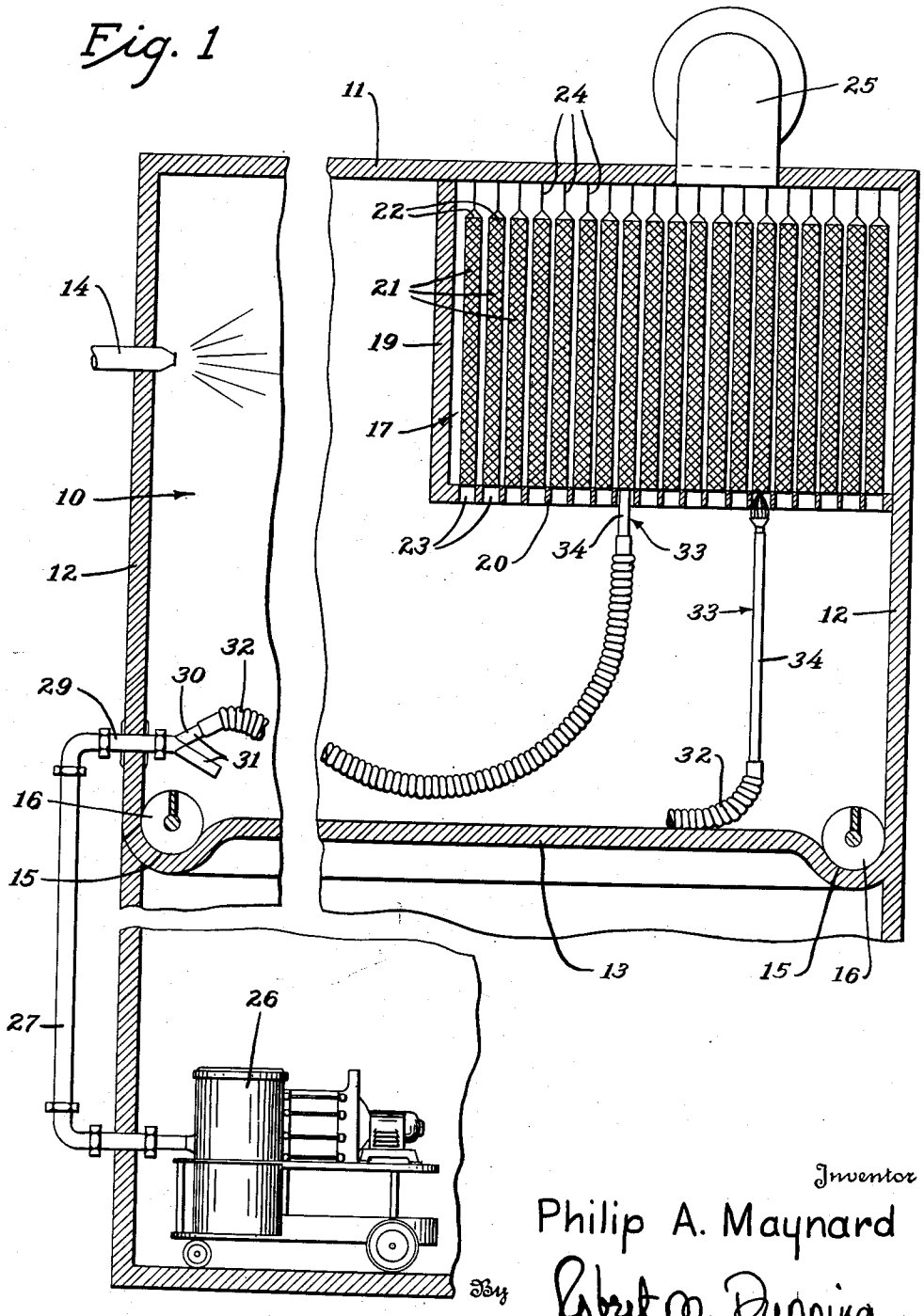
April 27, 1954 P. A. MAYNARD 2,676,353

APPARATUS FOR CLEANING ELONGATED POROUS TUBES

Filed June 10, 1948

2 Sheets-Sheet 1

Fig. 1



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2 Sheets-Sheet 2

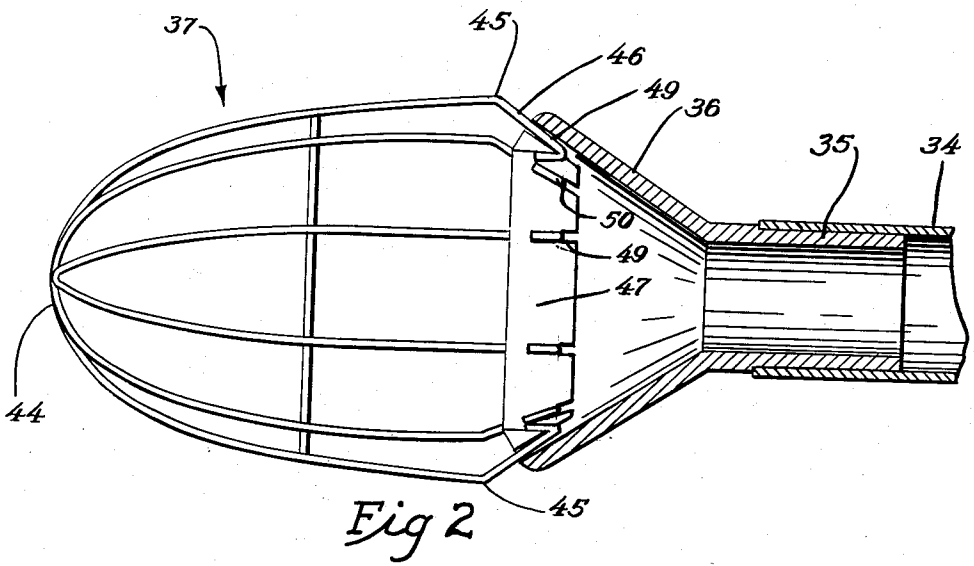


Fig 2

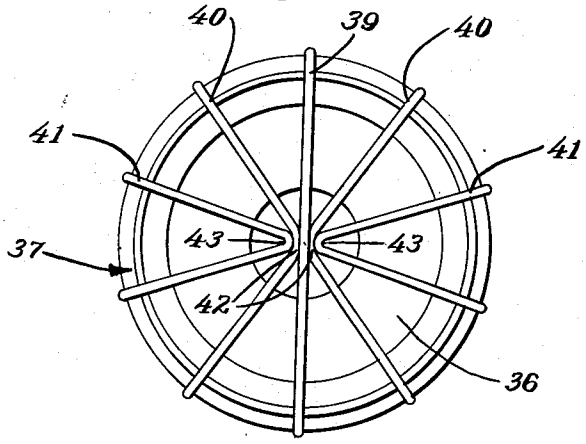


Fig. 3

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APPARATUS FOR CLEANING ELONGATED POROUS TUBES

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Application June 10, 1948, Serial No. 32,206

5 Claims. (Cl. 15—422)

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My invention relates to apparatus for cleaning elongated porous tubes and deals more particularly with the cleaning of elongated tubes of cloth or other material.

In the manufacture of various items, it is necessary to separate solid materials from air. For example in the manufacture of powdered milk, the milk is often sprayed into a separating room in the form of a fine liquid which solidifies into a fine powder. Because of the lightness of this powder it is necessary to separate the powder from the air. This is often done by drawing the air through porous tubes of canvas or the like having pores therein which are too small to allow the passage of the powder. This operation produces a film of powder on the inner walls of the tube which is difficult to remove, but which must be removed if the efficiency of the drying apparatus is to be unimpaired. Attempts have been made to clean these tubes by the use of a long handled brush or the like which is extended into the tube through its open end. However, if the milk powder is not entirely dry such a brush smears the powder upon the surface of the cloth tube, or so-called sock filling the pores thereof and making the tube useless for its intended purpose, unless it is cleaned by washing or other means.

The object of the present invention lies in the apparatus for cleaning these tubes by vacuum. I have found that if a long handled tool of proper construction is inserted within the bag and air is drawn through the cloth tube or so-called sock in a reverse direction the powder will become disengaged from the walls of the tube or sock and the tubes or socks may be effectively cleaned.

