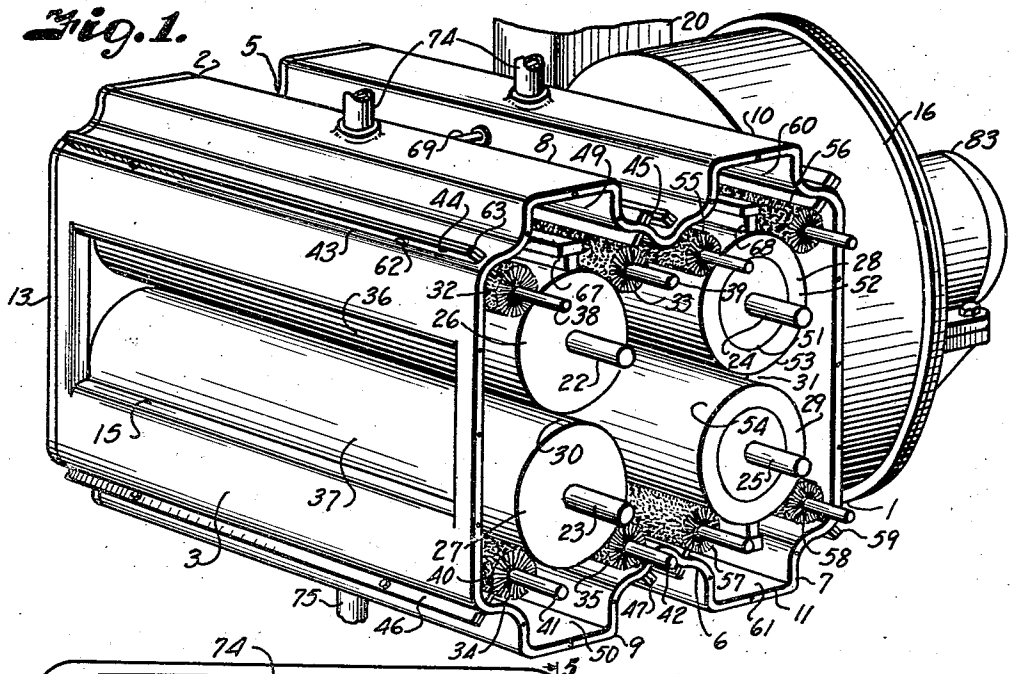
May 12, 1942. E. F. SARVER 2,282,770

APPARATUS FOR REMOVING FOREIGN PARTICLES FROM AIR OR SIMILAR GASEOUS MEDIUMS

Filed March 6, 1940 2 Sheets-Sheet 1

Fig. 1.



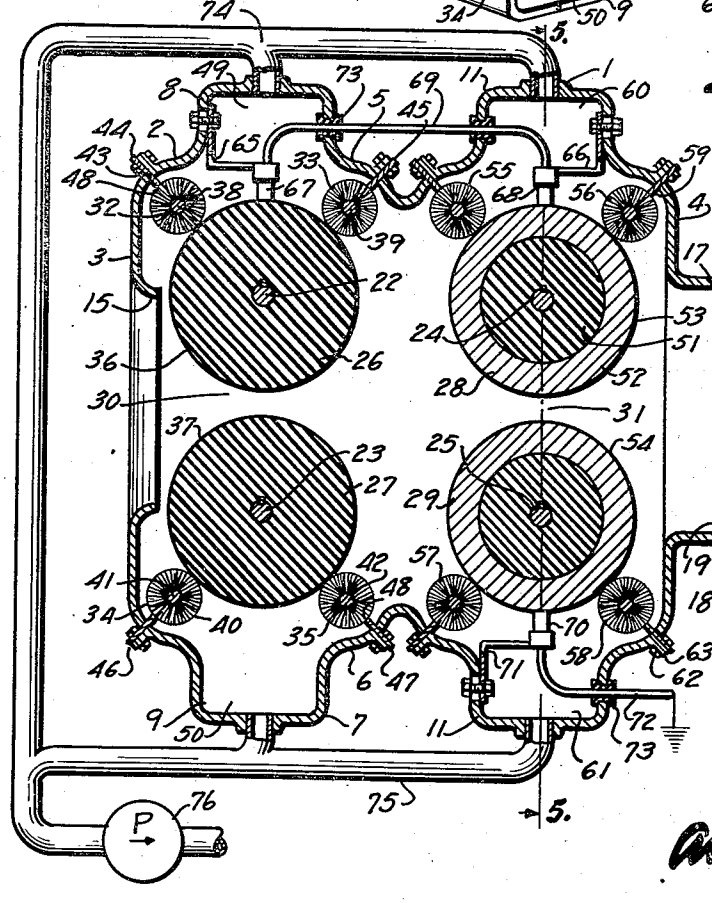
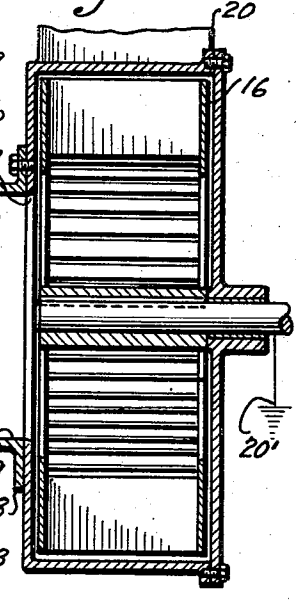


