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Hayashi

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[54] **AIR PURIFIER**

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[73] Assignee: **Nissan Motor Company, Limited,** Yokohama, Japan

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[52] **U.S. Cl.** ..... **55/124,** 55/127, 55/134, 55/138, 55/139, 55/146, 55/148, 55/149, 55/151, 55/155, 55/337, 55/351, 55/399, 55/429, 55/458, 55/459, 98/2.05, 128/172, 317/4, 317/262 AE

[51] **Int. Cl.** **B03c 3/12,** B03c 3/14

[58] **Field of Search** ..... 55/127, 124, 126, 136, 55/137, 138, 139, 154, 155, 150, 151, 130, 134, 146, 148, 149, 337, 351, 399, 429, 458, 459; 261/DIG. 34; 98/1, 2, 2.05, 2.06, 2.07, 2.08, 2.11, 27, 37, 40 R; 128/172, 190; 317/4, 262 R, 262 AE

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Primary Examiner—Dennis E. Talbert, Jr.

[57] **ABSTRACT**

To enhance the dust collecting efficiency and to make it possible to collect dust of relatively large particle sizes in a compact construction, an air purifier comprises dust collecting wall means including a dust collecting electrode and extending helically to provide a continuous helical passageway for air to be circulated in the air purifier and at least one charging electrode also helically extending in the passageway for establishing an electric field in the passageway through application of a high-tension current to be collecting electrode or to the charging electrode. Dust particles are collected by the dust collecting wall means by reason of the centrifugal forces imparted to the particles and the electrostatic attraction exercised on the particles as the air is passed through the passageway. Also proposed is an improved automotive air conditioning and cleaning system in which either atmospheric air or a mixture of the atmospheric air and air recirculated from a passenger compartment is cleaned before it is directed into the passenger compartment.

