

[54] VACUUM CLEANER HAVING SIGNAL FOR INDICATING ABSENCE OF DUST BAG

34; 242/199, 200

[75] Inventors: **Hans Georg Ljung**, Jakobsberg; **Dan Johannes Barrner**, Vallingby; **Karl Gustav Grellsson**, Sollentuna, all of Sweden

[73] Assignee: **Aktiebolaget Electrolux**, Stockholm, Sweden

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[51] Int. Cl. **G08b 21/00**

[58] Field of Search **116/112, 114, 65, 116/67, 114 AD; 15/327, 339; 55/274, DIG.**

[56]

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Primary Examiner—Louis J. Capozzi

Attorney—Edmund A. Fenander

[57]

ABSTRACT

In a vacuum cleaner, a device for producing an audible signal when operation of the cleaner is initiated and no dust bag is positioned in the cleaner.

8 Claims, 4 Drawing Figures

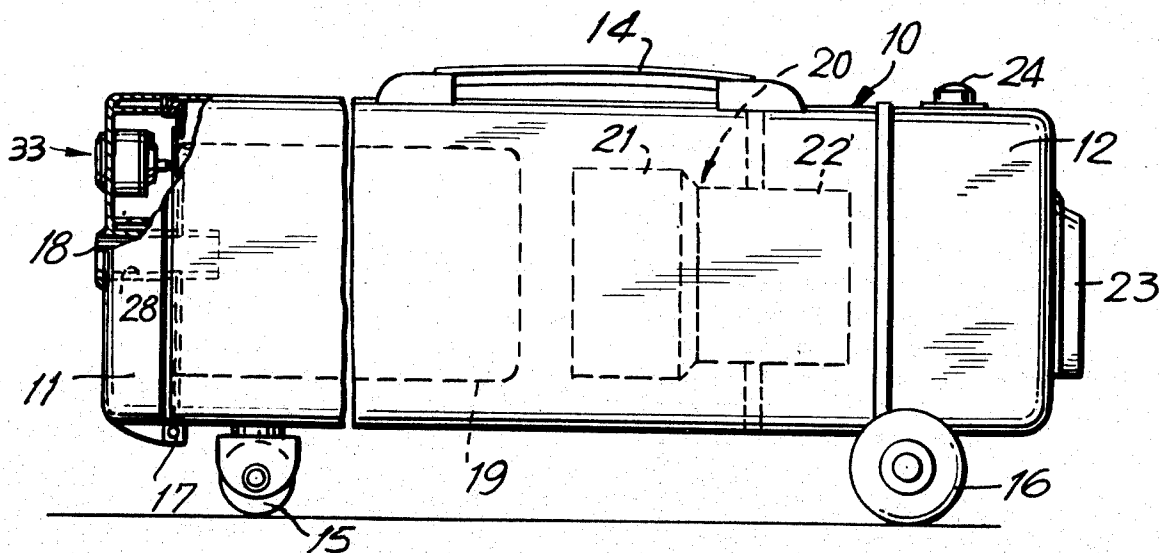


FIG. 1

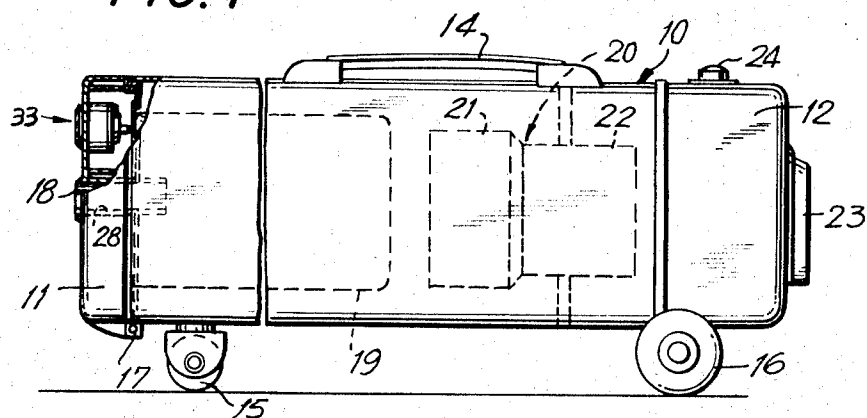
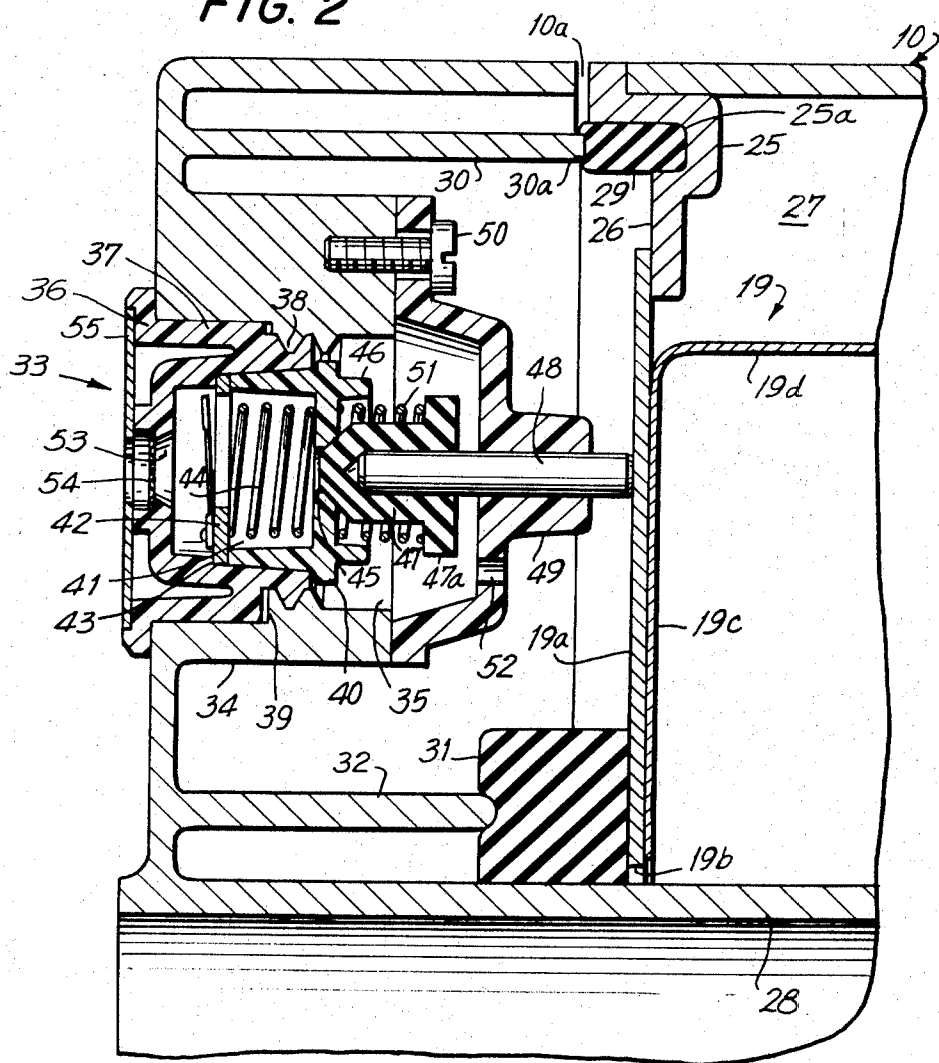