Fig. 2.



INVENTOR

Emmett F. Sarver.

BY

Arthur C. Brown

ATTORNEY

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Fig. 3.

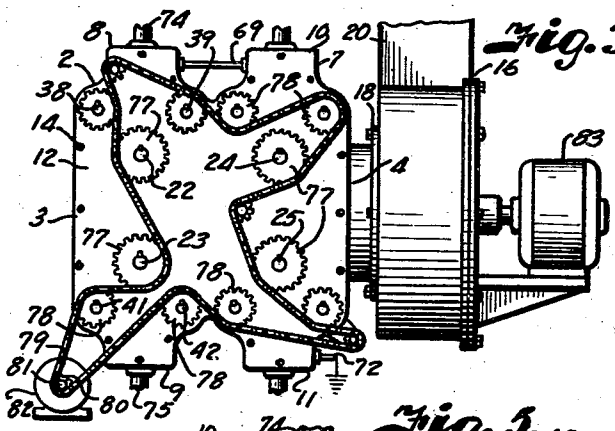


Fig. 4.

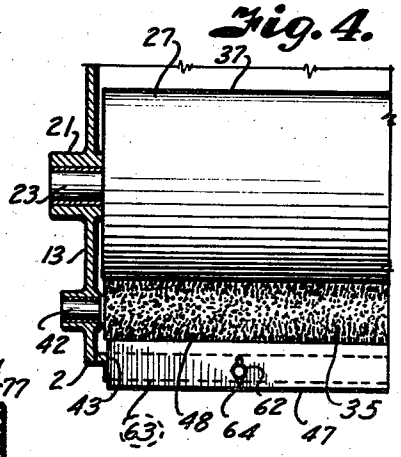


Fig. 5.

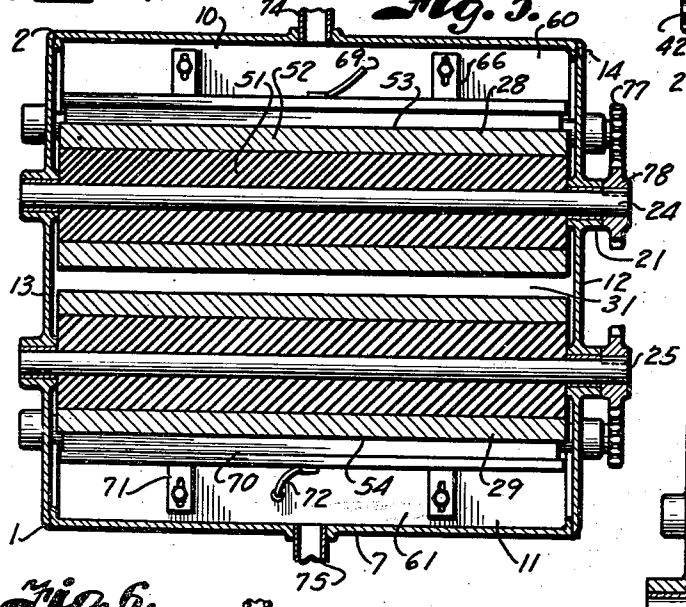


Fig. 7.

