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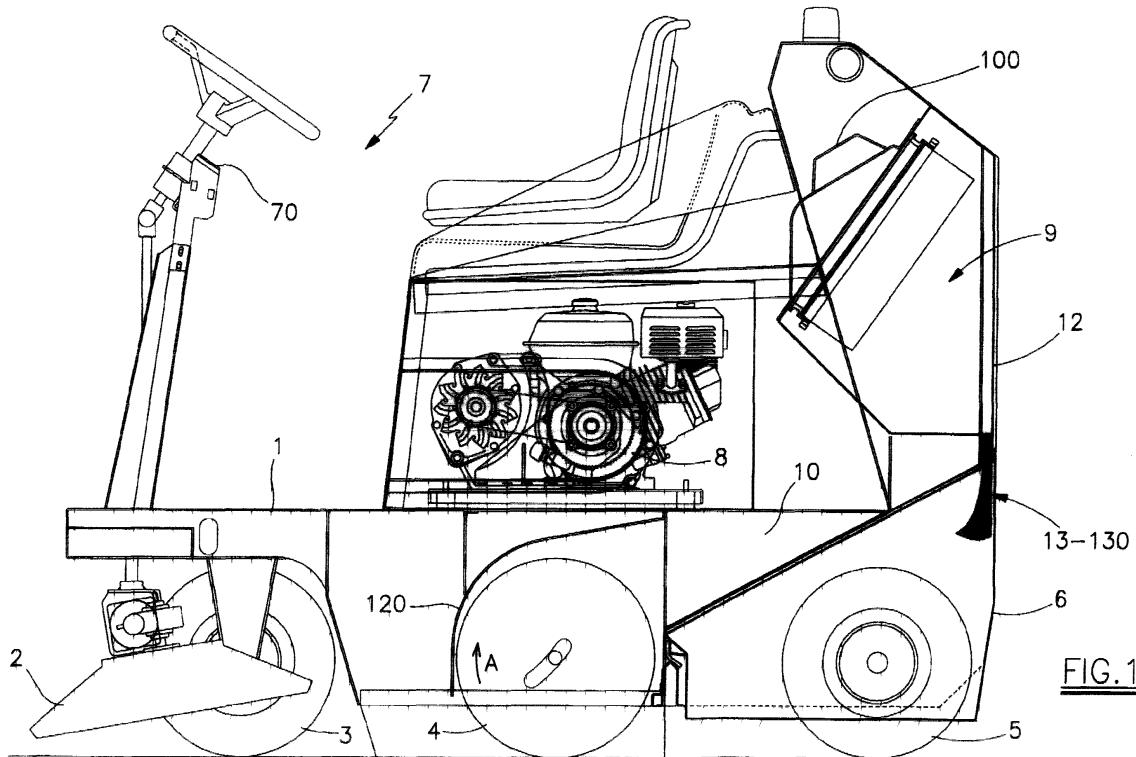
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### (54) Improved motor sweeper with maximum level alarm on the collection bin

(57) A motor sweeper comprising a frame (1), at least one dirt collection brush and a rear dirt accumulation bin, above which there is a filtration chamber (9), and a sensing member (30, 44) connected to at least one warning device (66, 99) arranged to warn the user

when the level of the dirt accumulated in the bin (6) is close to said mouth, said sensing member (30, 44) being disposed in such a manner as to be practically insensitive to the passage of dirt directed towards the bin (6) during the filling stage, but to be activated when the level of dirt accumulated in the bin (6) is close to said mouth.



## Description

**[0001]** This invention relates to improvements in motor sweepers used for cleaning indoor and outdoor surfaces and floors in general.

**[0002]** The improvements concern in particular those motor sweepers with the operator on board, although there is nothing to prevent them being used on motor sweepers with the operator following.

**[0003]** For such outdoor and indoor cleaning, motor sweepers have been widely used for some time, they comprising essentially a frame with an overlying driver compartment below which there are provided at least one front lateral conical brush, a steerable wheel to the rear thereof, a rearward-lying transverse horizontal cylindrical brush, two drive wheels to the rear thereof, and a rear collection bin for the dirt collected by the cylindrical brush.

**[0004]** In particular, said bin is removably inserted in a compartment which is accessible from the rear region of the machine and communicates at its front with the operational housing for said cylindrical brush and at its top with a chamber closed by an air filtration unit.

**[0005]** There is also provided a suction unit which maintains the aforedefined communication path constantly under vacuum to facilitate transfer of the dirt from the brush to the bin.

**[0006]** Notwithstanding several attempts in this sense by various parties, including the Applicant, such motor sweepers are still incapable of determining when the bin is full and of indicating this situation to the operator.