7 Claims, 9 Drawing Figures

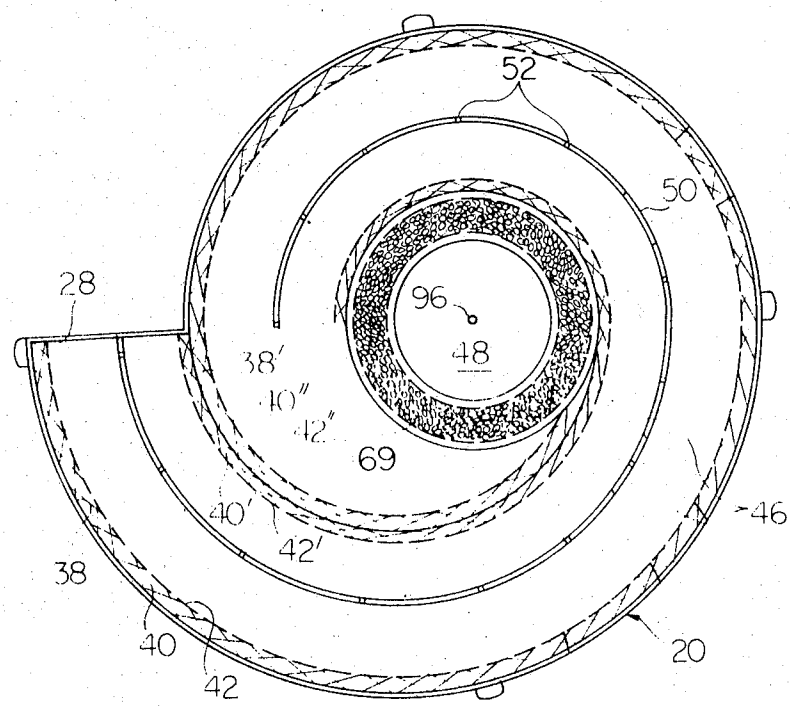


Fig. 1

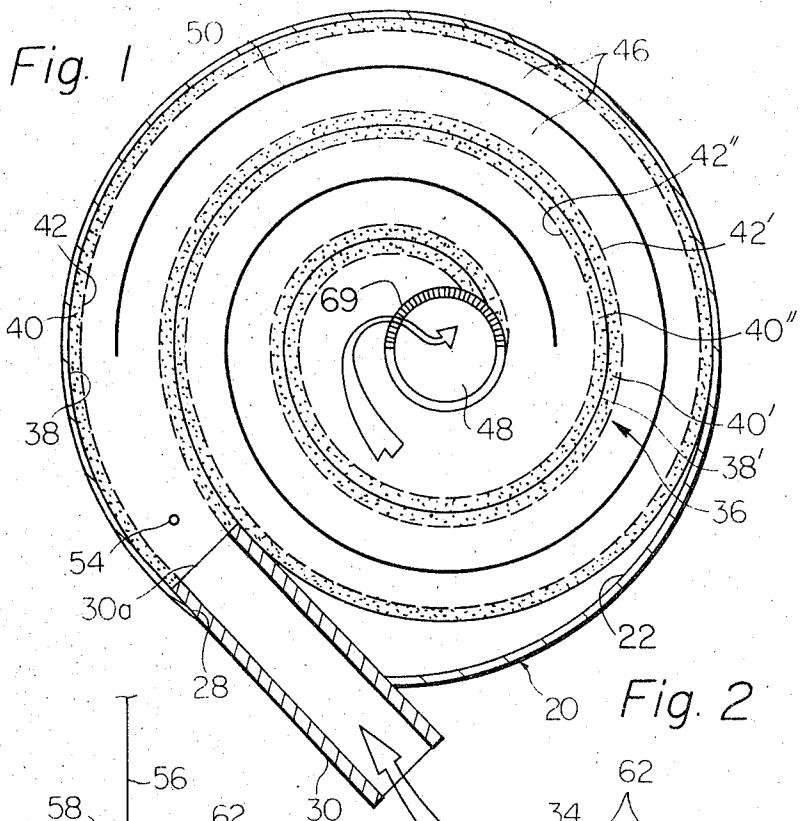

50
46
42″
42
42′
69
40
40″
38
40′
38′
36
48
54
30a
22
28
20
30

Fig. 2

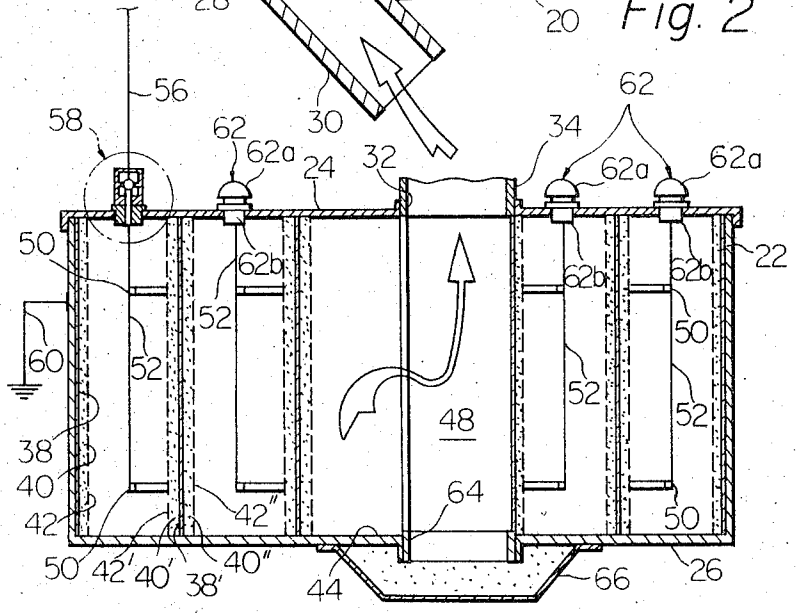

56
58
62
62a
24
32
34
62
62a
62a
50
62b
62b
62b
22
52
52
52
52
60
50
48
38
40
42
64
42″
50
50
42′
40′
38′
40″
44
66
26