A feature of the present invention lies in the provision of an apparatus for cleaning porous tubes used for separating air from solid particles and which operates to reverse the flow of air through the tubing so as to disengage the particles clinging to the walls of the tube. As a result the porous tubes or socks may be cleaned effectively in a fraction of the time previously required to clean the tubes or socks much less thoroughly.

A feature of the present invention lies in the provision of a tool which holds the tube expanded while the air is drawn through the same to disengage particles clinging to the inner surface thereof.

These and other objects and novel features of my invention will be more clearly and fully set forth in the following specification and claims.

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In the drawings forming a part of my specification:

Figure 1 illustrates diagrammatically a separating room in which the solid particles of material are separated from air and showing my porous tube cleaning apparatus in conjunction therewith.

Figure 2 is a longitudinal sectional view through a portion of the cleaning tool.

Figure 3 is an end elevation view of the tool illustrated in Figure 2.

The separating room is indicated in general by the numeral 10. This room is provided with a closed ceiling 11, side walls 12, and a flooring 13. Suitable doors, not illustrated in the drawings, are provided through which access may be obtained to the interior. The powdered milk enters through a suitable jet 14 and is sprayed into the air, some of the milk settling upon the floor 13. Suitable means, not illustrated in the drawings, are provided for forcing the powdered milk toward one or more elongated troughs such as 15. This powder moving means may comprise automatic scraper blades which travel over the floor 13, or the powder may be handled by scoops or other implements of that type. Conveyors 16 are provided in the troughs 15 for conveying the powdered material from the separating room.

A separate chamber 17 is provided in one portion of the separating room which is enclosed within the chamber 10. A partition wall 19 extends across the room 10 depending from the ceiling 11 and a floor 20 closes the lower end of the chamber 17 thus formed. A series of tubes 21 are suspended within the chamber 17, these tubes having closed upper ends 22. The lower ends of the tubes 21 are open and are clamped to or otherwise secured to the floor 20 in communication with openings 23 through the floor. Thus the interior of the tubes 21 are in communication with the chamber 10 and the interior of the tubes communicates with the interior of the chamber 17, only through the pores of the tubes. Spring hangers 24 or other suitable suspending means are attached to the upper ends of the tubes 21 to hold them in parallel upright condition.

A blower 25 is provided for withdrawing air from the chamber 17. This blower 25 thus tends to draw air through the tubes 21 from the chamber 10. Means are provided for holding the tubes or socks 21 expanded and circular in section and the movement of air through the porous body of the tubes acts to separate the solid powder particles from the air. The solid particles then tend

to drop onto the floor 13 through the openings 23 communicating with the open lower ends of the tubes or socks 21. However, after a period of use the powder is drawn against the inner surface of the tubes or socks and tends to clog the pores, thus greatly reducing the efficiency of the drying apparatus.

In order to avoid this difficulty I provide a vacuum machine 26 which, in the form illustrated, is located in a room below the level of the chamber 10, or on the same room level, although the particular location of the vacuum machine is unimportant. The machine 26 is connected by suitable piping 27 to a nipple 29 extending through a side wall 12 of the chamber 10 and attached to a Y 30. This Y 30 is provided with two inlets 31, both of which are connected by flexible conduits 32 to the cleaning tool which is illustrated in general by the numeral 33.

The tool 33 includes an elongated pipe or tube 34 of sufficient length to extend the length of the tubes 21. It will be noted that the space beneath the floor 20 of the chamber 17 must be sufficient to enable the tool to be inserted through the various holes 23 and into the tubes 21.

The elongated tubing 34 is welded or otherwise connected to a sleeve 35 having an outwardly flared end 36. This outwardly flaring end 36 acts as a support for a wire guard illustrated in general by the numeral 37. This wire guard is of an outer diameter which fits snugly within the tubes 21 to hold the portion of the tube adjacent the guard fully expanded during the cleaning operation.