**[0007]** This is mainly due to the difficulty, because of the heterogeneity of the material collected, of identifying a suitable parameter on which to base said measurement, and hence of identifying a means able to operate on the basis of said parameter.

**[0008]** In this sector there is therefore a need for means for this purpose, by which the operator no longer has to regularly check the degree of filling of the bin in order to avoid difficulties such as non-disposal of the dirt, which is prevented from falling into the bin which is already full, and overheating of the suction unit because of the presence of an abundance of dirt reducing the air passage cross-section.

**[0009]** The main object of the present invention is to satisfy said requirement within the context of a simple, rational, reliable and low-cost construction.

**[0010]** Said object is attained by virtue of the characteristics defined in the claims.

**[0011]** In attaining said object, the invention provides a sensing member to be positioned in proximity to the bin loading mouth in such a manner as to be practically insensitive to the passage of dirt directed towards the bin during the filling stage, but to indicate when the level of dirt accumulated in the bin is close to said mouth, with simultaneous activation of a warning device for the operator.

**[0012]** According to a first embodiment, said sensing

member assumes the form of a swinging flap which is preferably partially inserted into the bin loading mouth.

**[0013]** Said flap is preferably hinged to the rear wall of the filter chamber on a horizontal transverse axis, and is positioned along the central region of the width of the bin mouth.

**[0014]** In a second embodiment, the sensing member comprises a body provided with reciprocating rectilinear movement which cyclically, at predetermined time intervals, is inserted into the bin to check the level of the dirt collected therein.

**[0015]** By virtue of the aforesaid embodiments the operator is released from the burden of having to monitor the degree of filling of the bin, and is no longer concerned with problems connected with the bin filling as this is automatically monitored and suitably indicated.

**[0016]** Finally, it should be noted that the means of the invention not only are insensitive to the passage of the heterogeneous material directed towards the bin, but are also insensitive to temporary abnormal situations, such as impact by a heavy body, for example a stone, which strikes said flap in said predetermined direction, or the temporary jamming of a branch in the region facing the flap.

**[0017]** The constructional characteristics and merits of the invention will be apparent from the ensuing detailed description given with reference to the accompanying drawings, which illustrate two particular preferred embodiments thereof by way of non-limiting example.

**[0018]** Figure 1 is a transparent side elevation showing a first embodiment of a motor sweeper according to the invention.

**[0019]** Figure 2 is a perspective view of a detail of Figure 1 on an enlarged scale.

**[0020]** Figure 3 is a transparent side elevation showing a second embodiment of a motor sweeper according to the invention.

**[0021]** Figure 4 is a partly sectional enlarged view of the second embodiment of the sensing member with

40 which the motor sweeper of the invention is provided.

**[0022]** Figures 5 and 6 are views in the direction V of Figure 4 on a reduced scale, showing two different operating positions of the sensing member.

**[0023]** From said figures, and in particular Figure 1, it 45 can be seen that the illustrated machine, which is of usual type overall, comprises essentially a frame 1 below which there are provided a front lateral conical brush 2 (or two thereof), a steerable wheel 3 to the rear thereof, a rearward-lying transverse horizontal cylindrical brush 50 4, two drive wheels 5 to the rear thereof, and an extractable rear collection bin for containing the dirt.

**[0024]** Above the frame 1 there are a driver compartment 7 with relative instrument console 70, an internal combustion engine 8 for providing energy to all the machine user devices, which do not require specification, and a filtration chamber 9 for the air constantly drawn in by the suction unit 100.

**[0025]** The cylindrical brush 4 is rotated in the direc-

tion indicated by the arrow A of Figure 1, and is surrounded by a guard 120 which deviates the dirt rearwards towards a channel 10 communicating at its rear end with the loading mouth of the bin 6, and with the overlying filtration chamber 9.

**[0026]** According to the first embodiment of the invention, as shown in Figure 1 and Figure 2, a small housing 13 of variable geometry is provided centrally in the lower part of said chamber 9.

**[0027]** It comprises a channel-shaped horizontal member 22 positioned transversely to the machine with its mouth facing forwards and having a length less than that of said rear wall 12, and carrying at its ends two transverse connection plates not visible in the figures.

**[0028]** The lower part of the member 22 is inserted into said loading mouth, in the immediate vicinity of the front face of the central portion of the upper edge of the rear wall of the bin 6.

**[0029]** As can be seen in Figure 2, the lower edge of the member 22 is inclined downwards, to the upper front edge of the member 22 there being hinged, on the axis indicated by 11, a swinging cover or flap 44.

**[0030]** The flap 44 comprises an upper longitudinal portion which is arched in the transverse direction with its concavity facing forwards, and is lowerly bent rearwards, below the inclined edge of the member 22, so that its terminal edge is spaced from the wall 12.