Fig. 3

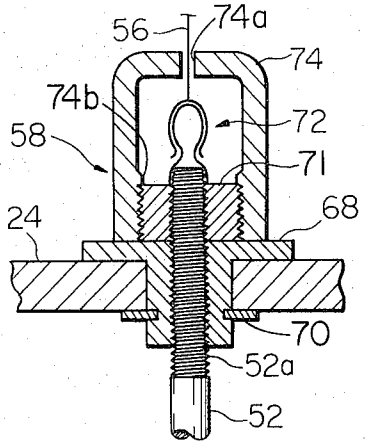

56
74a
74
74b
72
58
71
68
24
70
52a
52

Fig. 4

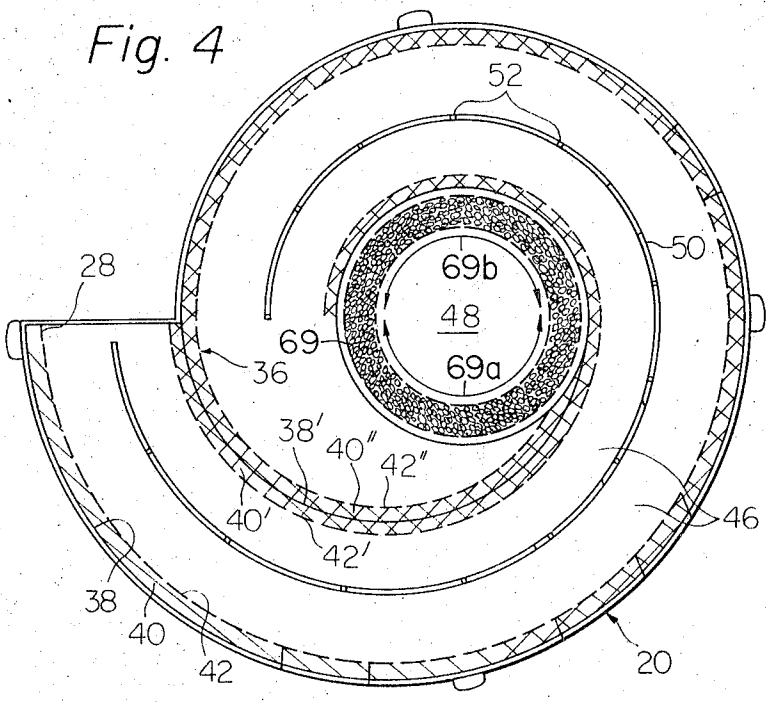

52
50
28
69b
48
69
69a
36
38'
40"
42"
40'
42'
46
38
40
42
20

Fig. 5

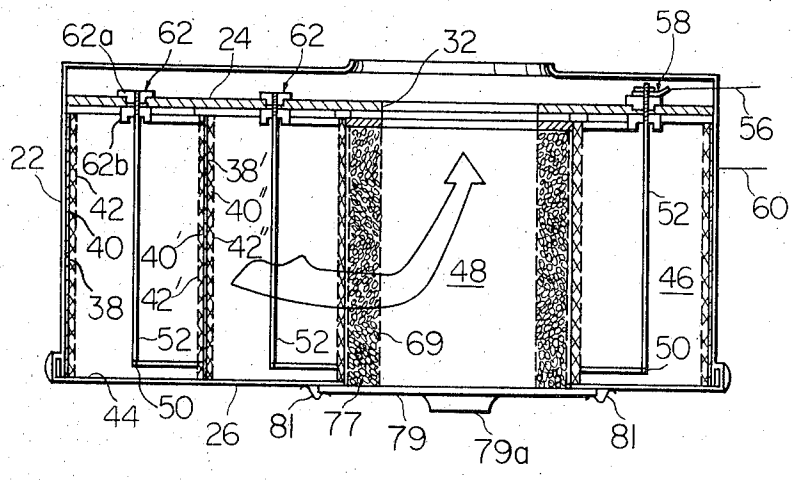

62a
62
24
62
32
58
56
60
22
62b
42
40
38
38'
40''
40'
42''
42'
48
52
46
50
52
52
69
44
50
26
81
77
79
79a
81

Fig. 6

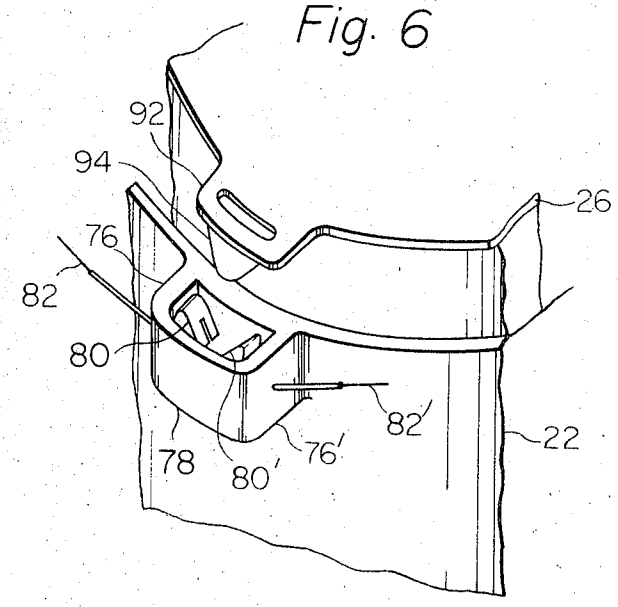

92
94
76
82
80
26
82'
22
78
80'
76'

