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(54) Vacuum cleaner.

(57) In a vacuum cleaner having a tank chamber, an air suction chamber, an air circulation chamber, and a motor chamber, a speaker is mounted in the air circulation chamber. A plurality of terminals in the motor chamber act¤¤te:
a music synthesis IC. The terminals and a liquid level switch are connected to a microcomputer in the motor chamber. After a job is finished, a voice from the speaker automatically informs a worker the job is done and goes on to thank and praise the worker. The speaker then plays a tune, thereby giving the worker a sense of satisfaction and freedom that the job is done and encouraging the worker to start the next job.

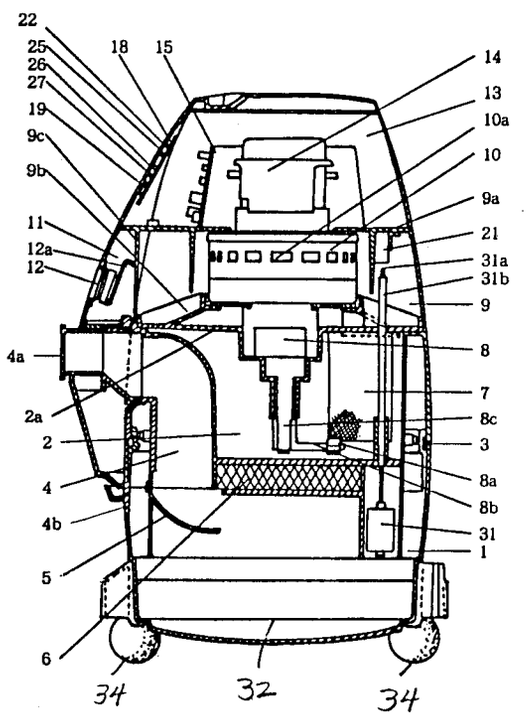

FIG. 1

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BACKGROUND OF THE INVENTION

The present invention relates to vacuum cleaners, more particularly, to a vacuum cleaner that broadcasts an artificial voice and a tune when it has finished cleaning.

Japanese Laid-Open Utility Patent Publication No. 1-41390 discloses a vacuum cleaner that picks up oil. A thick, spongy filter that removes oil drops is attached at the upper side of a tank chamber. A bag-like filter for removing dust is affixed in an air suction chamber at the upper side of the filter that removes oil drops. By beating the bottom of the bag-like filter, a dust-scattering device keeps the filter from becoming clogged. A collision board is attached at the lower side of an air-guiding cylinder that has a suction inlet. The oil sucked from the suction inlet is removed by the spongy filter and drops to a tank chamber.

There is no mechanism to broadcast a voice and a tune in any prior-art vacuum cleaner.

A worker feels satisfied and free on finishing a job. If the worker hears a voice and a tune, these feelings of satisfaction and freedom are increased. Hearing a voice and a tune also encourages the worker to start the next job.

OBJECTS AND SUMMARY OF THE INVENTION

An object of the present invention is to provide a vacuum cleaner that overcomes the lack of broadcast sound of the prior art.

A further object of the present invention is to provide a vacuum cleaner that offers a worker an encouraging voice and an uplifting tune when a job is completed.

A still further object of the present invention is to provide a vacuum cleaner that, by means of a voice and a tune, encourages a worker to feel satisfied and free and to start the next job.

Briefly stated, the present invention provides, in a vacuum cleaner having a tank chamber, an air suction chamber, an air circulation chamber, and a motor chamber, a speaker mounted in the air circulation chamber. A plurality of terminals in the motor chamber actuate: low-speed and high-speed modes of a main motor, a dust-scattering motor, a speech synthesis IC, and a music synthesis IC. The terminals and a liquid level switch are connected to a microcomputer in the motor chamber. After a job is finished, a voice from the speaker automatically informs a worker the job is done and goes on to thank and praise the worker. The speaker then plays a tune, thereby giving the worker a sense of satisfaction and freedom that the job is done and encouraging the worker to start the next job.

According to an embodiment of the invention, a vacuum cleaner is characterized by apparatus to broadcast speech and music in response to a job-completion signal.

According to a feature of the invention, a vacuum cleaner is characterized by means for suctioning dust and liquid, means for holding the dust and liquid, means for actuating the means for suctioning, the means for actuating being responsive to the means for holding when the means for holding becomes full, means for communicating to an operator whether the means for holding is full, the means for suctioning having at least two modes, the means for communicating being disposed to communicate to the operator which of the at least two modes is operative, means for preventing an accumulation of the dust, the means for communicating disposed to communicate to the operator whether the means for preventing is operative, means for broadcasting speech and music to the operator, and the means for broadcasting being responsive to the means for actuating.