FIG. 2



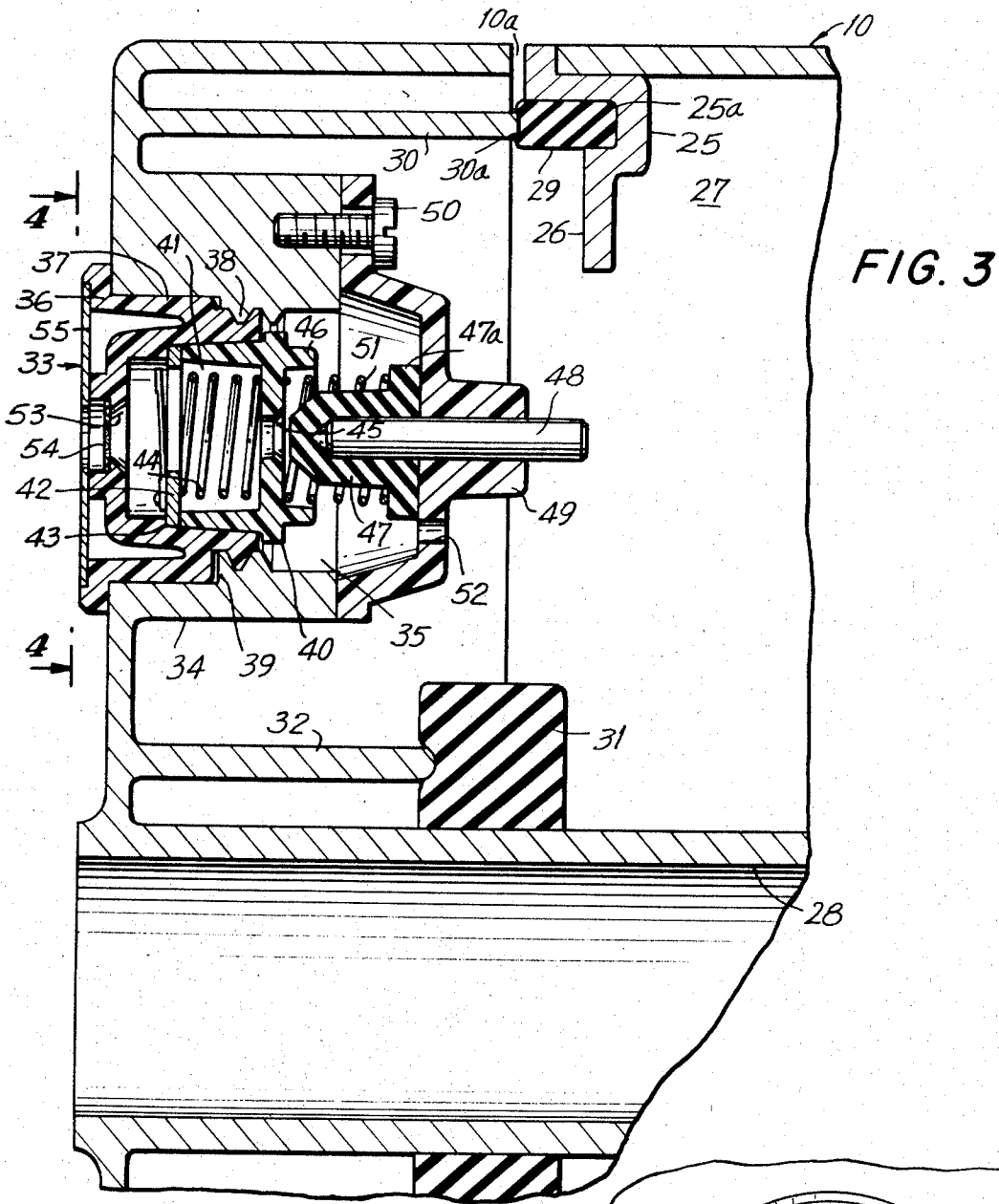
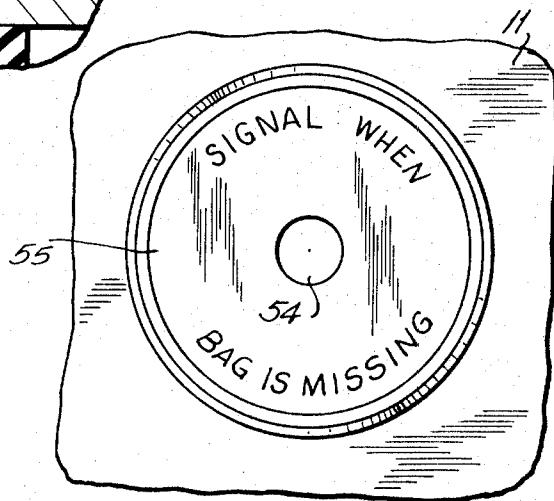


