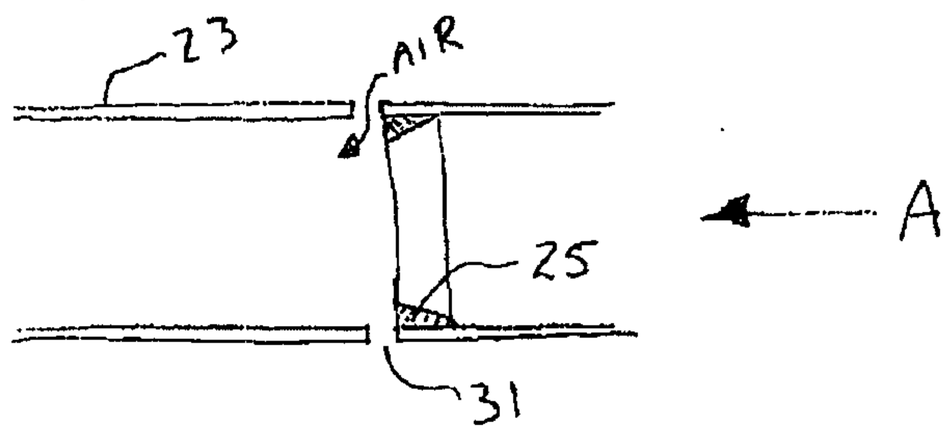
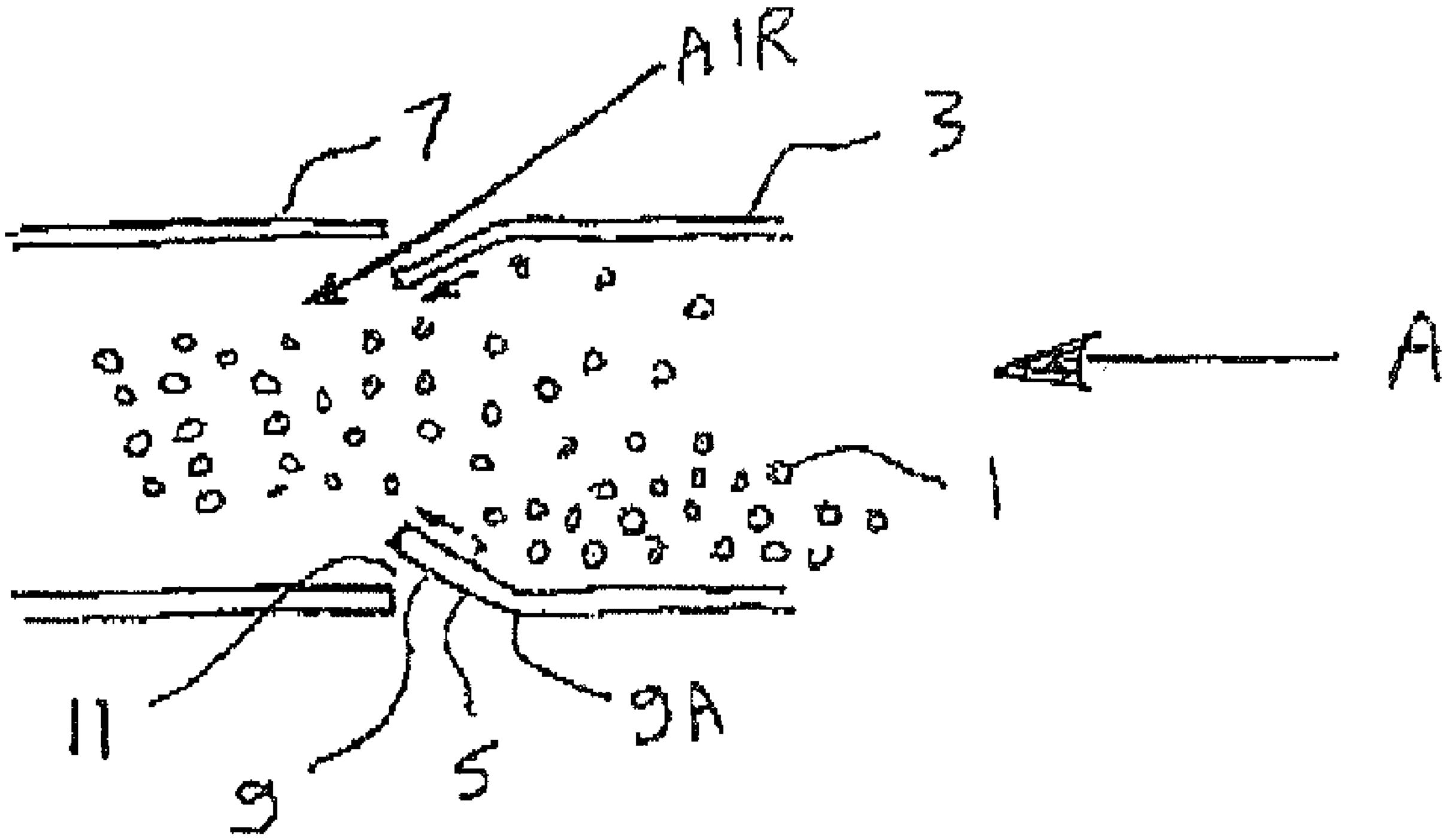


FIG.3

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