According to another feature of the invention, a vacuum cleaner is characterized by a tank chamber, an air suction chamber attached to the tank chamber, an air circulation chamber attached to the air suction chamber, a motor chamber attached to the air circulation chamber, the air suction chamber having a dust-scattering motor, the air circulation chamber having a speaker chamber with a speaker, a main switch, a remote control switch, a microcomputer, a main motor responsive to a one of the main switch and the remote control switch, the main motor disposed within the motor chamber to suction up dust and liquid, the main motor having at least two speeds, a liquid level switch disposed to stop the main motor when the tank chamber becomes full, a dust-scattering motor disposed within the air suction chamber to prevent an accumulation of the dust, a plurality of light-emitting-diodes (hereinafter "LEDs") disposed to communicate to an operator which of the at least two speeds, the dust-scattering motor, and the liquid level switch is operative, a speech synthesis integrated circuit (hereinafter "IC"), a music synthesis IC, and the speech synthesis IC and the music synthesis IC are disposed to broadcast to the operator in response to signals from the microcomputer.

In summary, a vacuum cleaner has an air suction chamber attached to a tank chamber, an air circulation chamber attached to the air suction chamber, and a motor chamber attached to the air circulation chamber. The air suction chamber has a dust-scattering motor. A speaker chamber containing a speaker is

placed in the air circulation chamber, which is divided by a wall. In the motor chamber are a switch base, which has a main switch, and a control base, which has a microcomputer with a plurality of terminals. The terminals are connected to a main motor, a signal generator, a liquid level switch, a main switch, and a remote control switch. The remote control switch is located next to a handle on a hose going into the air suction chamber. A light-emitting-diode (hereinafter "LED") controller selects between low-speed and high-speed modes and activates a dust-scattering motor, a numerical control, a speech synthesis integrated circuit (hereinafter "IC"), and a melody IC.

Turning on the power puts the vacuum cleaner into an initial mode. Turning on either the main switch or the remote control switch begins a power ON mode. The main motor's speed, low or high, is set by either the main switch or the remote control switch. Either the main switch or the remote control switch actuates a dust-scattering motor, placing the vacuum cleaner in a dust-scattering mode. A collar on a rod attached integrally to a motor driving shaft beats the bottom of a main filter so that stacked dust on the main filter is scattered.

About four seconds after the dust-scattering motor is turned off by the main switch or the remote control switch, and after the noise of the dust-scattering motor subsides, a microcomputer is actuated. A speech synthesis IC and a melody IC are in turn actuated by the microcomputer so that a voice telling the worker the job is done and a pleasant tune are broadcast from a speaker for about 36 seconds.

Since the following four modes: power ON, low speed, high speed, and dust-scattering, each have an LED, looking at the LEDs shows which mode is currently actuated.

The filled-up tank mode starts when the tank chamber is filled with a liquid. When a liquid is sucked up, filling the tank chamber, it raises a float. The liquid level switch is turned on, stoping the main motor and cutting off any input from the main switch or the remote control switch. In this mode the LED blinks on and off to inform the operator. A leading-edge action of the liquid level switch shuts off the LED and returns the vacuum cleaner to the initial mode.

The above, and other objects, features and advantages of the present invention will become apparent from the following description read in conjunction with the accompanying drawings, in which like reference numerals designate the same elements.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a side cross-section of a vacuum cleaner of the present invention for picking up both a liquid and a powder such as dust.

Fig. 2 is a side cross-section of a vacuum cleaner of the present invention for picking up a powder such as dust.

Fig. 3 is a perspective view of a vacuum cleaner of the present invention for picking up a powder such as dust.

Fig. 4 is a circuit diagram of a vacuum cleaner of the present invention.

Fig. 5 is a block diagram of a vacuum cleaner of the present invention showing the transition from one mode to another by means of a main switch or a remote control switch and also showing a liquid-level switch.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to Figs. 1 - 3, a vacuum cleaner for picking up by suction both a liquid and a powder (such as dust) has, above a tank chamber 1, an air suction chamber 2 with a sealing board 2a. A packing 3 about suction chamber 2 seals against air flow leakage past suction chamber 2.

Tank chamber 1 sits on a base 32. A plurality of casters 34 permit base 32 to roll about on a floor. A manifold 4 has a suction inlet 4a at one end in communication with the outside. Manifold 4 has an outlet 4b at its other end. A baffle 5 is disposed below outlet 4b to divert the air flow toward the center of suction chamber 2. Manifold 4 and baffle 5 are within air suction chamber 2 and attached thereto. An auxiliary filter 6 divides air suction chamber 2 horizontally above baffle 5. A plurality of bag-shaped main filters 7 are attached above auxiliary filter 6 and below sealing board 2a. A dust-extracting motor 8 is disposed, with its drive shaft 8c pointed downward, in a concave central portion of sealing board 2a. A collar 8a rotates freely at an end of an L-shaped rod 8b. Rod 8b is attached to the bottom of drive shaft 8c. As it is rotated by drive shaft 8c, collar 8a beats the bottom of main filters 7.

