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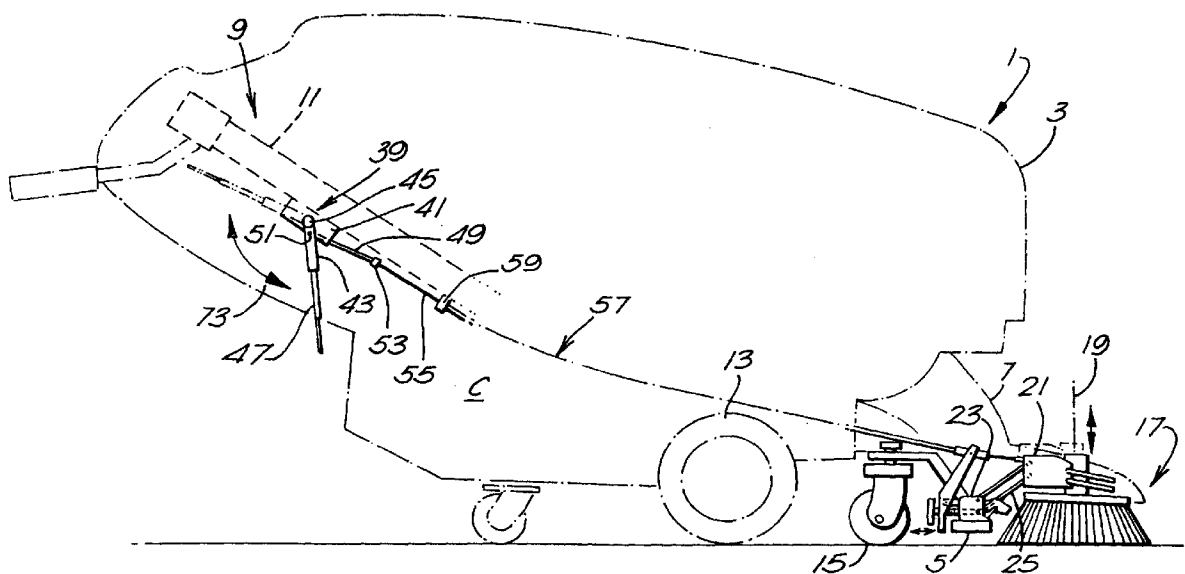
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CARPMAELS & RANSFORD
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(57) A pedestrian operable suction sweeping machine has a pair of rotatable brushes (17) and a suction head (5) at its front end, handlebars at the rear, an optional foldaway trailing seat, and a casing (3) in which are located a motor and a fan to generate a suction air stream to draw debris from the suction head (5) into a

debris compartment at the rear of the machine. Filters are associated with the debris compartment to filter dust and heavier debris from the air stream before this is returned to the atmosphere. The machine has a brush raising mechanism (25) to raise the brush when not in use which is operable from the handlebars, this mechanism preferably being rod and cable (57) operated.

FIG. 1**EP 0 866 172 A2**

Description

This invention relates to a pedestrian operable suction sweeping machine which is designed for picking up debris from streets and other areas. By a pedestrian operable machine is meant a machine which can be operated by a person walking or riding behind the machine.

Such a machine is the subject of our U.K. Patent No.2287418B. Such machines include rotary brushes and a suction inlet at ground level, through which debris is drawn by a fan driven by a motor. The debris is then collected in a large capacity container, such as a refuse bag or sack. The machine is provided with a filter arrangement which allows the air drawn into the machine to be returned to the atmosphere, after any dust and other solids have been filtered from it and deposited in the container. While such machines work very satisfactorily, they suffer from the disadvantage that the rotary brushes, being closely adjacent the ground at the front of the machine, are susceptible to unnecessary wear as a result of transport of the machine to and from the workplace, i.e. a Council depot. The present invention seeks to overcome this disadvantage.