FIG. 3

FIG. 4



VACUUM CLEANER HAVING SIGNAL FOR INDICATING ABSENCE OF DUST BAG

BACKGROUND OF THE INVENTION

1. Field of the Invention

Vacuum cleaners have a cover which closes an opening in a wall of a casing and is movable therefrom for the insertion and withdrawal of a dust bag. In a tank-type vacuum cleaner a flexible hose has one end detachably connected to an opening in the cover and its opposite end connected to a wand having a suitable tool connected to its outer free end. A motor-fan unit in the casing produces a partial vacuum therein to cause dirt-laden air to be drawn into the casing from the cleaning tool through the wand and hose. As the dust-laden air flows through the air permeable dust bag in the casing of the vacuum cleaner, the dust and dirt is removed from the air by the dust bag and air free of dust and dirt is discharged from the cleaner through a discharge opening or air outlet.

When a vacuum cleaner is operated for a relatively long interval of time without a dust bag properly positioned therein, the dust removed from one area of a room or enclosure is discharged with the air leaving the cleaner and distributed over the entire area of the room being cleaned. Further, continued use of the vacuum cleaner under these conditions causes dust in the air to accumulate on the motor-fan unit which tends to interfere with its proper operation.

2. Description of the Prior Art

It has been the practice heretofore to provide interlocking mechanism which prevents a vacuum cleaner cover from being latched in closed position on the casing when there is no dust bag positioned in the cleaner. With such interlocking mechanism ambient air is drawn into the interior of the cleaner and mixes with dust-laden air introduced into the cleaner through the flexible hose. When the person using the vacuum cleaner stays in its immediate vicinity it will become apparent immediately that the cover is not latched in its closed position.

However, a person using the vacuum cleaner sometimes leaves a room practically at the moment the operation of the vacuum cleaner is started. When there is no dust bag positioned in the cleaner on such occasions, the vacuum cleaner often continues to operate for a relatively long interval of time with the cover unlatched, which is objectionable. Further, such interlocking mechanism that functions to prevent a cover from latching in its closed position when no dust bag is positioned in the vacuum cleaner is complicated and adds considerably to the overall cost of manufacturing the cleaner, which is objectionable.

SUMMARY OF THE INVENTION

It is an object of our invention to provide a vacuum cleaner having an improved device for producing a signal when operation of the cleaner is initiated and no dust bag is positioned in the cleaner.

Another object is to provide such an improved device which is simple and inexpensive to manufacture and produces an audible signal with the aid of air.

We accomplish this by providing such a device having a passageway which establishes communication with the interior of the vacuum cleaner casing and the atmosphere for producing an audible sound with the aid of air flowing therethrough to the atmosphere. A

valve member is movable between a first position to close the passageway and a second position to open the passageway and is biased to its second open position by resilient means.