A bottom of an air circulation chamber 9 above suction chamber 2 is defined by sealing board 2a. A top of air circulation chamber 9 is defined by a sealing board 9a. An air discharge cylinder 10 is mounted on a support 9b in the center of air circulation chamber 9. Air discharge cylinder 10 has a window 10a to

discharge air filtered by main filter 7 to remove dust. A speaker chamber 11 outside air circulation chamber 9 is divided therefrom by partition wall 9c. A speaker 12 is fixed in speaker chamber 11 by a metal fitting 12a attached to partition wall 9c.

A motor chamber 13 above air circulation chamber 9 contains a main motor 14 attached to air discharge cylinder 10 through a hole in the center of sealing board 9a. A control unit 15 surrounds main motor 14 and contains a microcomputer 17 (not shown; see Fig. 4) with sixteen terminals 16 (not shown; see Fig. 4).

A switch plate 18 is fixed to an inside wall of motor chamber 13. A main switch 19 mounted on switch plate 18 can be seen from outside motor chamber 13.

Referring to Fig. 4, a remote control switch 20 is located beside a hose (not shown) connected to suction inlet 4a. Each of main switch 19 and remote control switch 20 has two positions, so that the speed of main motor 14 can be either high or low, depending on which position the active one of main switch 19 and remote control switch 20 assumes.

Referring to Fig. 5, the vacuum cleaner of the present invention is turned on from either main switch 19 or remote control switch 20. Main motor 14 has two speeds, low and high, which are set by main switch 19 or remote control switch 20.

The vacuum cleaner enters a first dust-scattering mode when dust-scattering motor 8 is actuated by either main switch 19 or remote control switch 20. In the first dust-scattering mode, collar 8a beats the bottom of main filter 7 so that the dust stacked thereon is scattered into the air within air suction chamber 2.

After dust-scattering motor 8 is turned off by main switch 19 or remote control switch 20, about four seconds elapses during which the noise of dust-scattering motor 8 dies down. Then a second dust-scattering mode starts with the actuation of microcomputer 17. A voice informing the worker that the job is finished and a soothing tune are automatically broadcast from speaker 12 for about 36 seconds.

After the broadcast ends, the vacuum cleaner enters a fill-up mode. Referring again to Fig. 1, a liquid level switch 21 is fixed to sealing board 9a of air circulation chamber 9 in the down direction. A falling-edge action of liquid level switch 21 stops main motor 14, and any input from main switch 19 or remote control switch 20 is cut off.

Referring again to Figs. 3 and 4, that the vacuum cleaner is in fill-up mode is shown by illuminating an LED 22. The illumination of LED 22 is stopped by a leading-edge action of liquid level switch 21, and the vacuum cleaner returns to the initial mode.

Referring again to Fig. 1, liquid level switch 21 is actuated by a float shaft 31a, which is attached at the upper end of a float 31 that floats in tank chamber 1, rising as liquid level rises. A guide 31b encloses float shaft 31a.

Referring again to Figs. 3 and 4, a power source 23 actuates terminals 16. A power source 24 sends a signal to main switch 19 and remote control switch 20. Power for LED 22 is provided through terminal 16a. Terminal 16b is connected to an LED 25 that shows the vacuum cleaner is in low-speed mode. Terminal 16c is connected to an LED 26 that shows the vacuum cleaner is in high-speed mode. Terminal 16d is connected to an LED 27 that shows the vacuum cleaner is in dust-scattering mode. LEDs 22, 25, 26, and 27 receive electric energy from a power source 28. Terminal 16e is connected to a speech synthesis IC 29 and a music synthesis IC 30 to send them a starting signal. Terminal 16f and terminal 16g are connected to a numerical control. Terminal 16h is connected to main switch 19; terminal 16i, to remote control switch 20; and terminal 16j, to liquid level switch 21.

Table 1 shows the interrelation of control in each mode of motor 14; dust-scattering motor 8; LEDs 22, 25, 26, 27; speech synthesis IC 29; and music synthesis IC 30. In the table, O and X stand for ON and OFF respectively. The triangle stands for a blinking LED.