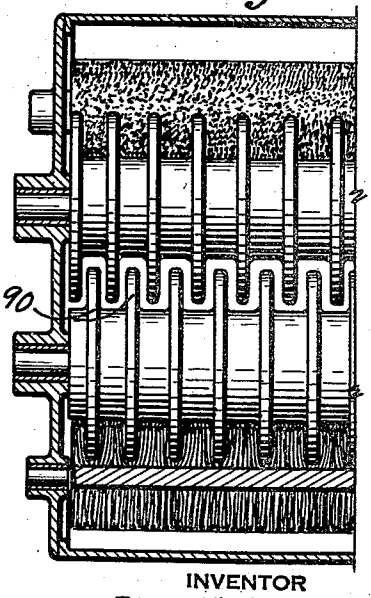
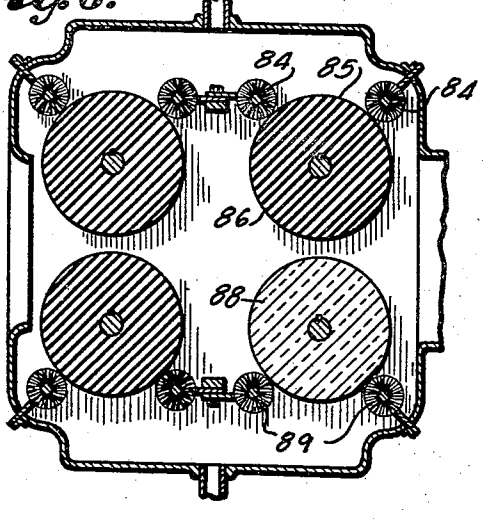


Fig. 6.



INVENTOR

Emmett F. Sarver.

BY

Arthur C. Brown

ATTORNEY

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2,282,770

UNITED STATES PATENT OFFICE

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APPARATUS FOR REMOVING FOREIGN PARTICLES FROM AIR OR SIMILAR GASEOUS MEDIUMS

Emmett F. Sarver, Kansas City, Mo., assignor of two-thirds to Alan Dunn Barr, Lakewood, Ohio

Application March 6, 1940, Serial No. 322,489

4 Claims. (Cl. 183—7)

This invention relates to apparatus for removing foreign particles from gaseous mediums, particularly dust, pollen, smoke, and germs from air, and has for its principal object to provide an apparatus of this character which effectively removes such particles with little resistance to flow of the gaseous medium therethrough.

Other objects of the invention are to provide an apparatus of this character that is of simple, inexpensive construction and capable of low cost operation.

Further objects of the invention are to provide an air-cleaner with means for deionizing the air passed therethrough; to provide an apparatus that is self-clearing of the removed material; and to provide an apparatus that requires little or no servicing.

In accomplishing these and other objects of the invention, I have provided improved details of structure, the preferred forms of which are illustrated in the accompanying drawings, wherein:

Fig. 1 is a perspective view of an apparatus constructed in accordance with the present invention and showing a side plate removed to better illustrate arrangement of drums and charging rolls or brushes for effecting removal of particles from a gaseous medium that is moved therebetween.

Fig. 2 is a longitudinal central section through the apparatus.

Fig. 3 is a side elevational view of the apparatus, particularly illustrating drive of the drums and their associated charging rolls or brushes.

Fig. 4 is a fragmentary section through one corner of the casing, particularly illustrating the brush cleaning blades.

Fig. 5 is a cross-section on the line 5—5 of Fig. 2.

Fig. 6 is a longitudinal section through a modified form of the invention.

Fig. 7 is a section showing a modified form of drums.

Referring more in detail to the drawings:

1 designates an apparatus constructed in accordance with the present invention, and which includes a casing 2 having end walls 3—4 connected by a top 5 and a bottom 6. The top and bottom 5 and 6 have transversely arranged offset portions 7 to provide suction manifolds 8, 9, 10 and 11. The ends of the casing are closed by plates 12 and 13 preferably removably connected therewith by fastening devices such as screws 14 thereby permitting inspection or removal of the inner mechanism. The wall 3 has an inlet opening 15 extending substantially across the width of the casing through which a stream of gaseous medium, such as air, is moved by a blower 16.

In the illustrated instance, the inlet 17 of the blower is connected with a flange 18 projecting circumferentially of an outlet opening 19 in the end wall 4 of the casing so that air or other gas to be cleaned is drawn through the casing and discharged through an outlet duct 20 which is connected with the discharge of the blower. The rotor for the blower is preferably formed of conductive material and the shaft is grounded as at 20', for a purpose later described.