**[0031]** At the opposing ends of the flap 44 there are preferably provided two baffles (not visible in the figures) which cover the terminal connection plates of the member 22.

**[0032]** The purpose of said inclination of said edge is to prevent the formation of inconvenient deposits of foreign material such as dust in the interior of the member 22.

**[0033]** In any event (see Figure 2), the rear wall 12 of the chamber 9 is provided with at least one access door 130 through which the housing 13 can be cleaned, for example by compressed air, and through which access can be gained to the means described hereinafter, for example for maintenance operations.

**[0034]** It should also be noted that the purpose of said arched shape of the upper portion of the flap 44 is to provide a region for the temporary deposition of the dirt when the bin is full, in order to make the flap sensitive to this situation.

**[0035]** Said flap 44 is maintained in the illustrated position by at least one rear spring 55, which in the figure is shown completely extended, and which requires a modest force of 0.1-0.15 kg for its shortening.

**[0036]** There are also provided a microswitch 77 to be contacted by the flap when this swings rearwards, and at least one limit stop 88 to prevent damage to the microswitch 77.

**[0037]** Said microswitch 77 is connected to the machine electronic control system 33, to which two indicator or warning devices positioned on the console 70 are also connected.

**[0038]** Of said warning devices one 66 is light-emitting, such as a flickering lamp, and the other 99 is sound-emitting, such as a buzzer.

**[0039]** Said electronic control system 33 is advantageously provided with a circuit for delaying the activation of said warning devices if a temporary abnormal situation occurs, such as a rearward swing of the flap 44 following collision by a rigid body such as a stone, a piece of glass or a can.

**[0040]** Said delay period can be of the order of 3-6 seconds.

**[0041]** According to a variant of the invention, not shown, the elements contained in the member 22 can be positioned on the outside of the machine body, for example within a hood positioned at one end of the axis 11 about which the flap 44 swings.

**[0042]** Figures 3, 4, 5 and 6 show a second embodiment of the invention. In the description of the second embodiment of the invention with reference to said figures, those components already illustrated and described in the first embodiment are indicated by the same reference numerals,

**[0043]** Said figures show the sensing member 30 positioned on the longitudinal axis of symmetry of the motor sweeper above the dirt entry mouth of the collection bin.

**[0044]** The sensing member 30 is supported by a frame 31 consisting of a profiled sheet metal member 32 rigid with a cross-member of the motor sweeper, and having its ends C-shaped to receive the end of a plate 133, to which said sensing member is fixed.

**[0045]** The sensing member 30 comprises a geared electric motor 34 fixed to the plate 133, and having fixed to its exit shaft 340 an eccentric disc 35 provided with a rear shoulder 350, as shown in Figure 4. Said disc 35 is fixed to the shaft 340 by a setscrew 36.

**[0046]** On the disc 35 there is mounted a profiled connecting rod 37, which is inescapably secured to the disc by a snap ring 38. To the bottom of the connecting rod 37 there is pivoted a rod 39 which slides within a guide sleeve 40 fixed to the base of the profiled sheet metal member 32. To the lower end of the rod 39 there is fixed a frusto-conical body 41 intended to come into contact with the dirt present in the collection bin.

**[0047]** The rod 39 is constructed of flexible material in order not to hinder passage of the dirt fed into the bin by the rotary brush. In the illustrated embodiment the rod is in the form of a spring.

**[0048]** With reference to Figure 4, one 430 of the two elements of a proximity sensor 43 is fixed to the rear of the plate 133, its other element 431 being fixed to the upper end of the profiled sheet metal member 32.

**[0049]** The proximity sensor is connected to a control circuit arranged to activate an alarm signal when the two component elements of the sensor withdraw from each other. Said alarm signal can be of the sound and/or light-emitting type, its purpose being to warn the user when the dirt level in the bin has reached the maximum allow-

able.

[0050] The operation of said sensing member 30 is controlled by the electronic circuit or system 33 in the following manner.

[0051] On starting the rotary brush the sensing member 30 is also activated. Specifically, the electric motor rotates the disc 35 which transmits reciprocating rectilinear movement to the rod 39 via the connecting rod 37. The speed of rotation of the shaft 340 of the motor 34 can be preset by the user, at between 6 and 80 r.p.m.

[0052] The frusto-conical body 41 fixed to the lower end of the rod 39 acts as an element sensitive to the level of dirt collected in the motor sweeper bin.

[0053] In particular, when the dirt in the bin reaches a level higher than the lowest position attainable by the frusto-conical body 41 during its rectilinear reciprocating movement, the body 41 prior to reaching the bottom dead centre of its stroke rests on the upper surface of the dirt, causing the plate 133 to rise. The raising of the plate causes the two elements of the proximity sensor 43 to withdraw from each other with consequent activation of the two warning devices 66 and 99 positioned on the motor sweeper console.