TABLE 1

MODE	Power ON LED	Low speed motor and LED	High speed motor and LED	Dust-scattering motor and LED	Speech and music synthesis ICs
Initial	X	X	X	X	X
Power ON	O	X	X	X	X
Low speed	X	O	X	X	X
High speed	X	X	O	X	X
Dust-scattering 1	X	X	X	O	X
Dust-scattering 2	X	X	X	O	O
Filled-up	△	X	X	X	X

It is possible to select with main switch 19 or remote control switch 20 an appropriate mode (low or high speed) automatically, depending on how much dirt and debris must be picked up.

Dust-scattering motor 8 can be actuated by main switch 19 or by remote control switch 20 to prevent stacked dust from accumulating on main filter 7.

About four seconds after dust-scattering motor 8 stops, when its noise is reduced, microcomputer 17 sends a starting signal to speech synthesis IC 29 and music synthesis IC 30. A voice to inform a worker that a job is finished and to offer thanks and praise, and a pleasant tune, are automatically broadcast from speaker 12. The worker feels mentally satisfied, free for having finished a job, and encouraged to do the next job.

The worker can confirm which mode, such as power ON, low speed, high speed, or dust-scattering mode, the vacuum cleaner is in by observing LEDs 22, 25, 26, and 27 on the front surface of motor chamber 13.

Main motor 14 stops in response to a falling-edge action of liquid level switch 21. Thus the input of main switch 19 or remote control switch 20 is cut off to prevent an overflow. The fill-up mode is confirmed by making LED 22 blink. The vacuum cleaner returns to the initial mode in response to a leading-edge action of liquid level switch 21. Then, since LED 22 is turned off, the worker can confirm that the vacuum cleaner is ready to do the next job.

Having described preferred embodiments of the invention with reference to the accompanying drawings, it is to be understood that the invention is not limited to those precise embodiments, and that various changes and modifications may be effected therein by one skilled in the art without departing from the scope or spirit of the invention as defined in the appended claims.

Claims

1. A vacuum cleaner characterized by apparatus to broadcast speech and music in response to a job-completion signal.

2. A vacuum cleaner characterized by:
means for suctioning dust and liquid;
means for holding said dust and liquid;
means for actuating said means for suctioning;
said means for actuating being responsive to said means for holding when said means for holding becomes full;
means for communicating to an operator whether said means for holding is full;
said means for suctioning having at least two modes;
said means for communicating being disposed to communicate to said operator which of said at least two modes is operative;
means for preventing an accumulation of said dust;
said means for communicating disposed to communicate to said operator whether said means for preventing is operative;
means for broadcasting speech and music to said operator; and
said means for broadcasting being responsive to said means for actuating.

3. A vacuum cleaner characterised by:

a tank chamber;

an air suction chamber attached to said tank chamber;

an air circulation chamber attached to said air suction chamber;

a motor chamber attached to said air circulation chamber;

said air suction chamber having a dust-scattering motor;

said air circulation chamber having a speaker chamber with a speaker;

a main switch;

a remote control switch;

a microcomputer;

a main motor responsive to a one of said main switch and said remote control switch;

said main motor disposed within said motor chamber to suction up dust and liquid;

said main motor having at least two speeds;

a liquid level switch disposed to stop said main motor when said tank chamber becomes full;

a dust-scattering motor disposed within said air suction chamber to prevent an accumulation of said dust;

a plurality of LEDs disposed to communicate to an operator which of said at least two speeds, said dust-scattering motor, and said liquid level switch is operative;

a speech synthesis IC;

a music synthesis IC; and

said speech synthesis IC and said music synthesis IC being disposed to broadcast to said operator in response to signals from said microcomputer.