According to the present invention, we provide a pedestrian operable suction sweeping machine including an operator's station, an outer housing, a motor, a pair of spaced rotary brushes, remote from the operator's station, and a fan driven by the motor, a suction head connected by an inlet duct to the fan, whereby debris may be swept by the brushes and then collected from the ground in a fluid stream generated by the fan, be forced by the fan into an outlet duct extending from the fan to a container, and be collected in the container, there being a filter arrangement associated with the housing to collect debris in the fluid stream but allowing filtered air to pass back into the atmosphere adjacent the machine, means to raise and lower the brushes out of and into contact with the ground, control means at the operator's station for controlling the means to raise and lower the brushes, and a brush wear compensating mechanism associated with the means to raise and lower the brushes and with the control means.

Preferably, the machine is provided with all or the majority of the features disclosed in our Patent No. 2287418B, and/or with one or more of the additional features disclosed in our U.K. Patent Application Nos. 9521534.0, 9610916.9 or 9616069.6.

Preferably also, the means to raise and lower the brushes comprises a pair of flexible cable controls connected at one end to the respective brushes and at an opposite end to the control means. Preferably, a single control means operates two cable controls, one for each brush.

Preferably, the two rotary brushes are located at the front of the machine, one on each side thereof, and each rotary brush is mounted for rotation by a hydraulic motor or the like, about a vertical axis, and is supported on a sub-frame which itself is supported on a main frame

member of the machine by at least one pivoted arm member and preferably by a parallelogram linkage; this linkage may be raised and lowered by the brush wear compensating mechanism which preferably includes an adjusting knob which can lower the brushes via a screw thread mechanism as the bristles of the brush wear in use. Preferably also, the brush sub-frames can be raised manually and held in a raised position by a hook or latch.

Preferably, each cable control is of the Bowden cable type and comprises an inner cable slidable in an outer flexible sleeve, one end of the inner cable being attached to an upper region of the respective brush sub-frame, and the equivalent end of the outer flexible sleeve being attached to an anchorage point on the main frame member, whereas the opposite end of the inner cable is attached to a yoke common to both cables, with the equivalent end of the flexible sleeve being attached to an anchor point in the region of the operator's station.

Preferably, the yoke is attached to one end of a pull rod, the opposite end of which is pivotally attached to a handle or lever intermediate the ends thereof, one end of the handle being pivotally connected to a handlebar frame at the operator's station, and the opposite end of which carries a hand grip. This end of the handle may be extendible.

Preferably, the said one end of the cable sleeve is attached to an adjustment compensation lever pivotally supported on the main frame member, the position of said lever being controlled by the wear adjusting knob, thus adjusting the anchorage point of said one end of the cable sleeve in dependence upon the wear of the brushes.

A preferred embodiment of suction sweeping machine according to the present invention is now described by way of example with reference to the accompanying drawings, in which:-

FIGURE 1 is a side elevation showing the machine in outline only but with a brush raising and lowering mechanism in some detail; and

FIGURE 2 is a perspective view of part of the mechanism shown in Figure 1 to a larger scale.

Referring to the drawings, a pedestrian operable suction sweeping machine 1 has a housing 3 in which are located a motor, a fan driven by the motor whereby debris collected from the ground by a suction head 5 is drawn by the fan through an inlet duct 7 and then passes through an outlet duct extending from the fan to a container located at the point C, there being a filter arrangement associated with the housing 3 to collect fines and solids but to allow filtered air to pass back into the atmosphere adjacent the machine. The machine has an operator station indicated generally at 9 at which a pair of laterally spaced machine operating handles 11 are provided, at its rear end, is supported upon drive wheels 13 and forward balancing wheels 15, and at its front end

has a pair of laterally spaced rotating brushes 17. Each brush 17 is arranged to rotate about a vertical axis 19 and is supported on a sub-frame 21 which itself is supported on a main frame member 23 by a parallelogram linkage 25. This linkage 25 allows each brush to be adjusted vertically as indicated generally by the pair of arrows 27 between a position of use when the tips of the bristles of the brush are resting on the ground, and a raised transport position, in which position the brush can be held by a hook or latch 29. A brush wear adjusting mechanism indicated generally at 31 is provided for each brush, the mechanism including an adjusting knob 33 operating a threaded rod 35 by means of which the linkage 25 may be adjusted by small amounts (by screwing in or screwing out the rod 35 in the direction of the arrows 27) to move the brush vertically in the direction of the arrows 27 by small amounts to accommodate bristle wear.