Fig. 7

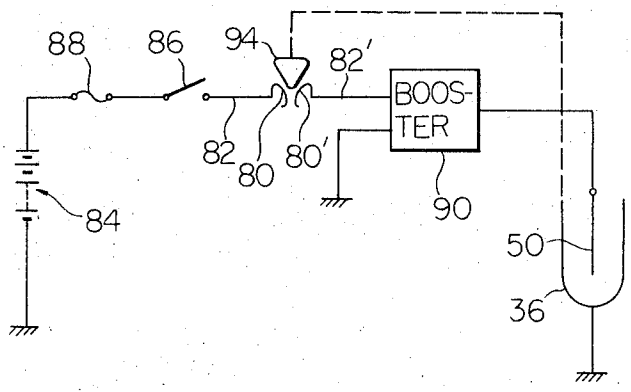

88
86
94
82'
BOOS-
TER
82
80
80'
84
90
50
36

Fig. 8

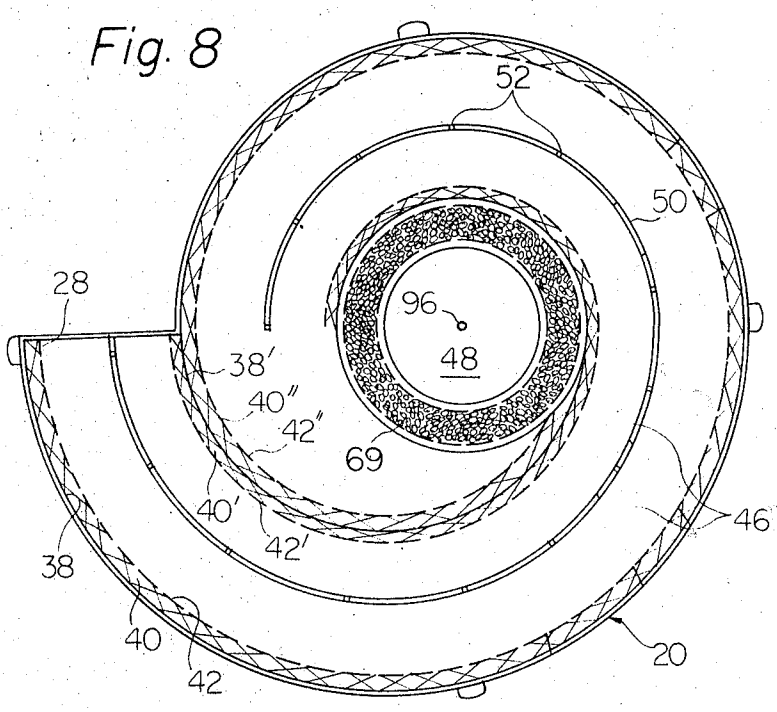
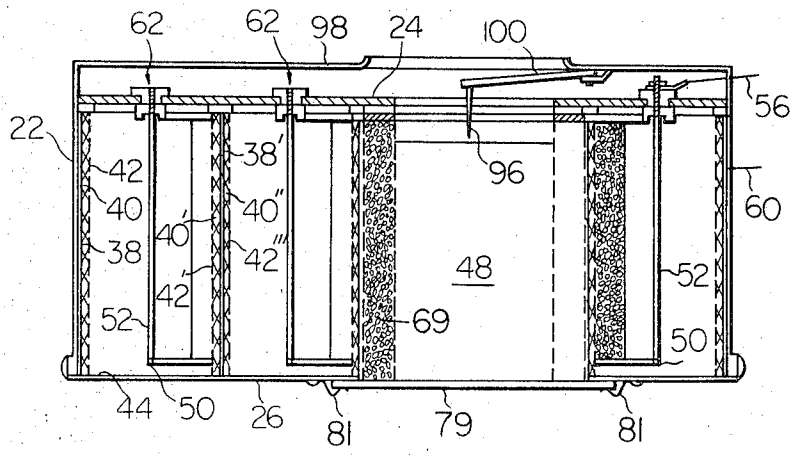

52
50
28
96
48
38'
40"
42"
69
40'
42'
46
38
40
42
20

Fig. 9


62
62
98
24
100
56
22
42
40
38
38'
40'
40''
42'
42''
42
52
48
96
60
52
69
50
44
50
26
81
79
81

AIR PURIFIER

The present invention relates to an air purifier and, more particularly, to an air purifier of the dust collector type adapted to remove dust from atmospheric air.

A primary object of the present invention is to provide an improved air purifier having an enhanced dust collection efficiency and capable of collecting dust of relatively large particle sizes.

Another important object of the invention is to provide an improved air purifier which meets serious space requirements such as in buses and automobiles.

To accomplish these objects, an air purifier herein proposed is characterized in that it operates on the principles of operation of a centrifugal dust separator and an electrostatic dust precipitator which per se are well known in the art.

In accordance with the present invention, the air purifier consists essentially of a generally cylindrical casing having an air inlet opening which is directed substantially tangentially of the casing and an air outlet opening which is located substantially centrally of the casing, dust collecting wall means positioned within the casing and providing a continuous passageway helically extending between the air inlet and outlet openings, the wall means including at least one dust collecting electrode for connection to one electric terminal, and at least one charging electrode helically extending in and along the passageway and electrically isolated from the collecting electrode, the charging electrode being for connection to another electric terminal having a polarity opposite to the polarity of the terminal for the collecting electrode for thereby establishing an electric field between the charging and collecting electrodes so that particles of dust entrained in an air stream directed into the passageway through the air inlet opening become ionized and are attracted to the dust collecting wall means as the air stream is circulated through the passageway.

By reason of the increased dust collecting efficiency and the ability of collecting relatively large dust particles, an air purifier of the general configuration above described will provide advantageous especially where used in a motor vehicle in which only a limited amount of space is available for incorporating the air purifier.

Other features and advantages of an air purifier according to the present invention will be more apparent from the following description taken in conjunction with the accompanying drawings in which like reference numerals and characters designate corresponding parts and members throughout the figures and in which:

FIG. 1 is a cross sectional view of a first preferred embodiment of an air purifier according to the present invention;

FIG. 2 is a side sectional view of the air purifier illustrated in FIG. 1;

FIG. 3 is a longitudinal sectional view showing on an enlarged scale of preferred example of an arrangement to support a charging electrode in the air purifier illustrated in FIGS. 1 and 2;

FIG. 4 is a cross sectional view showing a second preferred embodiment of an air purifier according to the present invention;

FIG. 5 is a side sectional view of the air purifier illustrated in FIG. 4;

FIG. 6 is a fragmentary perspective view showing on an enlarged scale a preferred example of a safety arrangement to be incorporated into the air purifier according to the present invention,

FIG. 7 is a schematic view showing an electric circuit including a switch means to be incorporated in the safety arrangement illustrated in FIG. 6;

FIG. 8 is a cross sectional view showing a third preferred embodiment of an air purifier according to the present invention; and

FIG. 9 is a side sectional view of the air purifier illustrated in FIG. 8.