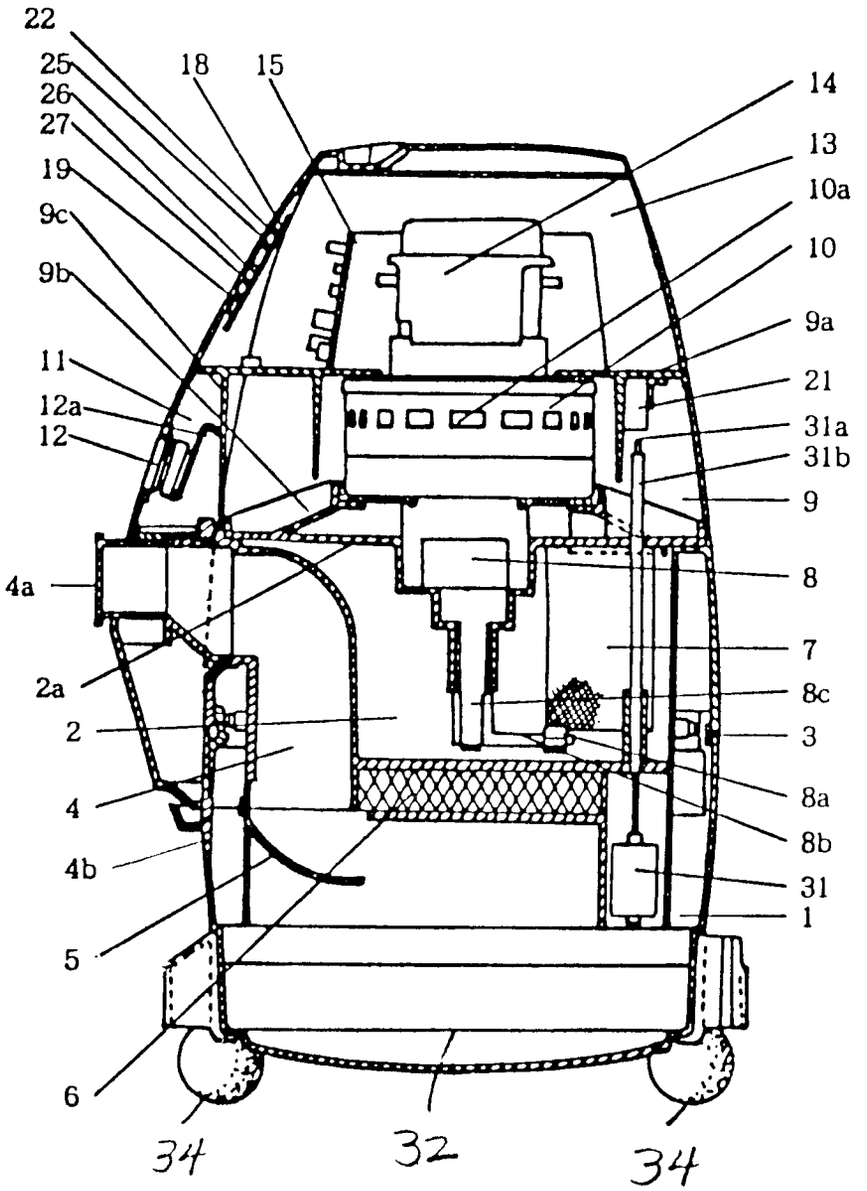

22
25
26
27
19
9c
9b
11
12a
12
18
15
14
13
10a
10
9a
21
31a
31b
9
8
7
8c
3
8a
8b
31
1
4a
2a
2
4
4b
5
6
34
32
34