When a probing element, which is operatively associated with the valve member, engages a dust bag positioned in the casing, it functions to move the valve member to its first closed position and the signal device remains silent. When the probing element fails to engage a dust bag because no bag is positioned in the cleaner, the probing element, due to the biasing action of the resilient means, functions to move the valve member to its second open position. When this occurs a part of the air flowing in the casing will be diverted and flow through the passageway of the device to atmosphere to produce an audible sound.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing, FIG. 1 is a side view, partly in section, of a suction cleaner having a device embodying our invention for producing a signal when operation of the cleaner is initiated and no dust bag is positioned in the cleaner;

FIGS. 2 and 3 are enlarged fragmentary sectional views of the signalling device shown in FIG. 1 to illustrate details; and

FIG. 4 is a fragmentary view taken at line 4—4 of FIG. 3.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIG. 1 of the drawing, the suction cleaner which we have shown embodying our invention comprises a casing 10 having a front end cover 11 and a rear hood 12. The casing 10 is provided with a handle 14, a front caster wheel 15 and a pair of rear wheels 16. The front caster wheel 16 rotates about vertical and horizontal axes to facilitate turning of the cleaner as it is being moved over a supporting surface.

The front end cover 11 and rear hood 12 are detachably secured to the casing 10 in any suitable manner. As shown in FIG. 1, the front end cover 11 is hinged at 17 to the casing 10 and can swing from and to its illustrated closed position in which it can be latched in any suitable manner (not shown).

The end cover 11 is formed with an air inlet opening 18 to which a suction hose (not shown) can be removably connected. Suitable cleaning tools may be detachably connected to the outer free end of a wand which, at its inner end, is connected to the outer free end of the hose and through which air flows into the casing.

A dust bag 19 is mounted in the casing 10 adjacent to the front end cover 11 and functions to separate dust and dirt from air flowing therethrough. The flow of air through the casing 10 is effected by a motor-fan unit 20 which includes a centrifugal fan 21 carried at one end of an electrical motor 22. The fan 21 receives air which passes through the dust bag 19 and the air discharged by the fan flows through the motor 22 and an air outlet 23 in the rear hood 12. The motor 22 is adapted to be connected to a source of electrical supply by suitable conductors (not shown) and controlled by an electric switch having an operating button 24 at the top of the casing.

Although we do not wish to be limited thereto, the dust bag 19, which in a broad sense constitutes a dirt-collecting member, may comprise an end closure 19a

formed of suitable sheet-like material like cardboard, for example, having a central opening 19b. The open end 19c of a paper dust collecting bag 19d is fixed in any suitable manner, as by an adhesive, to the inner face of the end closure 19a.

The casing 10 is provided with a collar or ring 25 at the open end 10a thereof which is formed with a seat 26 on which the end closure 19a is positioned with the dust bag 19d extending within the space 27 of the casing 10. The front end cover 11 is formed with a tubular member 28 projecting inward therefrom. The tubular member 28, the outer end of which defines the air inlet opening 18 in the front end cover 11, projects through the opening 19b in the end closure 19a into the interior of the paper bag 19d.

In order to provide an airtight seal between the front end cover 11 and open end 10a of the casing 10 a resilient gasket 29 of annular form is retained in a recessed portion 25a of the rim or collar 25. The interior of the front end cover 11 is provided with a wall 30 of annular form which projects inward toward the open end 10a of the casing 10. When the front end cover 11 is in its closed position the inner end 30a of the wall 30 bears against the gasket 29 to form an airtight seal between these parts.

An annular sealing member 31 is disposed about the tubular member 28 and frictionally positioned thereto. The sealing member 31 is prevented from moving axially of the tubular member 28 by a ring-shaped flange 32 which is disposed about the tubular member and projects inward from the closed end of the front end cover 11.

With a dust bag 19 positioned in the casing 10 and the front end cover 11 in its closed position the sealing member 31 bears against the end closure 19a and the flange 32 in turn acts and bears against the sealing member. In this way the sealing member 31 is compressed between the tubular member 28 and end closure 19a around the opening 19b in the latter. This ensures that all of the dust-laden air entering the cleaner at the air inlet opening 18 will pass into the dust bag 19.

In accordance with our invention we provide a device 33 which produces a signal when operation of the vacuum cleaner is initiated and no dust bag 19 is positioned in the casing 10. The signalling device 33 is disposed within the interior of the front end cover 11 and forms a unitary part thereof.