## Claims

1. A motor sweeper comprising a frame (1), at least one dirt collection brush and a rear dirt accumulation bin, above which there is a filtration chamber (9), **characterised by** comprising a sensing member (30, 44) connected to at least one warning device (66, 99) arranged to warn the user when the level of the dirt accumulated in the bin (6) is close to said mouth, said sensing member (30, 44) being disposed in such a manner as to be practically insensitive to the passage of dirt directed towards the bin (6) during the filling stage, but to be activated when the level of dirt accumulated in the bin (6) is close to said mouth.
2. A motor sweeper as claimed in claim 1, **characterised in that** said sensing member comprises a profiled flap (44) which is upperly hinged to the rear wall of said chamber on a horizontal axis transverse to the machine, and faces a rear housing which carries the means for activating said at least one warning device (66, 99).
3. A motor sweeper as claimed in claim 2, **characterised in that** said flap (44) has a length less than the width of the filling mouth of the bin (6) and is positioned at the centre of said width.
4. A motor sweeper as claimed in claim 2, **characterised in that** said flap (44) comprises an upper longitudinal portion which is transversely arched, has its concavity facing forwards, and is lowerly bent

rearwards to cover the lower edge of said housing (13), where its free edge is spaced from said rear wall of said chamber.

5. A motor sweeper as claimed in claim 4, **characterised in that** the bent lower part of said portion is inserted into the mouth of the bin (6).
6. A motor sweeper as claimed in claim 2, **characterised in that** said flap (44) rests against a rearward-lying elastic counteracting member (55).
7. A motor sweeper as claimed in claim 2, **characterised in that** said activation means consist of a microswitch (77) with which a limit stop (88) for the rearward movement of the flap (44) is associated.
8. A motor sweeper as claimed in claim 7, **characterised in that** said microswitch is connected to said at least one warning device (66, 99) via the machine electronic control system (33).
9. A motor sweeper as claimed in claim 8, **characterised in that** said electronic control system (33) is provided with means for activating said at least one warning device (66, 99) with a slight delay relative to the entering signal emitted by the microswitch (77).
10. A motor sweeper as claimed in claim 1, **characterised in that** said sensing member (30) comprises a movable body (41) which at predetermined time intervals is inserted into the bin (6) to verify the level of the dirt collected therein.
11. A motor sweeper as claimed in claim 10, **characterised in that** said body (41) is of frusto-conical shape.
12. A motor sweeper as claimed in claim 10, **characterised in that** said body (41) moves with reciprocating rectilinear movement, being driven by suitable means (34, 35, 37, 39).
13. A motor sweeper as claimed in claim 12, **characterised in that** said means (34, 35, 37, 39) are supported by a plate (133) which can translate in level relative to said motor sweeper frame.
14. A motor sweeper as claimed in claim 13, **characterised in that** to said plate (133) there is fixed a sensor (43, 430, 431) connected to an electronic control system (33) to which said at least one warning device (66, 99) is also connected.
15. A motor sweeper as claimed in claim 10, **characterised in that** said means (34, 35, 37, 39) comprise a geared motor (34), an eccentric disc (35) as

sociated with the shaft of the geared motor (34), and a connecting rod (37) which is mounted on said eccentric disc (35) and to which is connected an end of a rod (39), the other end of which supports said body (41). 5

16. A motor sweeper as claimed in claim 15, **characterised in that** said rod is constructed of flexible material. 10

17. A motor sweeper as claimed in claim 16, **characterised in that** said rod is a spring.

18. A motor sweeper as claimed in claim 1, **characterised in that** said at least one warning device (66, 15 99) is arranged to emit a light signal. 15

19. A motor sweeper as claimed in claim 1, **characterised in that** said at least one warning device (66, 99) is arranged to emit a sound signal. 20

