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(30) Priority: 21.11.2001 NL 1019409	(74) Representative: Verhees, Godefridus Josephus Maria Brabants Octrooibureau, De Pinckart 54 5674 CC Nuenen (NL)
(71) Applicant: De Zeven Son B.V. 5691 RH Son en Breugel (NL)	

(54)

Method and cleaning vehicle for cleaning a floor

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In order to be able to clean a floor rapidly, a floor is sprayed with high-pressure jets of clean water by a spray unit (23) and the dirty water and dirt which have been sprayed loose are sucked up by a suction unit (27), said spray unit (23) and suction unit (27) being located on a cleaning vehicle (1). In this process, clean water is taken from a clean-water tank (19) and the dirty water is sucked into a dirty-water tank (21), which are also sit-

uated on the cleaning vehicle.

The dirty-water tank (21), should it be full, is emptied into a larger dirty-water tank (53) on a tank lorry (49). In this way, the cleaning vehicle (1) does not have to go to a tip in order to be emptied, but it can discharge the dirty water into a tank lorry (49) directly nearby. Should the tank lorry be full, it will go to the tip while the cleaning vehicle (1) can continue working. Because of this, cleaning can continue uninterruptedly.

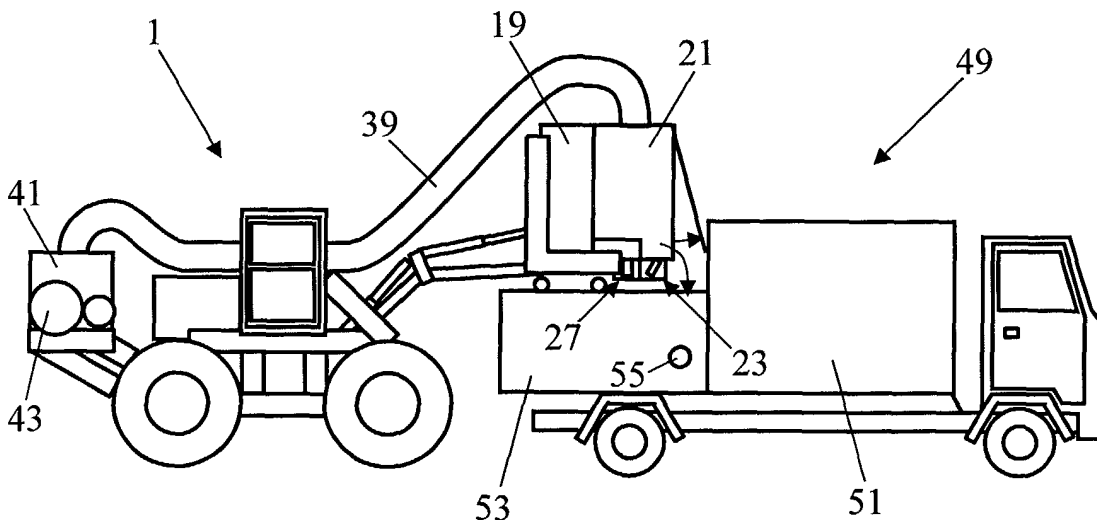


FIG. 6

Description

BACKGROUND OF THE INVENTION:

Field of the invention

[0001] The invention relates to a method for cleaning a floor comprising the mechanically spraying of water under high pressure onto a floor and after that the mechanically sucking up of the water and dirt sprayed loose. More particularly, the invention relates to a method for removing weeds and grass from a floor of grounds within water catchment areas, from pedestrian zones in shopping centres, from car parks, from platforms, etc.

Prior art

[0002] Such a method is generally known for cleaning asphalt, especially porous asphalt. With this method water is sprayed into the pores of the asphalt under a pressure of approximately 150 bars and after that sucked up along with the dirt that was sprayed loose. This known method is carried out with generally known lorries equipped for this purpose which are provided with a clean-water tank and a dirty-water tank and which, furthermore, comprise a number of nozzles in a row with a suction mouth nearby. If the dirty-water tank is full and/or the clean-water tank is empty, the lorry goes to a tip in order to empty the dirty-water tank and fill the clean-water tank. While this is taking place, the cleaning activities are at a standstill.