In accordance with the present invention, a mechanism for adjusting the height of each brush 17 is provided which can be operated from the operator's station 9. This mechanism is generally in the form of a flexible cable control of the Bowden cable type, there being one such cable for each brush operated by a control means 39 mounted on one of the handlebars 11. The control means 39 comprises a pivot support 41 in which one end of a lever 43 is pivotally supported at 45, the opposite end of the lever preferably being telescopic (to provide additional leverage if required) as shown at 47.

A pull-rod 49 is pivotally connected to the lever 43 at 51, the point 51 being inboard of the pivotal connection 45 of the lever 43 to the plate 41. The rod is connected to a central portion of a yoke 53 and one end of an inner cable 55 of each flexible cable control (shown generally at 57) is connected to an end portion of the yoke 53. One end of an outer flexible sleeve of each cable control 57 is connected to a bracket 59 on the handles 11 to provide an anchorage point and the opposite end of the sleeve is connected indirectly to the frame member 23, as will more fully be described hereinafter.

The opposite end of the inner cable 55 is connected to the sub-frame 21 for its respective brush 17 by means of a bifurcated anchorage 61 pivotally connected at one end to the sub-frame 21 and having, at its opposite end, a screwthreaded adjuster 63 of known construction to which the end of the cable 55 is attached.

Associated with the adjusting mechanism 31 is an adjustment compensation lever 65. The lever 65 is pivotally supported at a central location 67 on a machine frame extension member 69 and as the height of each brush 17 is adjusted by operation of the knob 37, so the lever will be rocked about its pivot support 67 in a clockwise or anti-clockwise direction, depending upon the direction of rotation of the knob 37. To achieve this, one end of the lever 65 is screw threadedly engaged with the threaded rod 35. At its opposite end the lever 65 pivotally supports an anchorage member 71 for the end of the sleeve 57 remote from the operating lever 43 and

it will thus be appreciated that as the height of each brush 17 is adjusted by operation of the knob 37, so the position of the anchorage member 71 will be adjusted relative to the frame member 23 (and, of course, the inner cable 55).

When it is required to raise the brushes 17, for example when transporting the sweeping machine from a Council depot to its place of work, the lever 43 is pulled by the operator so as to rock it from its full-line position to its broken-line position shown in Figure 1, thus causing each of the inner cables 55 to move to the left as shown in Figure 1, thereby pulling the bifurcated anchorages 61 towards the anchorage members 71, causing each of the parallelogram linkages 25 to rock generally anti-clockwise about their points of pivotal connection to the frame member 23, thus raising the brushes off the ground. When it is desired to move the brushes from their raised position to a work position, the lever is rocked from its broken-line position to its full-line position as depicted by arrow 73. This will, of course, cause the inner cables 55 to move to the right as shown in Figure 1, thus allowing the weight of each brush and its associated sub-frame 21, etc., to rock clockwise about its frame member 23 until the bristles of each brush are resting on the ground.

As can be seen from Figure 1, the construction of the lever 43 and the manner in which the rod 49 is pivotally connected thereto is such that an over-centre pivot mechanism is provided and when the lever is rocked clockwise to raise the brushes the pivot 51 will pass over a dead-centre position relative to the pivot 45, thus locking the lever in that position.

Although the above described mechanism has been described with particular reference to a pedestrian operable suction sweeping machine of the types disclosed in our Patent No.2287418B and in our pending patent applications, Nos.9521534.0, 9610926.9 and 9612069.6, it will of course be appreciated that it could be used with any suction sweeping machine of a similar construction.