Reference will now be made to the drawings, first to FIGS. 1 and 2 which illustrate a first preferred embodiment of an air purifier according to the present invention.

As seen in FIGS. 1 and 2, the air purifier embodying the present invention includes a generally cylindrical casing which is designated in its entirety by reference numeral **20**. The casing **20** is formed of an electrically non-conductive material and comprises a generally cylindrical wall **22** and upper and lower end walls **24** and **26**, respectively. The casing **20** has formed in its cylindrical wall **22** and opening **28** through which an air inlet duct **30** projects into the casing **20** substantially tangential to the inner surface of the cylindrical wall **22** as seen in FIG. **1**. Approximately centrally of the upper wall **24** of the casing **20** is formed an opening **32** which is in communication with an air outlet duct **34**.

Within the casing **20** is positioned a dust collecting electrode **36** which spirals inwardly from a leading end **30***a* of the air inlet duct **30** toward the center of the casing **20**, terminating substantially in alignment with the air outlet opening **32** in the upper end wall **24** of the casing **20**. The outermost segment of the dust collecting electrode **36** is attached to the inside of the cylindrical wall **22** along a portion thereof, and comprises a radially outer layer **38**, a radially intermediate layer **40** of a dust collecting filter attached to the inner surface of the outer layer **38**, and an electrically conductive porous or meshed radially inner layer **42** attached to the inner surface of the intermediate layer **40**. The collecting electrode **36** extends for substantially one complete spiral revolution within the casing **20** having the configuration described above, and merges at the end **30***a* with a portion thereof which spirally extends further inward, but has an altered configuration which will now be described. The inner portion of the dust collecting electrode **36** comprises an electrically conductive intermediate layer **38'** electrically connected to the outer layer **38**, a pair of layers **40'** and **40''** of a dust collecting material attached to the radially outer and inner surfaces, respectively, of the intermediate layer **38'**. and a pair of electrically conductive porous or meshed outer layers **42'** and **42''** attached to the radially outer and inner surfaces of the layers **40'** and **40''**, respectively, of the dust collecting material, the layers **40''** and **42''** thus extending continuously from the layers **40** and **42**, respectively. The layers **40**, **40'** and **40''** of dust collecting material are preferably formed of unwoven cloth made of synthetic fibres such as glass fibres while the electrically conductive porous or meshed layers **42**, **42'** and **42''** are formed of, for example, wire meshes. The electrically conductive layers **38** and **38'** may be sheet metals. The electrically conductive layers **38** and **38'** are electrically connected to the electrically

conductive layers **42, 42'** and **42''** through an electrically conductive plate **44.**

The dust collecting electrode **36** thus configured defines a continuous passageway **46** spirally extending from the leading end **30***a* of the air inlet duct **30** to a substantially central portion **48** of the interior of the casing **20,** thus providing unrestricted communication between the air inlet duct **30** and the air outlet duct **34,** as seen in FIG. **1.**

A suitable number of charging electrodes **50,** shown in FIG. **2** as being two in number by way of example, spirally extend substantially centrally within the passageway **46** and terminate at their inner ends in the vicinity of the central portion **48** of the interior of the casing **20.** The charging electrodes **50** are spaced apart from each other along the axis of the casing **20** and are supported from the upper end wall **24** of the casing **20** by a number of electrically conductive rods or wires **52** as seen in FIG. **2.** The charging electrodes **50** may have their outer ends located immediately downstream of to the leading end **30***a* of the air inlet duct **30** or, where desired, the electrodes **50** may have their outer ends appropriately spaced from the leading end **30***a* of the air inlet duct **30,** as in the embodiment illustrated in FIG. **1.** Where the charging electrodes **50** are disposed in a manner illustrated in FIG. **1,** an additional charging electrode **54** in a rod form may be located at the entrance of the passageway **46** for preliminarily charging the or ionizing the dust particles before the air to be cleaned reaches the electrodes **50.** In this instance, the electrode **46** serves to augment the electric field between the electrodes **50** and the dust collecting electrodes **36** on both sides thereof.

Wiring arrangements are made so that the charging electrodes **50** and **54** are energized to a polarity opposite to the polarity of the dust collecting electrode **36.** Thus, one of the conductive rods or wires **52** is electrically connected to a source (not shown) of high dc voltage through a lead **56** and a joint **58** which is attached to the upper end wall **24** of the casing **20,** while the dust collecting electrode **36** or more particularly the electrically conductive layers **38** and **38'** are connected to ground through a line **60.** It is, in this instance, preferable that the charging electrode **54** be supplied with a dc voltage which is equal to or higher than the voltage applied to the spiral charging electrode **50.** The wiring arrangements above described charge the dust particles to a positive polarity but, where desired, the arrangement may be reversed so that the dust collecting electrode **36** is connected to the positive electrical source terminal and the charging electrodes **50** and **54** are connected to ground for charging the dust particles to a negative polarity. The conductive rods or wires **52** excepting the one connected to the lead **56** are supported at the upper end wall **24** of the casing by means of retainers **62,** each comprising a rivet **62***a* and a spacer **62***b* by which the rod or wire **52** is adjustably attached to the end wall **24.**