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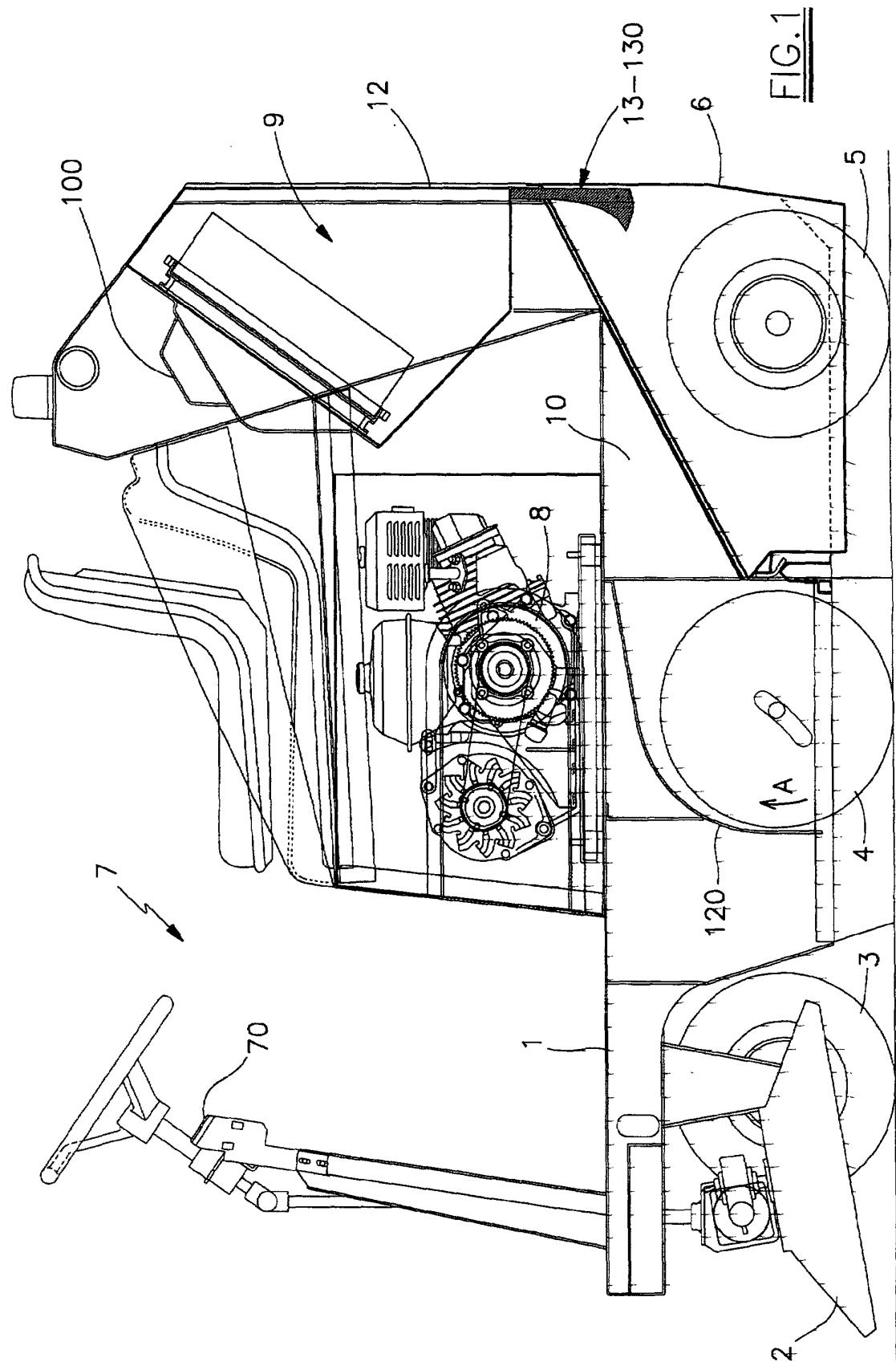