Various alternative types of means for raising and lowering the brushes could be provided, including a plurality of solid rods instead of cables, or a combination of rods and cables. It is even envisaged that hydraulic, pneumatic or electrical devices could be used, perhaps in conjunction with one another, and/or in conjunction with either one or more cables, and/or one or more rods and/or a combination thereof.

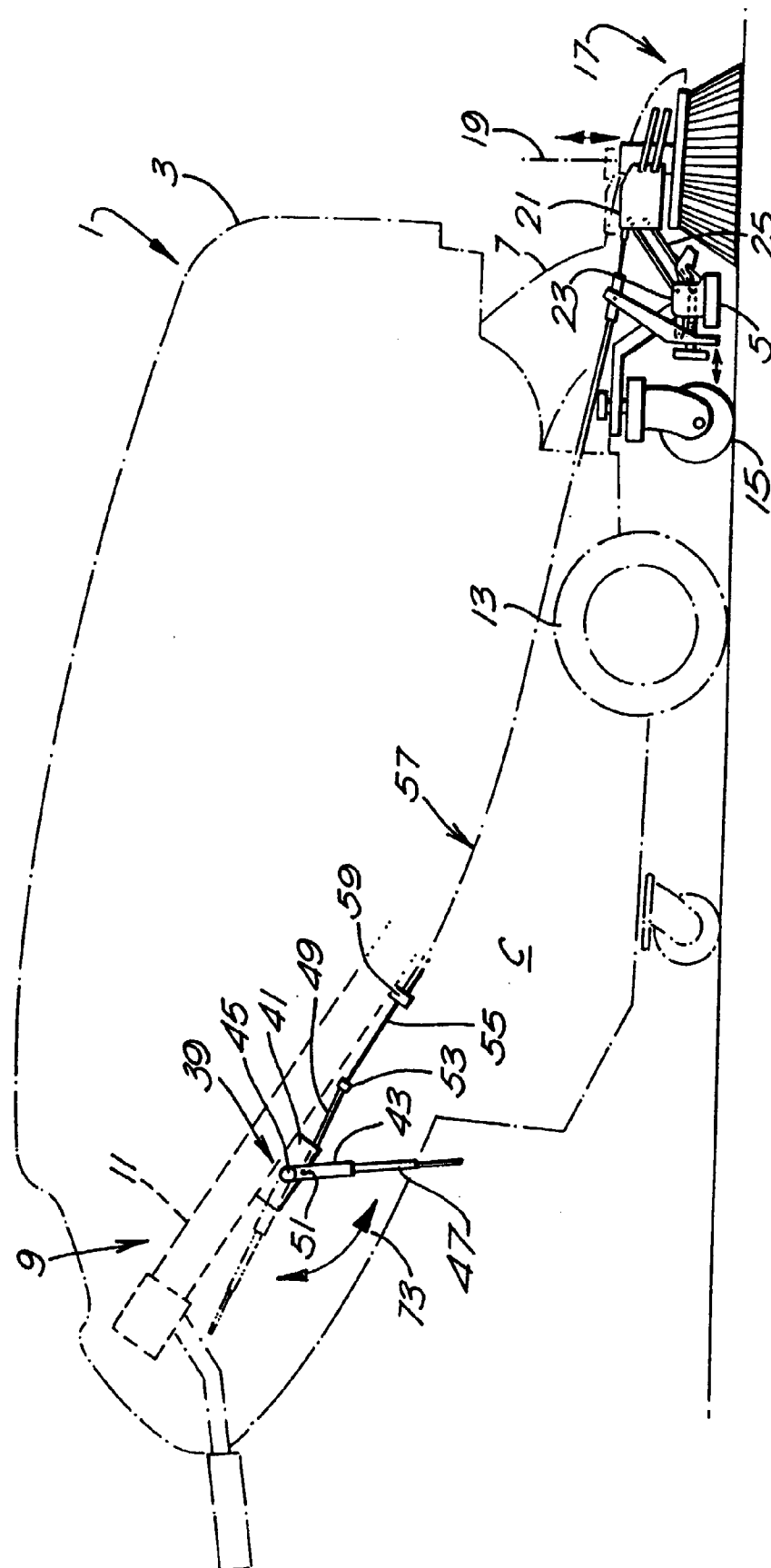
It will of course be understood that the present invention has been described above purely by way of example, and modifications of detail can be made within the scope of the invention.