Where desired, the lower end wall **26** of the casing **20** may be formed with an opening **64** located in alignment with the air outlet opening **32** in the upper end wall **24** for allowing relatively heavy dust particles to drop out of the casing **20** before the cleaned air is discharged from the air outlet opening **32.** In this instance, a dust reservoir **66** may be releasably supported at the lower surface of the lower end wall **26** of the casing **20** so that dust particles dropping from the interior of the casing **20** are deposited in the reservoir **66.** The lower end wall **26** and the adjacent dust collecting electrode **36** are releasably connected to the cylindrical wall **22** of the casing **20** so that the end wall **26** and the dust collecting electrode **36** can be removed from the casing **20** for dislodging the dust deposited on the dust collecting layers **40, 40'** and **40''** of the dust collecting electrode **36.**

FIG. **3** illustrates a preferred example of the joint **58** through which a conductive rod or wire **52** is connected to the lead **56.** As seen in FIG. **3,** the joint **58** comprises a flanged, internally threaded retaining member **68** which is received in the upper end wall **24** of the casing **20** with its flange fast on the upper surface of the end wall **24** and its inner end projecting into the interior of the casing **20.** The retaining member **68** serves as a washer and is secured to the end wall **24** by means of a snap ring **70** which is fast on the inner surface of the end wall **24.** The conductive rod or wire **52** is threaded at its upper end portion **52***a* and screwedly received in the retaining member **68** with its tip projecting from the upper end of the retaining member **68.** An internally and externally threaded member **71** securely receives in its internally threaded bore the upper end portion **52***a* of the rod or wire **52** and rests on the upper face of the retaining member **68.** The rod or wire **52** is connected at its end to the lead **56** through a snap connection **72** which may be configured in the form of a ball and socket joint. The threaded member **71** and the snap connection **72** are enclosed within a cup-like cap member **74** having an internally threaded portion by which the cap member **74** screws onto the threaded member **71.** The cap member **74** has formed at its top an aperture **74***a* through which the lead **56** passes through the cap member **74.** Where desired, the cap member **74** may be formed with a projection **74***b* on its inner surface for engagement with the upper surface of the threaded member **71.** The retaining member **68,** threaded member **71** and cap member **74** are all formed of electrically insulating materials. A joint arrangement of the nature above described is merely for the purpose of illustration and, as such, is subject to various modifications and changes where desired.

Where the air purifier thus far described is placed in practical use, it is important that the same be arranged in combination with a blower or suction fan for achieving forced circulation of air through the air purifier. When, thus, the fan associated with the air purifier is driven and the charging electrodes **50** and **54** are energized from the source of high-tension dc., voltage, air entering the passageway **46** from the air inlet duct **30** is passed through the electric field established between the electrode **54** and the dust collecting electrode **36** on both sides of the former. Particles of dust contained in the stream of air become ionized to a positive polarity and then move into the electric field built up on both sides of the spiral electrode **50.** The dust particles are then attracted to the grounded electrically conductive layers of the dust collecting electrode **36** and are deposited on the intermediate dust collecting layers **40, 40'** and **40''** of the electrode **36** as the air flows through the spiral passageway **46** toward the substantially central portion **48** of the casing **20.**

It is generally known in the art that in an electrostatic dust precipitator having a straight air flow passageway, the dust collecting efficiency decreases if when the dust

particles are moved through the length of the passageway in the time period which is shorter than the time in which the ionized particles can be moved to the dust collecting electrode by the electrostatic attraction. If air to be cleaned were passed through the passageway at such a high velocity, no dust particles of any size could be satisfactorily trapped by the dust collecting electrode in a conventional air purifier using the electrostatic dust collection principle alone. Since, however, in the air purifier according to the present invention, air to be cleaned is passed therethrough in a spiral path, dust particles contained in the air stream are subjected to centrifugal force as the air circulates through the passageway **46**, so that those particles which could not be collected by dust collecting electrode **36** by the electrostatic attraction alone can be moved to the electrode **36** under the influence of centrifugal force even though air passes at a high velocity through the spiral passageway **46**. It is, moreover, said that dust particles of sizes larger than approximately **20** microns in diameter can not be collected by means of electrostatic attraction alone. In an air purifier according to the present invention, however, dust particles of sizes larger than 20 microns can be satisfactorily collected by the dust collecting electrode **36** even though the air is passed at a considerably high velocity through the air purifier, because the larger the particles are the greater the centrifugal forces imparted to the particles. An air purifier according to the present invention thus has outstanding features which include:

a. High dust collecting efficiency achieved essentially irrespective of the velocity and rate of flow of air passing through the air purifier and of the sizes of the dust particles contained in the stream of air.

b. The dust collected is securely trapped by the dust collecting material.

c. Minimum efforts are required for maintenance and servicing of the air purifier and for exchange of parts.

d. Compact overall configuration resulting from the spirally configured air passageway.