The device 33 is mounted in the end cover 11 in a hollow boss 34 having a passageway 35 extending therethrough. A member 36, which is disposed in the passageway 35, comprises a hollow sleeve 37 which is in threaded engagement with the wall of the passageway 35, as indicated at 38. The boss 34 is formed with an internal shoulder 39, the parts of the sleeve 37 at the left and right of the shoulder 39 being of different diameters. It will now be understood that the member 36 can be inserted into the hollow boss 34 and threadedly connected thereto at 38.

A cup-shaped element 40 having a cavity 41 snugly fits within the inner end of the sleeve 37. A metal reed 42 is held against a shoulder 43 within the sleeve 37 by the extreme open end of the cup-shaped element 40. A helical spring 44 disposed within the cavity 41 between the closed end of the cup-shaped element 40 and the reed 42 biases and urges the latter against the shoulder 43. The closed end of the cup-shaped element 40 is

formed with a central opening 45 and a flange 46 of circular form which is disposed about the opening 45.

The opening 45 serves as a seat for a valve 47 which is movable between closed and open positions. The valve 47 is recessed to receive one end of a pin 48, the opposite end of which extends through an opening in a member 49 which is fixed to the inner end of the boss 34 in any suitable manner, as by cap screws 50, for example. The valve 47 is biased to its open position shown in FIG. 3 by resilient means, such as a helical spring 51, which is disposed about the valve between the closed end of the cup-shaped element 40 and a flange 47a of the valve 47.

During operation of the suction cleaner, dust-laden air is drawn into the casing 10 through the central opening 18 in the front end cover 11 and flows through the tube 28 into the dust bag 19. Dirt is trapped in the dust bag and air separated from such dirt passes into the space 27. Air flows from the space 27 into the inlet of the fan 21 from which it is discharged into the motor 22 to effect cooling thereof. The air finally is discharged from the casing through the outlet 23 in the rear hood 12.

As seen in FIG. 2, the pin 48, which may be referred to as a probing element, is engaged by the end closure 19a of the dust bag 19 and functions to hold the valve 47 in its closed position at the opening 45. Under these operating conditions the opening is closed and the device 33 is rendered inoperable to produce a signal. When no dust bag 19 is positioned in the casing 10, however, there is nothing in the path of movement of the pin or probing element 48 and it can freely move to the right, as shown in FIG. 3. This movement of the pin 48 is effected by the helical spring 51 which urges the valve 47 to its open position.

When operation of the suction cleaner has been initiated with no dust bag positioned in the casing, air will be drawn into the casing 10 through the inlet opening 18 and tube 28 into casing 10 by the motor-fan unit 20. Such air can flow at a relatively high velocity from the interior of the casing to the atmosphere in a path of flow which includes an opening 52 in member 49, passageway 35, opening 45 in the closed end of the cup-shaped element 40, cavity 41 in the cup-shaped element 40 and axially extending passageway 53 at the closed end of the member 36.

The air flowing through the cavity 41 of the cup-shaped element 40 past the metal reed 42 will cause the latter to vibrate rapidly and produce an audible sound. When such an audible sound or signal is produced, anyone in the vicinity of the vacuum cleaner will become aware of the fact that no dust bag 19 is positioned in the casing 10 and immediately disconnect the motor 22 from the source of electrical supply by pushing the operating button 24 of the motor switch to open it. Hence, a person can stop the operation of the vacuum cleaner practically immediately after operation thereof has been initiated, so that the cleaner cannot be injured in any way due to the fact that it has been operated for a very short interval of time with no dust bag positioned in the casing 10.

When a dust bag 19 now is positioned in the casing 10, operation of the cleaner can be initiated again and the signal device 33 will be rendered inoperable, as explained above, with the parts of the signal device in the relative positions illustrated in FIG. 2.