Claims

1. A pedestrian operable suction sweeping machine including an operator's station (9), an outer housing

- (3), a motor, a pair of spaced rotary brushes (17), remote from the operator's station, and a fan driven by the motor, a suction head (5) connected by an inlet duct to the fan, whereby debris may be swept by the brushes (17) and then collected from the ground in a fluid stream generated by the fan, be forced by the fan into an outlet duct extending from the fan to a container, and be collected in the container, there being a filter arrangement associated with the housing to collect debris in the fluid stream but allowing filtered air to pass back into the atmosphere adjacent the machine, means (25) to raise and lower the brushes (17) out of and into contact with the ground, control means (47,49,53,55) at the operator's station for controlling the means (25,55,57) to raise and lower the brushes (17), characterised in that a brush wear compensating mechanism (31) is associated with the means (25) to raise and lower the brushes and with the control means (47,55,57).
2. A pedestrian operable suction sweeping machine as claimed in claim 1 wherein the means to raise and lower the brushes comprises a pair of flexible cable controls (55,57,59,63,71) connected at one end to the respective brushes (17) and at an opposite end to the control means (47,49,53,55).
 3. A pedestrian operable suction sweeping machine as claimed in claim 2 wherein a single control means (47) operates two cable controls (57), one for each brush (17).
 4. A pedestrian operable suction sweeping machine as claimed in claim 2 or 3 wherein each cable control (57) is of the Bowden cable type and comprises an inner cable (55) slidable in an outer flexible sleeve (57), one end of the inner cable being attached to an upper region of the respective brush sub-frame (21), and the equivalent end of the outer flexible sleeve being attached to an anchorage point (71) supported on a main frame member (23), whereas the opposite end of the inner cable (55) is attached to a yoke (53) common to both cables, with the equivalent end of the flexible sleeve being attached to an anchor point (59) in the region of the operator's station.
 5. A pedestrian operable suction sweeping machine as claimed in claim 4 wherein the brush wear compensating mechanism (31) comprises a brush wear adjusting knob (33) which can lower the brush via a screw thread mechanism (35) as the bristles of the brush wear in use, and can adjust said anchorage point (71).
 6. A pedestrian operable suction sweeping machine as claimed in claim 4 or 5 wherein the said one end of the cable sleeve (57) is attached to an adjustment compensation lever (65) pivotally supported (67) on the main frame member (23), the position of said lever (65) being controlled by the wear adjusting knob (33), thus adjusting the anchorage point (71) of said one end of the cable sleeve in dependence upon the wear of the brushes (17).
 7. A pedestrian operable suction sweeping machine as claimed in any one of the preceding claims wherein the two rotary brushes (17) are located at the front of the machine, one on each side thereof, and each rotary brush is mounted for rotation by a motor about a vertical axis, and is supported on a sub-frame (21) which itself is supported in a main frame member (23) of the machine by at least one pivoted arm member (25).
 8. A pedestrian operable suction sweeping machine as claimed in claim 7 wherein the brush sub-frames (21) can be raised manually and held in a raised position by a hook or a latch (29).
 9. A pedestrian operable suction sweeping machine as claimed in claim 4, 5 or 6 or claims 7 or 8 when dependent on claim 4, 5 or 6 wherein the yoke (43) is attached to one end of a pull rod (49), the opposite end of which is pivotally attached (51) to a handle or lever (47) intermediate the ends thereof, one end of the handle being pivotally connected (45) to a handlebar frame (11) at the operator's station (9), and the opposite end of which carries a hand grip.
 10. A pedestrian operable suction sweeping machine as claimed in claim 9 wherein said opposite end of the handle is extendible.