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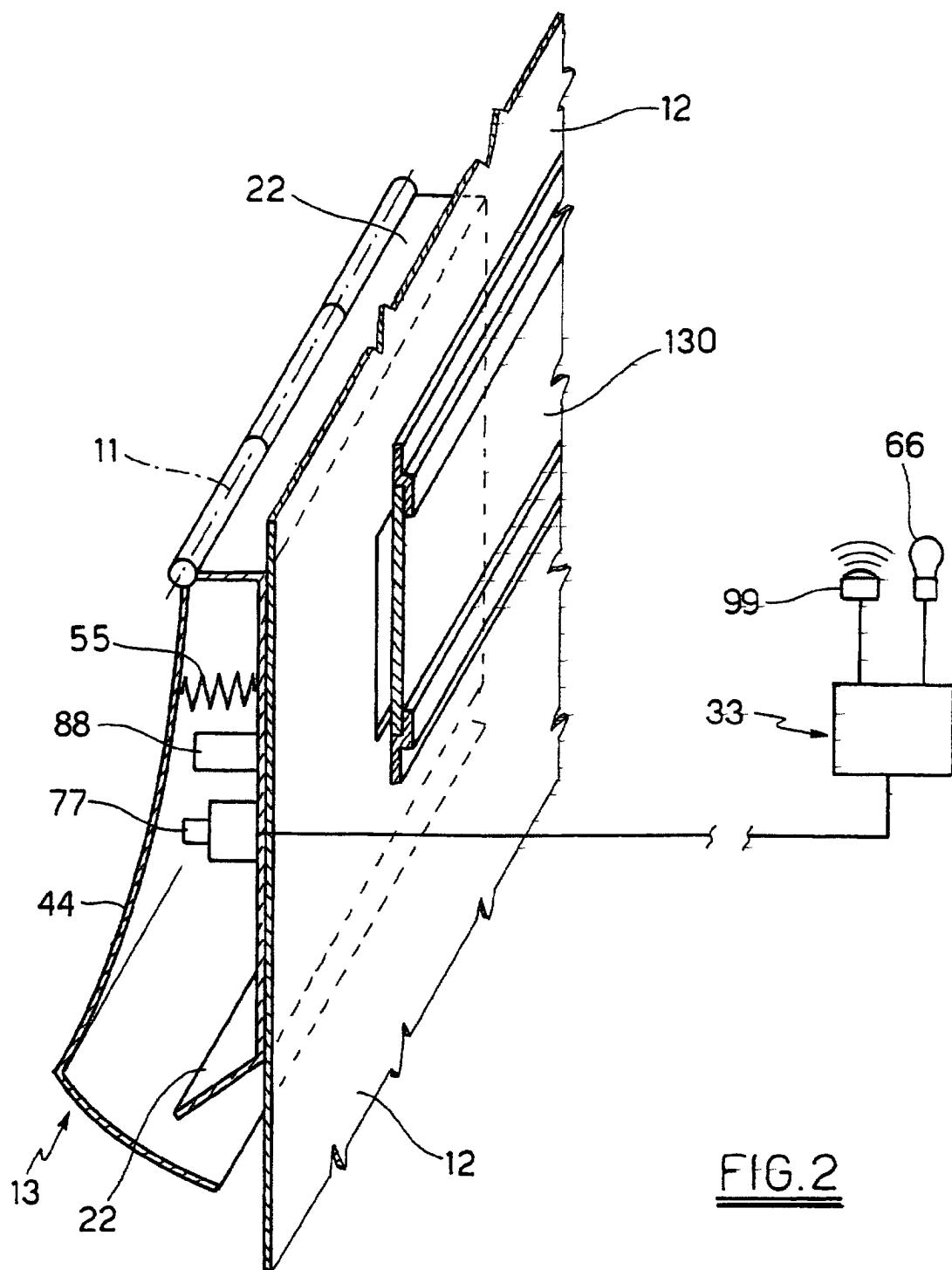
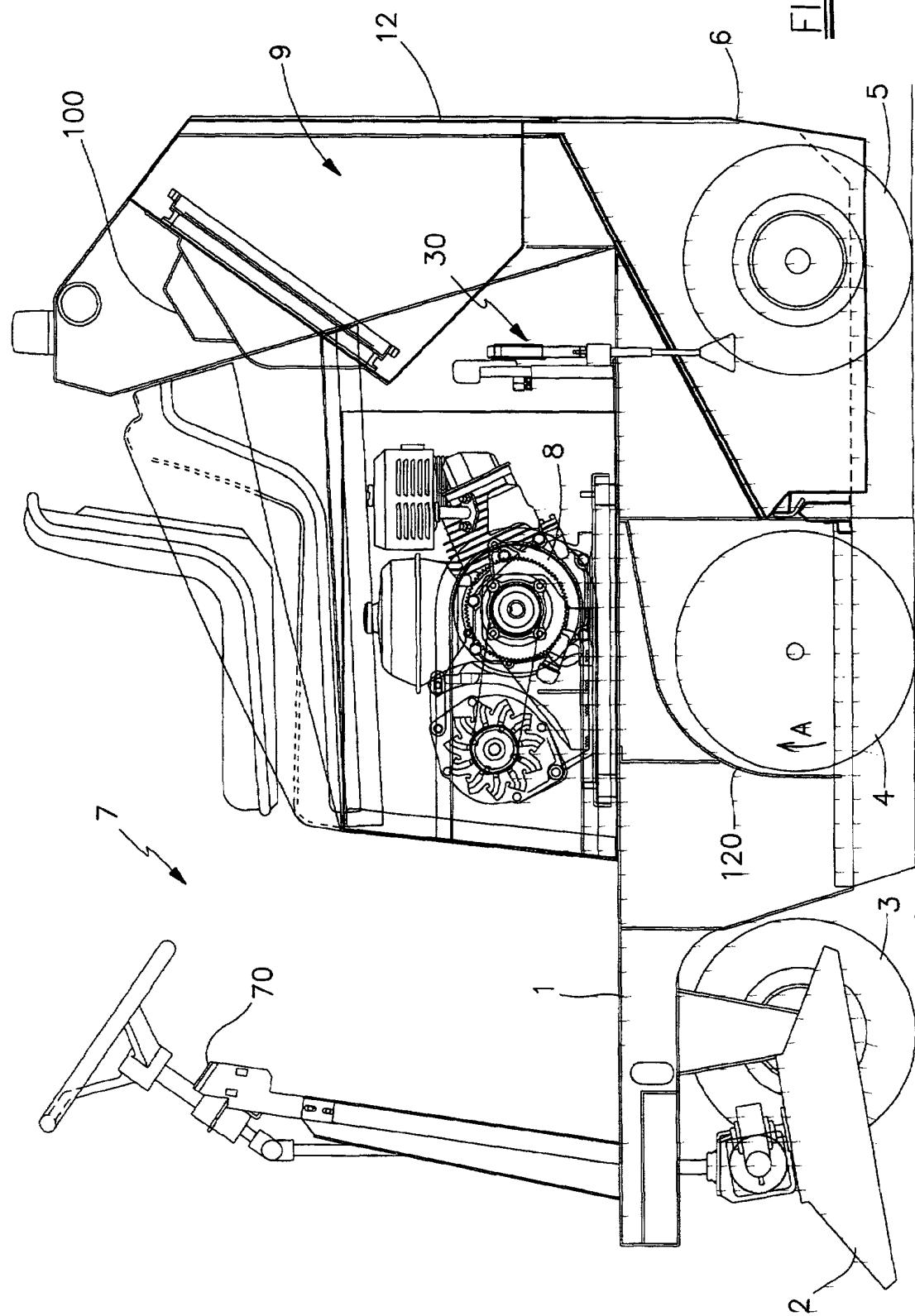