Journalled in suitable bearings 21 in the end walls are pairs of shafts 22—23 and 24—25 carrying drums 26—27 and 28—29 respectively, the drums 26 and 27 being located adjacent the air inlet 15 of the casing and the drums 28 and 29 adjacent the outlet opening 19, with the drums of the pairs spaced apart to provide passageways 30 and 31 therebetween. The drums 26 and 27 are formed of material which when rubbed with another material attract dust, pollen, germs, smoke and similar particles contained in the air-stream. For example, they may be formed of hard rubber which material is capable of taking on a static charge when rubbed with fleece-like rolls or brushes 32, 33, 34 and 35. The drums 26 and 27 are of sufficient length to extend completely across the inner width of the casing and have their peripheral faces 36 and 37 spaced apart so that the passageway 30 is such as to assure attraction of foreign particles carried in the air-stream. The fleece-like rollers 32 and 33 are carried by shafts 38 and 39 having their ends journalled in the side walls of the casing at points above the shaft 22 so that the peripheries 40 thereof are in brushing contact with the face 36 of the drum 26. The fleece-like rollers 34 and 35 are similarly carried on shafts 41 and 42 and in rubbing contact with the face 37 of the drum 27.

Extending through slots 43 in the top and bottom of the casing are blades 44—45 and 46—47 having edge portions 48 engaging the peripheries of the respective rolls or brushes 32, 33, 34 and 35. The rolls 32 and 33 and their associated blades 44 and 45 thus close the space on the respective sides of the manifold 8 to form a collecting chamber 49 at the top of the casing. A similar collecting chamber 50 is likewise provided at the bottom of the casing in communication with the manifold 10. The drums 28 and 29 are of different construction in that they include cores 51 carrying metallic sleeves 52 having peripheral outer faces 53—54 respectively

which are spaced apart the proper distance to carry a current discharge across the passageway 31.

Likewise associated with the drums 26—29 are brush-like rolls 55—56 and 57—58, arranged similar to the fleece-like rolls just described. The brushes 55—56 and 57—58 are respectively contacted by blades 59 which close the sides of collecting chambers 60 and 61 similar to the collecting chambers 49 and 50. The blades which contact the rolls are preferably adjustably mounted in the slots 43 by fastening devices 62 extending through flanges 63 on the casing and through slots 64 in the blades as best shown in Fig. 4. With this adjustment the blades may be kept in contact with the rolls.

Carried by suitable brackets 65 and 66, which are attached to the upper manifold portions of the casing, are brushes 67 and 68 arranged to contact the faces 36 and 53 of the drums 26 and 28 respectively, so that a static charge collected on the drum 26 is transferred through the brush 67 to the brush 68 by means of an interconnecting conductor 69 to charge the metallic sleeve 52 of the drum and wherefrom an opposite charge is induced on the drum 29. Therefore any particles that may pass the drums 26 and 27 are collected upon one or the other of the peripheral faces 53 or 54 and carried thereon into the collection chambers 60 and 61.

Contacting the metallic sleeve 52 of the drum 29 is a brush 70 that is carried on a bracket 71 similar to the brackets 65 and 66 previously described, and which is grounded by a conductor 72. The conductors 69 and 72 are insulated with respect to the casing by suitable insulators 73.

Connected with the manifolds of the respective collection chambers are suction ducts 74 and 75 leading to the inlet of a suction pump indicated at 76, Fig. 2, so that the particles collected in the respective chambers are removed therefrom in that they are carried in the small air-streams being drawn through the collection chambers by the suction pump.

The drums and their associated rubbing rolls may be driven in any suitable manner in the directions of the arrows as shown in Fig. 2, however, as illustrated in Fig. 3, I have shown each of the drum shafts as provided with a sprocket 77 and each of the roll or brush shafts with the sprocket 78 which are all interconnected by an endless chain 79 driven from a sprocket 80 on the shaft 81 of a suitable driving mechanism 82 whereby the mechanisms are actuated at proper speeds.

The blower 16 may be operated by any suitable prime mover, for example a motor 83, which may be directly connected with the rotor shaft of the blower. With the blower in operation, air is drawn through the opening 15, passages 30 and 31 and discharged through the duct 20. With the drums in operation, a static charge or attractive force is generated on the surfaces 36 and 37 of the drums 26 and 27 to attract and collect thereon foreign particles carried in the air-stream, especially those particles having a charge opposite to the charge on the drums, or like charges of smaller intensity. Neutral particles or those having no charge will have charges induced thereon by the charged surfaces of the drums. These particles and particles having charges of intensities similar to the charge of the drums will continue through the passage 30. As the drums rotate, the particles are carried under the rolls 32 and 34 which also serve as brushes to remove the particles from the surfaces of the drums and discharge them into the collecting chambers from where they are readily removed with the streams of air being drawn through the collection chambers by the suction pump 76. The rolls 33 and 35 remove charged particles that are not removed by the rolls 32 and 34 and cooperate therewith in reestablishing and maintaining a static charge on the drums.