A filter 54, which may be formed of suitable material which is permeable to air, is provided in the axially extending passageway 53 at the closed end of the member 36. Further, an apertured plate 54 is provided at the exterior surface of the member 36 upon which may be provided a suitable warning, such as "SIGNAL WHEN BAG IS MISSING," as indicated in FIG. 4. In this way a person using the cleaner for the first time will understand that no dust bag 19 is positioned in the casing when an audible signal is produced by the device 33 when operation of the cleaner is initiated.

We claim:

1. In a suction cleaner of the class described having a casing provided with an inlet and outlet for air adapted to flow therethrough and a dust bag which is normally therein for removing dirt from air, the combination of
 - a. a device for producing a signal, and
 - b. means for controlling the operation of said device,
 - c. said control means including a probing element responsive to the absence of a dust bag in the casing to actuate said device to produce said signal.
2. In a suction cleaner of the class described having a casing provided with an inlet and outlet for air adapted to flow therethrough and a dust bag which is normally therein for removing dirt from air, the combination of
 - a. a device for producing a signal, said device including a probing element movable between first and second positions,
 - b. said device being inoperable to produce said signal when said element is in its first position and operable to produce said signal when said element is in its second position,
 - c. means for biasing said element from its first position toward its second position,
 - d. said element being engageable by a dust bag when the latter is disposed in the casing to retain said element in its first position against the action of said biasing means to render said device inoperable to produce said signal, and
 - e. said element being movable toward its second position by said biasing means in the absence of a dust bag in the casing to actuate said device to produce said signal.
3. In a suction cleaner of the class described having a casing provided with an inlet and outlet for air adapted to flow therethrough and a dust bag which is normally therein for removing dirt from air, the combination of
 - a. a device for producing a signal with the aid of air,
 - b. movable valve means to control flow of air for operating said device, and
 - c. means responsive to the absence of a dust bag in the casing to actuate said valve means for effecting flow of air to operate said device and produce such a signal.
4. Apparatus as set forth in claim 3 in which said device produces an audible sound with the aid of air which serves as said signal.

5. Apparatus as set forth in claim 4 in which
 - a. said device produces an audible sound with the aid of air flowing through said casing and
 - b. said means responsive to the absence of a dust bag in the casing actuates said valve means to divert a part of the air flowing through the casing and cause the diverted air to operate said device and produce such an audible sound.
6. Apparatus as set forth in claim 4 in which
 - a. said device has a passage communicating with the atmosphere for producing such audible sound with the aid of air flowing therethrough and
 - b. said means responsive to the absence of a dust bag in said casing actuates said valve means to establish a path of flow of air from within the casing to the passage of said device and from the latter exteriorly of said device to the atmosphere to produce such an audible sound.
7. Apparatus as set forth in claim 4 in which
 - a. said device has an opening and said movable valve means includes a valve member for closing the opening for substantially preventing flow of air through said device,
 - b. resilient means to bias said movable valve in one direction from the opening to cause air to flow through said device in the absence of a dust bag in said device, and
 - c. said valve member closing the opening against the biasing action of said resilient means responsive to a dust bag positioned in the casing to effect removal of dirt from air.
8. Apparatus as set forth in claim 4 in which
 - a. the inlet for air is defined by an opening at one side of the casing, the casing including a cover which closes the opening and is movable therefrom for the insertion and withdrawal of a dust bag,
 - b. said device being mounted within the cover and forming a unitary part thereof,
 - c. said device having a passage to establish communication with the interior of the casing and the atmosphere for producing the audible sound with the aid of air flowing therethrough to the atmosphere,
 - d. said movable valve means comprising a valve member which is movable between a first position to close said passage and a second position to open said passage, said valve means including structure to urge said valve member to its second open position, and
 - e. said means to actuate said valve means including a probing element operatively associated with said valve member (1) which is engaged by a dust bag positioned in the casing and functions to move said member to its first closed position and (2) which enables said structure to urge said valve member to its second open position when a dust bag is not positioned in the casing with the result that a part of the air flowing in the casing will be diverted and flow through said passage to the atmosphere to produce the audible sound.

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