FIG.2

FIG.3



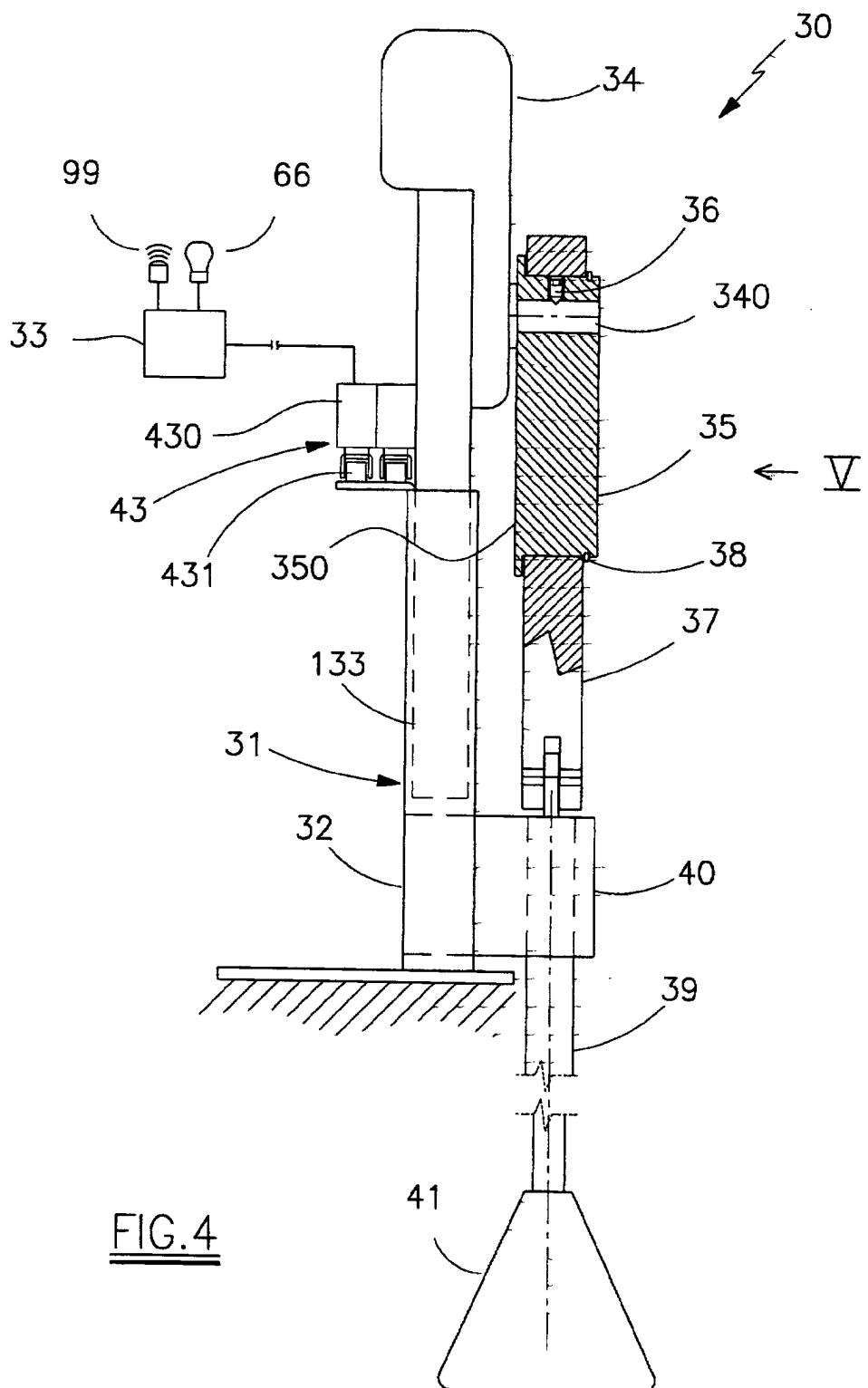


FIG. 4