It has been assumed in the description of the embodiment shown in FIGS. **1** and **2** that the electrically conductive layers **38** and **38'** are electrically connected to the porous or meshed electrically conductive layers **42**, **42'** and **42''** as through the conductive plate **44**, but they may be electrically isolated where desired. In this instance, the layers **42**, **42'** and **42''** should be formed of an electrically non-conductive material and at the same time the plate **44** should be removed from the arrangement illustrated in FIG. **2**.

Where desired, moreover, a deodorizing filter **69** may be located between the passageway **46** and the air outlet opening **32** for removing unpleasant odors from air to be discharged from the air outlet duct **34**. A more detailed configuration of such a deodorizing arrangement is illustrated in FIGS. **4** and **5** which show a second preferred embodiment of the air purifier according to the present invention.

Referring to FIGS. **4** and **5**, the deodorizing filter **69** is configured as generally cylindrical and has an open upper end which is in alignment with the air outlet openings **32** in the upper end wall **24** of the casing **20**. The use of a deodorizing filter in an air purifier is in itself well known in the art and it has been an ordinary practice to have the filter fixedly held in place on, for example, the casing of the air purifier. Where the deodorizing filter is thus fixedly mounted on casing, bad-smelling materials are accumulated on a limited area of the filter located in the path of air to be discharged from the air outlet opening **32**, and the remaining area of the filter is kept intact. In the case of the air purifier configuration illustrated in FIGS. **4** and **5**, air containing bad odors is passed locally through the area indicated as **69***a* of the filter **69** with the remaining area **69***b* kept intact throughout the use of the filter. This localized accumulation of materials will result in degraded deodorizing performance and a shortened life of the filter. Replacing the filter with a new one from time to time will require a disproportionate amount of time and labour and is therefore objectionable from an economical point of view.

For the purpose of eliminating this drawback, the lower end wall **26** of the casing **20** is formed with an opening **77** which is in alignment with the lower end of the deodorizing filter **69** and the opening **77** is closed by a closure **79** which is rotatably mounted on the lower surface of the lower end wall **26** of the casing **20** by means of fittings **81**. The deodorizing filter **69** is securely connected at its lower end to the upper surface of this closure **79** and is thus rotatable about its axis within the casing **20** together with the closure **79**. The angular position of the filter **69** relative to the path of air to be discharged from the air outlet opening **32** is thus variable by turning the closure **79** on the lower end wall **26** of the casing **20** so that smell-containing materials can be accumulated substantially uniformly throughout the area of the filter **69** by turning the filter **69** about its axis from time to time. To facilitate turning of the closure **79**, a knob **79***a* may be formed or mounted centrally on the lower surface of the closure **79**, as shown.

In FIGS. **4** and **5**, the air purifier embodying the present invention is shown as incorporating only one charging electrode **50** extending substantially centrally through the passageway **46** from the air inlet opening **28** to the air outlet opening **32**, although more than one electrode **50** may be employed if desired.

As previously mentioned, the lower end wall **26** of the casing **20** is arranged so as to be detachable together with the dust collecting electrode **36** to facilitate removal of dust particles deposited on the layers **42**, **42'** and **42''** of the dust collecting material **36**. If, in this instance, the lower end wall **26** of the casing **20** and the dust collecting electrode **36** supported by the end wall **26** are removed from the casing **20** with the charging electrode **50** inadvertently left energized by the high-tension power source (not shown), a serious danger will be incurred on the operator. FIG. **6** illustrates an embodiment of an air purifier according to the present invention which eliminates such a danger.

Referring to FIG. **6**, the cylindrical wall **22** of the casing **20** has formed at its circumferential edge portion adjacent the lower end wall **26** a pair of projections **76** and **76'** extending radially outward from the cylindrical wall **22** and joined together at their ends by a wall portion **78**. Spaced contact elements **80** and **80'** are mounted on the inner faces of these projections **76** and **76'**, respectively in a manner to face each other at a certain spacing therebetween. The contact elements **80** and **80'** are electrically connected to leads **82** and **82'**, respectively. As seen in FIG. **7**, the lead **82** is connected to the source **84** of the dc., high-tension voltage through an air purifier actuator switch **86** and a fuse **88**.

The other lead 82' is connected through a booster transformer 90 to the charging electrode 50 of the air purifier.

On the other hand, the lower end wall 26 of the casing 20 is formed with a radial projection 92 which is so located as to be in alignment with the projections 76 and 76' of the cylindrical wall 22 when the lower end wall 26 is attached in its working position to the cylindrical wall 22. The projection 92 carries on its upper face an electric connector element 94 which is connectably received between the spaced contact elements 80 and 80' when the lower end wall 26 is assembled to the cylindrical wall 22 for thereby completing an electric path between the high-tension power source 84 and the charging electrode 50.

Through provision of the switching arrangement above described, the charging electrode 50 can be reliably disconnected from the high-tension power source 84 even though the air purifier actuating switch 86 is inadvertently left closed when the lower end wall 26 is removed together with the dust collecting electrode 36 for the purpose of purging the collecting electrode 36.

It is empirically known that the negative ions in atmospheric air act to tranquilize human nerves while positive ions act to the contrary. FIGS. 8 and 9 illustrate a fourth preferred embodiment of the air purifier according to the present invention arranged to utilize such a phenomenon.