Summary of the invention

[0003] An objective of the invention is to provide a method for cleaning a floor of the type described in the preamble in which the cleaning can be carried out more rapidly. To this end, the method according to the invention is characterized in that the spraying and sucking up is performed by means of a spray unit and a suction unit situated on at least one cleaning vehicle, in which the clean water is taken from a clean-water tank and the dirty water is sucked into a dirty-water tank, which clean-water tank and dirty-water tank are situated on at least the one cleaning vehicle and where the dirty-water tank, if full, is emptied into a larger dirty-water tank on a tank lorry. With the method according to the invention the cleaning vehicle does not have to go to a tip, but the dirty water can be discharged into a tank lorry directly nearby. If the tank lorry is full, it goes to a tip while the cleaning vehicle can continue working. Because of this, cleaning can continue uninterrupted as a result of which the work can be carried out more rapidly.

[0004] In order to be able to clean better the floors of areas which are small and/or difficult to get at, for example, train station platforms, an embodiment of the method according to the invention is characterized in that the spraying is performed by means of the spray

unit on the cleaning vehicle and the sucking up is performed by means of the suction unit on an additional cleaning vehicle, where the clean-water tank is situated on the cleaning vehicle and the dirty-water tank on the additional cleaning vehicle. In this way as well, a lighter engine is sufficient for each cleaning vehicle as a result of which the cleaning vehicles can be smaller than the case is when one cleaning vehicle is used.

[0005] Emptying the dirty-water tank is carried out preferably by holding the dirty-water tank above the larger dirty-water tank by means of a lifting device situated on the cleaning vehicle or the additional cleaning vehicle, and opening the dirty-water tank so that the dirty water flows into the larger dirty-water tank.

[0006] If the clean-water tank is empty, clean water can be obtained from a canal or piping on site. If this, however, is not on hand, the clean-water tank preferably can be filled with clean water from a larger water tank also situated on the tank lorry.

[0007] In order to clean the floor even better with less water, a further embodiment of the method is characterized in that the clean water is first converted into steam before it is sprayed onto the floor to be cleaned. Furthermore, because of this a lower spray pressure is sufficient. Especially floors soiled with chewing gum can be sprayed clean better with steam than with water.

[0008] In order to get as much dirt as possible into the larger dirty-water tank and so that it will fill up and have to be emptied less quickly, still a further embodiment of the method is characterized in that the dirt in the dirty water in the larger dirty-water tank is allowed to settle and after settling, the water is discharged.

[0009] The known method is not suitable for removing weeds and grass on a floor because they are too well anchored to the floor. Removal of weeds and grass from a floor is, therefore, done mostly by hand with the help of chemical herbicides. In order to be able to remove weeds and grass from a floor in an environment-friendly way, still a further embodiment of the method according to the invention is characterized in that the spraying is performed by a number of nozzles in a row which move back and forth in a direction transverse to that of the direction the vehicle is moving and which rotate as well. Preferably, spraying is done under a pressure of more than 300 bars in order to get the dirt well off the floor. By spraying water under high pressure and having the nozzles move back and forth as well as rotate at the same time, even floors which are extremely soiled are cleaned well. In this way, the surface of the floor is sprayed more often by the jets of water as a result of which the floor is cleaned better.

[0010] In order to reduce the growth of weeds and grass after cleaning, the floor is preferably impregnated and any joints in the floor are preferably filled with sharp grit. Because of this, when the floor is cleaned the next time it will be less dirty and it will be more difficult for the weeds and grass to anchor themselves to the floor and in the joints, as a result of which the next cleaning can

be carried out more rapidly.