As best illustrated in Figures 2 and 3 of the drawings the wire guard includes a central generally U-shaped wire element 39, a pair of similar wires 40 on opposite sides thereof which are kinked to provide a flat V formation when viewed from the end as in Figure 3 of the drawings, and a pair of guard wires 41 which are also similarly shaped to the wire 39, but are kinked intermediate the ends to provide a relatively deep V when viewed from the end. The wires 40 are kinked at 42 while the wires 41 are kinked at 43. The wires come together at their center points as viewed in Figure 3 of the drawings, the apex or kink 42 in the wires 40 contacting opposite sides of the center point of the wire 39 and the apex or kinks in the wires 41 contacting the kinks 42 of the wires 40. The wires are welded or otherwise secured in this form and thus form a guard which includes a series of angularly spaced guard wires which are capable of holding the flexible tubes expanded during the cleaning operation.

As illustrated in Figure 2 of the drawings the various wires are provided with a curved forward end 44 which is of somewhat smaller radius than the radius of the tubes into which the tool is to extend. The wires curve outwardly gradually to a point of greatest diameter at 45 near the open end of the flared body portion 36. The free ends 46 of the wires then incline toward a common point to lie flat against the inner surface of the flared portion 36. A wire retaining ring 47 extends inwardly of the inwardly inclined end portions 46, the ring being provided with grooves 49 for receiving these wire ends 46. The extremities 50 of the guard wire ends 46 are bent over the edge of the retaining ring 47 to anchor the wires to the ring. The ring 47 is secured in the flared end 36 by welding or other suitable means.

The operation of my device will be readily understood from an observation of Figure 1 of the drawings. After the separating process has been in operation for a period of time the powdered material will cling to the inner surface of the porous tubes 21 and tend to clog the pores thereof. At this point the process is stopped and the floor 13 is cleared or vacuumed of powdered material. The flexible conduits 32 are next attached to the inlet ends 31 of the Y 30 and the vacuum machine 26 is placed into operation to draw air through the tools 33. Two separate tools are employed in order to cut down the time required for the tube or sock cleaning operation.

The workers next insert the tools 33 through each opening 23, moving the wire guarded end 37 of the tool throughout the length of the tube. Air is drawn through the tube or sock in a reverse direction from the chamber 19, thus tending to dislodge the particles of powdered or solid material from the inner wall surfaces. The wire guard holds the tubes fully expanded and prevents the tube material from being drawn inwardly by the source of suction.

I have found that by following this procedure the tubes may be quickly and effectively cleaned in an extremely short period of time. This arrangement has been found decidedly preferable to brushing the powdered particles from the tubes with a long handled brush or other tool of this type. The tubes may be used for an extended period without requiring any other type of cleaning. My invention is preferred over brushing in any form because it is more sanitary. As the powdered milk is used for human consumption, the brushing of the tubes is likely to mix foreign particles such as broken bristles with the product rendering it unfit for sale. The vacuum tool above described is entirely sanitary and satisfactory.

In accordance with the patent statutes, I have described the principles of construction and operation of my apparatus for cleaning porous materials, and while I have endeavored to set forth the best embodiment thereof, I desire to have it understood that obvious changes may be made within the scope of the following claims without departing from the spirit of my invention.

I claim:

1. An apparatus for cleaning porous open ended separator tubes including an elongated hollow handle, an outwardly flaring end on said handle, a wire guard comprising a series of angularly spaced wire members, said wire members being connected together at the outer extremity of the guard and extending gradually outwardly and rearwardly to form a rounded forward end on the guard, the wires extending rearwardly toward the flared end of the handle to a point of greatest separation near the flared end of the handle, and then converging inwardly, the converging portions of the wires being connected to the flared end of the handle.

2. The structure described in claim 1 and in which the converging portions of the wires are connected to the inner surface of the flaring end of the handle.

3. The structure described in claim 1 and including a retaining ring comprising the means for securing the converging ends of the wires to the flared portion of the handle.

4. The structure described in claim 1 and in which the converging ends of the wires extend inwardly of the flaring end of the handle and including a retaining ring lying inwardly of the converging ends of the wire.

5. The structure described in claim 1 and in which the converging ends of the wires extend

inwardly of the flared end of the handle and including a retaining ring inwardly of the wires, the converging ends of the wires being bent over the edge of the retaining ring to hold the wires in place.

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