FIG. 1

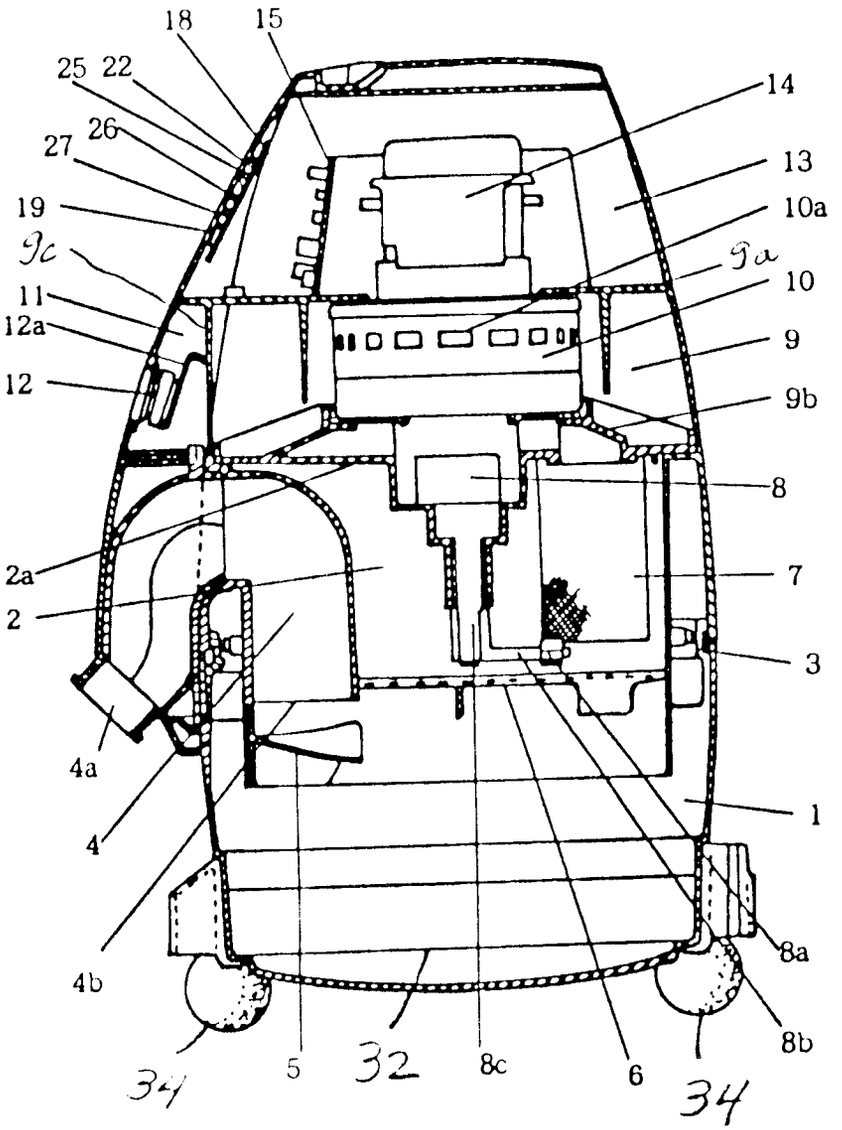

18
15
25
22
26
27
19
9c
11
12a
12
14
13
10a
9a
10
9
9b
8
2a
7
2
3
4a
1
4
4b
8a
8b
34
5
32
8c
6
34