Referring to FIGS. 8 and 9, the air purifier includes in addition to the parts and elements incorporated in the embodiment shown in FIGS. 4 and 5, an ionizing electrode 96 which is located in the air outlet opening 32 in the upper end wall 24 of the casing 20. The ionizing electrode 96 is shown as being in a needle form and is supported by an outer casing 99 through a support 100 of an electrically conductive material. The support 100 is connected to a source (not shown) of a negative high-tension d.c. voltage for impressing a negative high-tension potential on the ionizing electrode 96 so that air being discharged through the air outlet opening 32 is ionized to a negative polarity. The embodiment above described is thus adapted not only to clean and deodorize the air but to ionize the air to the negative polarity such that it will soothe the human nerves. Where the air purifier having such features is installed in a motor vehicle, the same will contribute to safe driving while supplying satisfactorily cleaned air.

What is claimed is:

1. An air purifier comprising a generally cylindrical casing having an air inlet opening and an air outlet opening located substantially centrally of the casing, dust collecting wall means positioned within said casing and providing a continuous passageway extending spirally between the air inlet and outlet openings in said casing, said wall means including at least one dust collecting electrode for connection to a first electric terminal, and at least one charging electrode extending spirally in and along said passageway and electrically isolated from said collecting electrode, said charging electrode being for connection to a second electric terminal having a polarity opposite to the polarity of the first electric terminal for thereby establishing an electric field between the charging and collecting electrodes so that particles of dust entrained in air directed into said passageway through said air inlet opening become ionized and are attracted to said dust collecting wall means as the air is circulated through said passageway from said air inlet opening to said air outlet opening, said dust collecting wall means further including a dust collecting filter attached to the surface of said dust collecting electrode facing said passageway and an additional dust collecting electrode of a wire mesh form, said additional dust collecting electrode being attached to the surface of said dust collecting filter facing said passageway and electrically connected to the first named dust collecting electrode.

2. An air purifier as claimed in claim 1, further comprising deodorizing means located in said passageway immediately anterior to said air outlet opening, in which said deodorizing means in movable in situ relative to said air outlet opening so that the area passing the cleaned air through said deodorizing means is variable through changing the position of the deodorizing means relative to said air outlet opening.

3. An air purifier as claimed in claim 2, further comprising an ionizing electrode located in the neighbourhood of said air outlet opening and operative to be impressed with a negative high-tension power and a grounding electrode spaced from said ionizing electrode for ionizing to negative polarity the air being discharged from said casing through said air outlet opening.

4. An air purifier as claimed in claim 3, in which said casing comprises an end wall supporting thereon said dust collecting wall means and releasable from said casing, and further comprising switch means mounted in part on said end wall and in part on a remaining portion of said casing for providing a releasable electrical connection between said dust collecting electrode and an electric power source, said electrical connection being interrupted when said end wall is released from said casing.

5. An air purifier as claimed in claim 3, further comprising an additional charging electrode located in said passageway immediately posterior to said air inlet opening for connection to a third electric terminal having a polarity which is similar to the polarity of said second electric terminal for thereby preliminarily charging the dust entrained in the air admitted to said passageway through said air inlet opening.

6. An air purifier comprising a generally cylindrical casing having an air inlet opening and an air outlet opening located substantially centrally of the casing, dust collecting wall means positioned within said casing and providing a continuous passageway extending spirally between the air inlet and outlet openings in said casing, said wall means including at least one dust collecting electrode for connection to a first electric terminal, and at least one charging electrode extending spirally in and along said passageway and electrically isolated from said collecting electrode, said charging electrode being for connection to a second electric terminal having a polarity opposite to the polarity of the first electric terminal for thereby establishing an electric field between the charging and collecting electrodes so that particles of dust entrained in air directed into said passageway through said air inlet opening become ionized and are attracted to said dust collecting wall means as the air is circulated through said passageway from said air inlet opening to said air outlet opening, and further comprising deodorizing means located in said passageway immediately anterior to said air outlet opening, in which said deodorizing means is mov-

able in situ relative to said air outlet opening so that the area passing the cleaned air through said deodorizing means is variable through changing the position of the deodorizing means relative to said air outlet opening.

7. An air purifier comprising a generally cylindrical casing having an air inlet opening and an air outlet opening located substantially centrally of the casing, dust collecting wall means positioned within said casing and providing a continuous passageway extending spirally between the air inlet and outlet openings in said casing, said wall means including at least one dust collecting electrode for connection to a first electric terminal, at least one charging electrode extending spirally in and along said passageway and electrically isolated from said collecting electrode, said charging electrode being for connection to a second electric terminal having a polarity opposite to the polarity of the first electric terminal thereby establishing an electric field between the charging and collecting electrodes so that particles of dust entrained in air directed into said passageway through said air inlet opening become ionized and are attracted to said dust collecting wall means as the air is circulated through said passageway from said air inlet opening to said air outlet opening, and an ionizing electrode located in the neighbourhood of said air outlet opening and operative to be impressed with a negative high-tension power and a grounding electrode spaced from said ionizing electrode for ionizing to negative polarity the air being discharged from said casing through said air outlet opening.

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