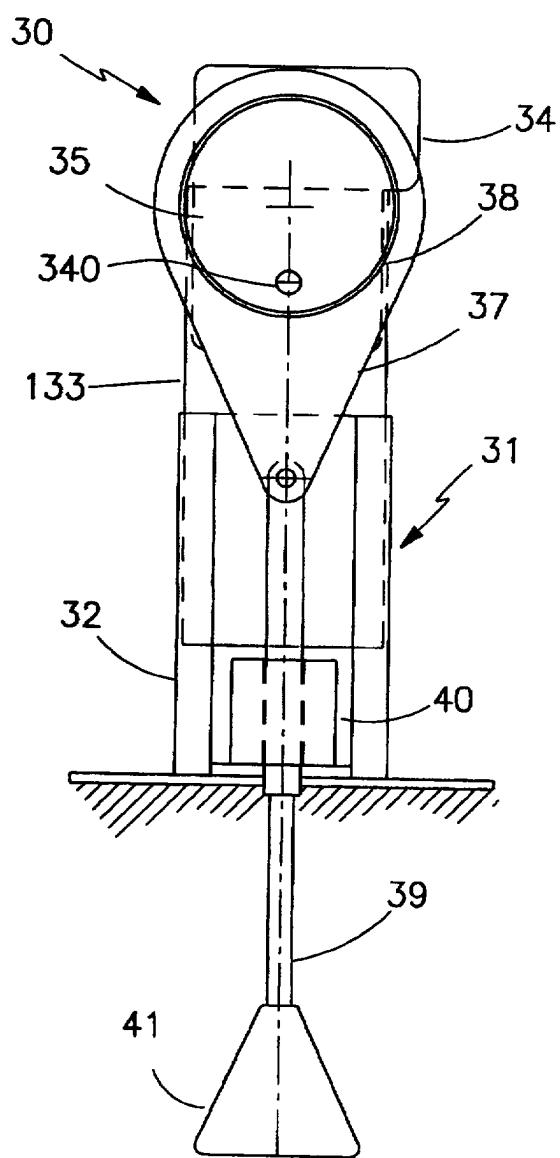


FIG.5

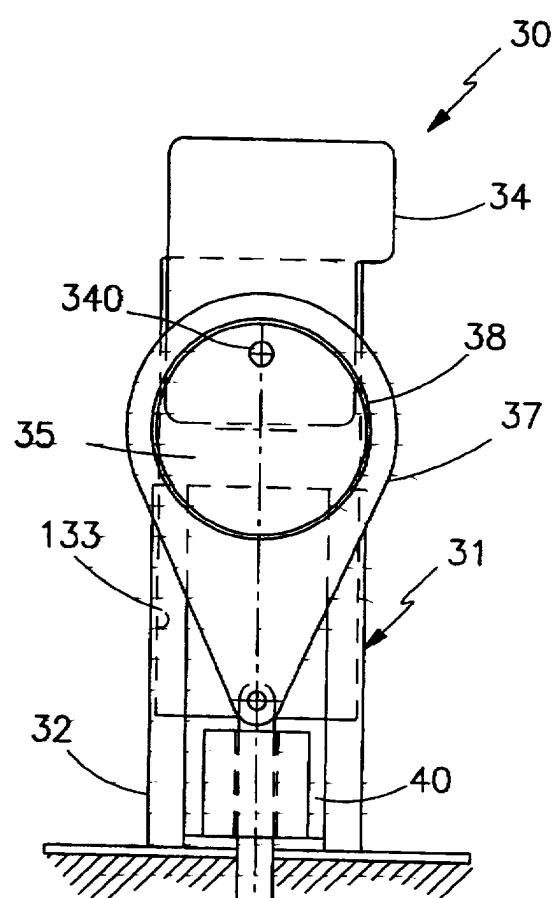


FIG.6