FIG. 2

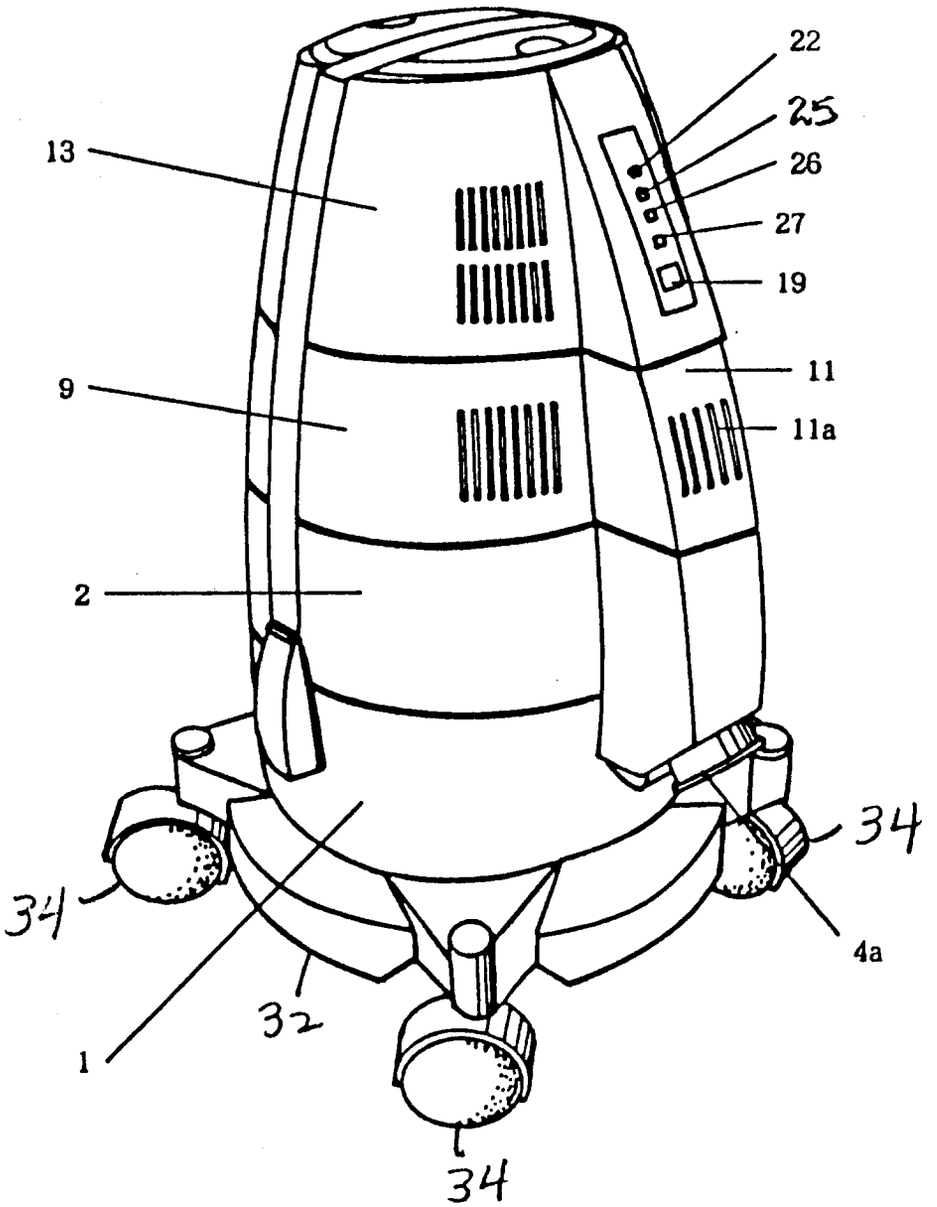
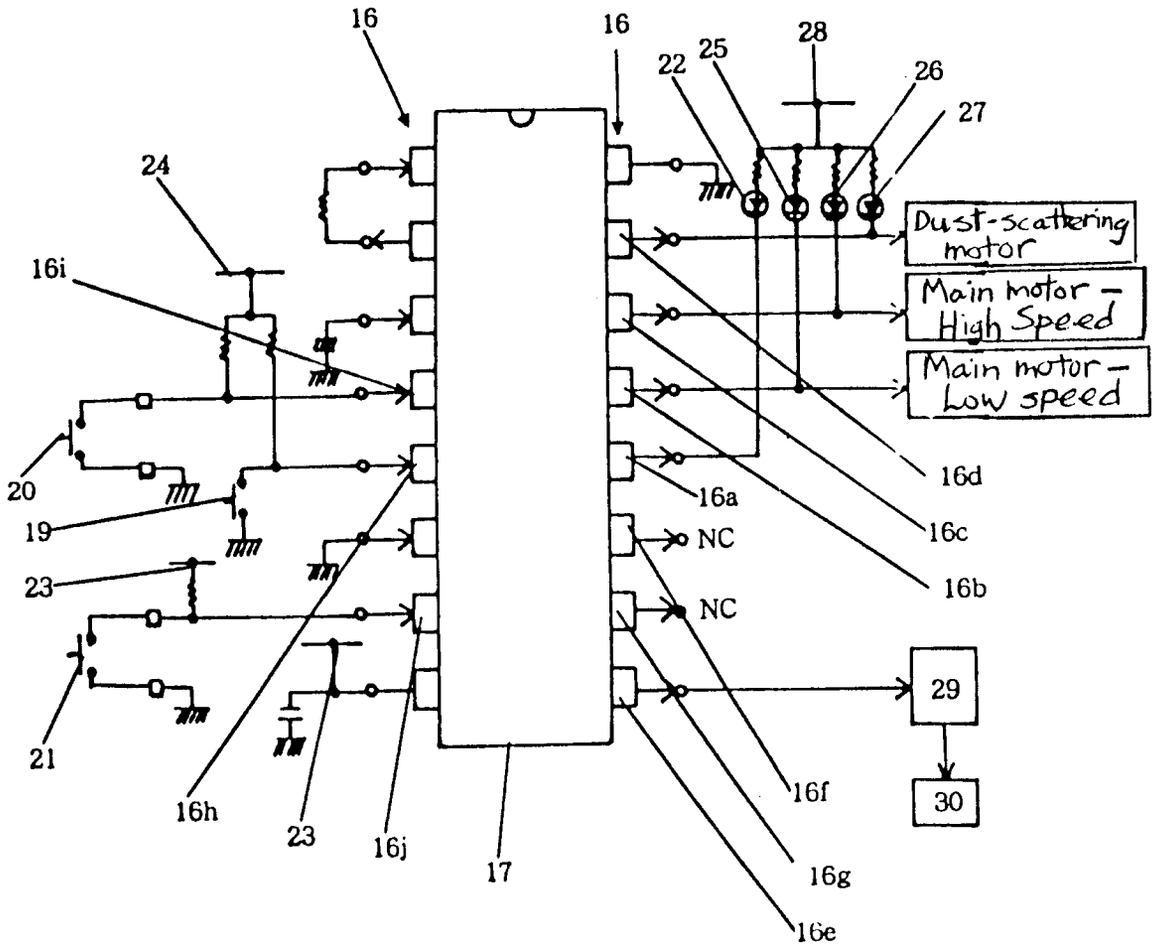


FIG. 3

FIG. 4


16
16
28
25
22
26
27
24
16i
Dust-scattering motor
Main motor – High Speed
Main motor – Low speed
16d
16a
16c
16b
20
19
NC
23
NC
29
21
16f
30
16h
23
16j
17
16g
16e