As the drum 26 rotates under the brush 67, the charge is removed and transferred by way of the conductor 69 and brush 68 to the drum 28 and an opposite charge is induced upon the drum 29. Therefore the particles passing the first drums and those which were ionized are attracted to one or the other of the surfaces 53 or 54 of the second pair of drums to be carried therewith and discharged into the collecting chambers by the brush rolls 55—56 and 57—58.

The air, upon impact with the metal blades of the fan rotor, is deionized thereby so that any ionization originally therein is removed by conduction of the charge to the ground 20'.

The form of the invention shown in Fig. 6 is similar to that just described except that the static charge passed between the last set of drums is generated by contact of brushes 84 with a drum 85 capable of taking a static charge on the face 86 thereof, the complementary drum 88 being formed of a material on which is generated a charge opposite to that generated on the drum responsive to contact of brushes 89. The drums 85 and 88, having different charges, will collect particles which may have opposite charges.

The drums shown in Fig. 7 are provided with a plurality of spaced flanges 90 to increase the extent of the charged surface of the drums, the flanges on the one drum being staggered and in lapping relation to the flanges on the other drum as clearly illustrated in the drawing.

From the foregoing it is obvious that I have provided an apparatus which is adapted for removing foreign particles from gas or air-streams with little or no resistance to the flow. It is also obvious that the apparatus will operate with little or no servicing expense and that the charged drums will effectively remove particles which are so minute they could not be removed by filtering. Therefore the apparatus is particularly adapted for removing germs, smoke, pollen, and other infinitesimal particles.

What I claim and desire to secure by Letters Patent is:

1. Apparatus of the character described, including a casing, a pair of drums rotatably supported in the casing and having cylindrical surfaces spaced apart to form a passageway therebetween, means having rubbing contact with the surfaces of the drums to effect charging of said surfaces, means contacting the drums for removal of foreign particles attracted to the charged surfaces of the drums, means contacting the charged surface of one of the drums at a point intermediate the charging and particle removing means to remove the charge from the drum, a second pair of drums having cylindrical surfaces spaced apart to form a passageway therebetween, means for conducting the charge from one of the first named drums to one of the last named drums, and means for grounding the other of said last named drums.

2. Apparatus of the character described, including a casing having an inlet and an outlet in opposite sides thereof, pairs of cylindrical

drums rotatably mounted in the casing with the drums in each pair spaced apart to provide a passageway therebetween, spaced contact members having rubbing contact with the drums on the respective sides of said passageways to effect a static charge on said drums, means cooperating with said contact members to form collecting chambers therebetween, and suction means connected with the collecting chambers for removing particles from said chambers which have been removed from charged surfaces of the drums by said contact members.

3. Apparatus of the character described, including a casing having an inlet and an outlet in opposite sides thereof, pairs of cylindrical drums rotatably mounted in the casing with the drums in each pair spaced apart to provide a passageway therebetween, spaced contact rolls engaging the drums on the respective sides of said passageways, blades connected with the casing and contacting the rolls to form collection chambers therebetween, and suction means connected with the collection chambers for removing particles from said chambers which have been removed from the surfaces of the drums by said contact rolls.

4. An apparatus of the character described including, a casing having an inlet at one end and an outlet at the other end, a rotatable member supported in the casing near the inlet end thereof having a surface formed of non-conductive material, means having rubbing contact with the surface of said non-conductive material to effect charging of said surface, means contacting the charged surface to remove foreign particles attracted to said charged surface, a pair of current conductive members within the casing near the outlet end thereof and spaced apart to provide an air passageway therebetween, means grounding one of said conductive members, a current conducting brush contacting the charged surface of the rotatable member to conduct said charge to the other of said conductive members, and means connected with the casing for effecting movement of a gaseous medium from said inlet through the casing and discharge of said medium through the outlet for contact with said members to effect removal of foreign particles contained in said gaseous medium.

EMMETT F. SARVER.