FIG. 1



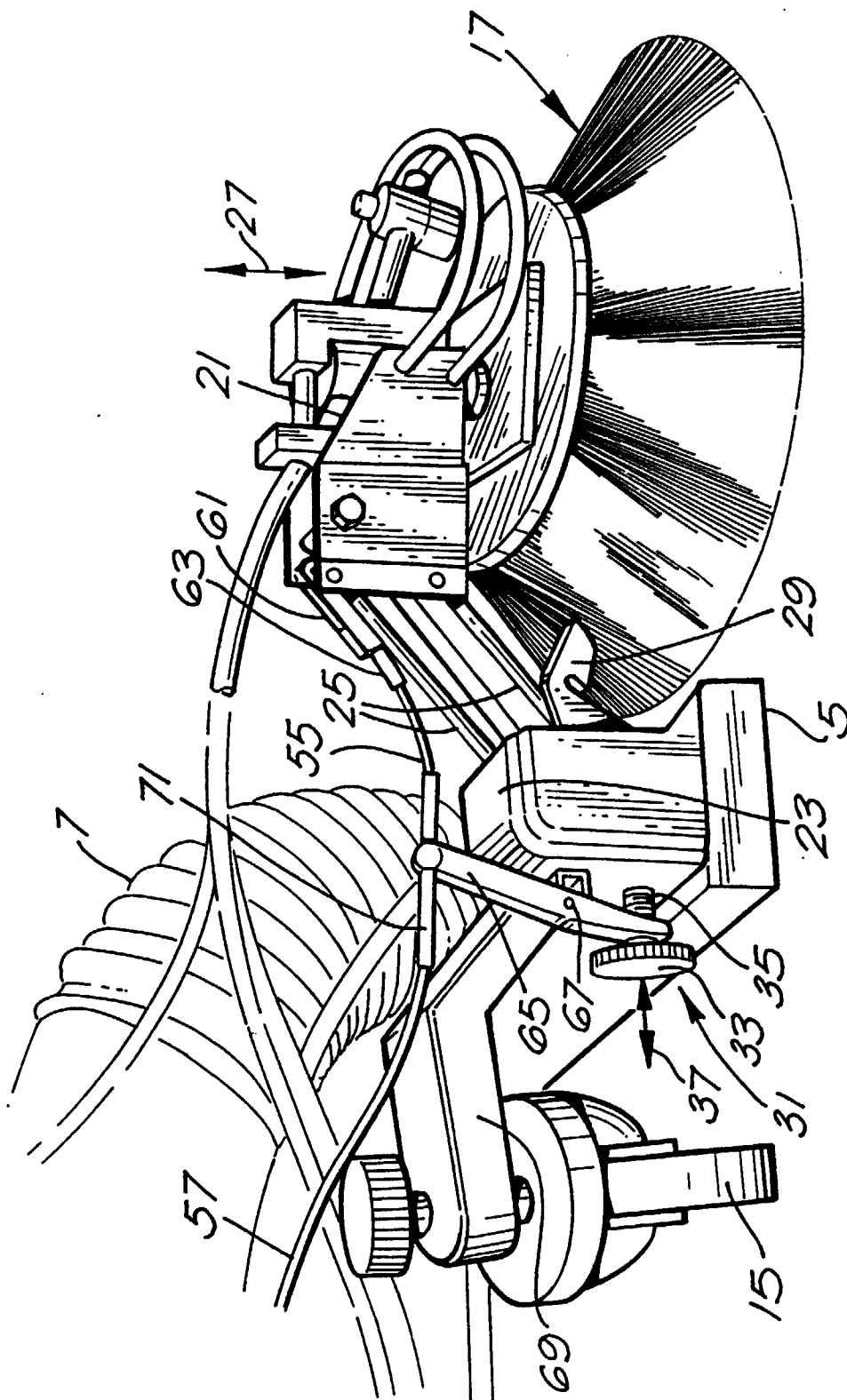


FIG. 2