[0011] The invention also relates to a cleaning vehicle which is suitable for application to the method according to the invention comprising a frame, four wheels, a clean-water tank, and a spray unit with nozzles, which spray unit is connected to the clean-water tank.

[0012] Regarding the cleaning vehicle, the invention is characterized in that the spray unit comprises a number of nozzles in a row which can move back and forth in a direction transverse to the direction the vehicle is moving. Because the nozzles move back and forth, the surface of the floor to be cleaned is sprayed more often with water, as a result of which the floor is cleaned better than it is with the known cleaning vehicle.

[0013] Moreover, the nozzles preferably can rotate about an axis in order to obtain an even better cleansing action. Furthermore, the nozzles are set preferably at an angle with respect to the surface to be cleaned and the spray unit is fitted so as to be able to spray water under a pressure of at least 300 bars. It is also possible to spray the floor to be cleaned with steam instead of water. In that case, the cleaning vehicle should be equipped with an installation for generating steam from water.

[0014] With the existing cleaning vehicle it is not possible to get at places which are difficult of access. An embodiment of the cleaning vehicle according to the invention in which places difficult of access can also be cleaned is characterized in that the cleaning vehicle comprises two axles situated one behind the other in the direction of travel, in which there are two wheels on each of the axles, where the wheels on one of the axles can be put at an angle of at least 45° with respect to the wheels on the other axle. Preferably, the spray unit moves in the same direction as the wheels of one of the axles.

[0015] Furthermore, a further embodiment of the cleaning vehicle is characterized in that it comprises a suction unit as well as a dirty-water tank which is connected to the suction unit, where the suction unit is situated behind the spray unit and preferably moves with the spray unit, and that the cleaning vehicle comprises a lifting device with which the dirty-water tank can be brought above a larger tank for the purpose of emptying it.

[0016] Preferably, the cleaning vehicle is provided with a detachable clean-water tank and a detachable dirty-water tank, as well as a detachable spray unit and suction unit. In this way, for example, an existing vehicle can be used that for cleaning is equipped with the necessary fittings such as a spray unit and a suction unit, as a result of which capital investments can be kept low.

[0017] Furthermore, the cleaning vehicle preferably comprises a detachable auxiliary engine for providing the required high pressure and the required suction force. Because of this, the capability of the existing vehicle does not have to be high and a relatively inexpensive existing vehicle will suffice.

Brief description of the drawings

[0018] The invention will be elucidated more fully below on the basis of drawings in which an embodiment of the cleaning vehicle according to the invention is shown. In these drawings:

Figure 1 is a side view of an embodiment of the cleaning vehicle according to the invention;

Figure 2 is a view from above of the cleaning vehicle;

Figure 3 is a cross-section of the cleaning vehicle's spray unit and suction unit by the nozzles;

Figure 4 is a side view of the spray unit and suction unit while in operation;

Figure 5 is a side view of a tank lorry for use in combination with the cleaning vehicle; and

Figure 6 shows the cleaning vehicle and the tank lorry cooperating with each other.

Detailed description of the drawings

[0019] In Figure 1 an embodiment of the cleaning vehicle 1 according to the invention is shown in a side view. The cleaning vehicle 1 basically consists of an existing machine 3, namely a power shovel, with a frame 5 on which there are a driver's cab 7, four wheels 9, 11, two of which are driven by an engine, and an arm 15 that can be moved by means of hydraulic cylinders 13.

[0020] For the purpose of its use as a cleaning vehicle 1 this known universally applicable machine 3 is equipped with a detachable tank 17, which is divided into a clean-water tank 19 and a dirty-water tank 21, as well as a spray unit 23 with nozzles 25 and a suction unit 27. These parts are assembled into one larger unit 29, which is connected to the end of the arm 15. The arm 15 is part of a lifting device for lifting the unit 29 for the purpose of emptying the dirty-water tank 21 into a larger dirty-water tank.