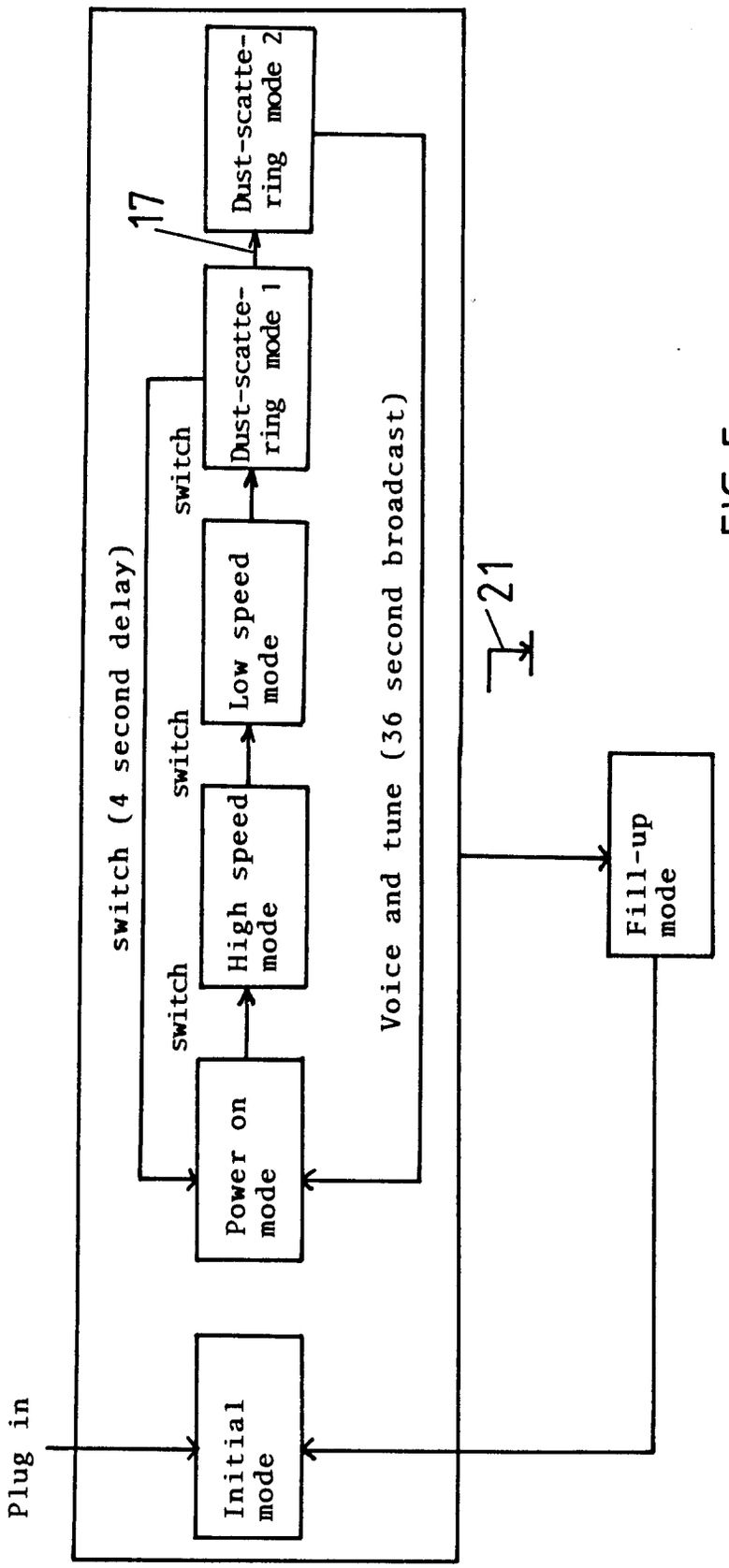

Plug in
Initial mode
Power on mode
switch
High speed mode
switch
Low speed mode
switch
Dust-scatte-ring mode 1
Dust-scatte-ring mode 2
17
switch (4 second delay)
Voice and tune (36 second broadcast)
Fill-up mode
21
21

FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 2291

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X Y	GB-A-2 224 172 (HOOVER PLC) * abstract *	1 2,3	A47L9/28
Y	EP-A-0 456 084 (FEDAG) * the whole document *	2,3	
A	EP-A-0 456 083 (FEDAG) * the whole document *	2,3	
E	PATENT ABSTRACTS OF JAPAN vol. 16, no. 349 (C-967)28 July 1992 & JP-A-41 05 630 (SANYO ELECTRIC CO LTD) * abstract *	1	
P,X	PATENT ABSTRACTS OF JAPAN vol. 16, no. 194 (C-938)11 May 1992 & JP-A-40 28 320 (HITACHI LTD) * abstract *	1-3	
P,A	PATENT ABSTRACTS OF JAPAN vol. 16, no. 240 (E-1211)3 June 1992 & JP-A-40 49 722 (FUJITSU LTD) * abstract *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A47L

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	24 FEBRUARY 1993	M. VANMOL

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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L : document cited for other reasons

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