[0021] The cleaning vehicle 1 is very manoeuvrable as can be seen in Figure 2 in the view from above of the cleaning vehicle. The machine 3 has two axles 31, 33 situated one behind the other in the direction of travel, each having two wheels 9, 11. The wheels 9 of the front axle 31 can be put at an angle of at least 45° with respect to the wheels 11 of the rear axle 33. The spray unit and suction unit 23, 27 move in the same direction as the front axle 31.

[0022] The spray unit 23 is fitted so as to be able to spray water under a pressure of at least 300 bars and preferably at least 600 bars, and has a number of nozzles 25 situated in a row. These nozzles 25 can move back and forth in a direction transverse to that of the direction the vehicle is moving, see the arrow 35 in Figure 3, and can rotate about an imaginary axis 36, see Figures 3 and 4.

[0023] Figure 3 shows a cross-section of the spray unit and the suction unit 23, 27 by the nozzles 25. The

suction unit 27 comprises a vacuum tank made up of the dirty-water tank 21 provided with a suction mouth 37. The vacuum tank is connected by means of a hose 39 to a vacuum pump 41, which is driven by an auxiliary engine 43, see Figures 1 and 2 also. This auxiliary engine 43 also provides the power necessary for the high-pressure pump 44 for the nozzles 25, see Figure 1. The high-pressure pump 44 pumps water through the piping 44a out of the clean-water tank 19 and pumps it under high pressure through the piping 44b to the nozzles 25. There are flexible flaps round the nozzles 25 and the suction mouth 37 to prevent water from splashing about in all directions, see Figures 3 and 4.

[0024] In Figure 4 the spray unit and suction unit 23, 27 are shown in a side view while in operation. The nozzles 25 are at an angle with respect to the surface 47 to be cleaned and spray water towards the suction mouth 37. The nozzles 25 can rotate about an imaginary axis 36.

[0025] In Figure 5 a tank lorry 49 for use in combination with the cleaning vehicle 1 is shown in a side view. The tank lorry 49 has a larger water tank 51 and a larger dirty-water tank 53. The larger dirty-water tank 53 is provided with a settling box and a drain for draining off the cleansed water.

[0026] In Figure 6 the cooperation of the cleaning vehicle 1 and the tank lorry 49 is shown while discharging the dirty water. In this process, the dirty-water tank 21 of the cleaning vehicle 1 is brought above the larger dirty-water tank 53 on the tank lorry 49 and the dirty water is discharged into the open larger dirty-water tank 53 at the top.

[0027] Although in the above the invention is explained on the basis of the drawings, it should be noted that the invention is in no way limited to the embodiment shown in the drawings. The invention also extends to all embodiments deviating from the embodiment shown in the drawings within the context defined by the claims. Thus the nozzles can also be placed on a separate arm and be connected to the water tank by means of a hose. This arm can preferably move in all positions so that it not only can get to areas of a floor which are difficult of access better, but also vertical walls or ceilings, for example, of a viaduct or tunnel, can be cleaned with the cleaning vehicle according to the invention.

Claims

1. Method for cleaning a floor comprising the mechanically spraying of water under high pressure onto a floor and after that the mechanically sucking up of the water and dirt sprayed loose, **characterized in that** the spraying and sucking up is done by means of a spray unit and a suction unit which are situated on at least one cleaning vehicle, in which clean water is taken from a clean-water tank and the dirty water is sucked into a dirty-water tank, which clean-

water tank and dirty-water tank are situated on the at least one cleaning vehicle, and where the dirty-water tank, if full, is emptied into a larger dirty-water tank on a tank lorry.

2. Method according to claim 1, **characterized in that** the spraying is performed by means of the spray unit situated on the cleaning vehicle and that the sucking up is performed by means of the suction unit situated on an additional cleaning vehicle, in which the clean-water tank is situated on the cleaning vehicle and the dirty-water tank is on the additional cleaning vehicle.
3. Method according to claim 1 or 2, **characterized in that** emptying the dirty-water tank is carried out by holding, with a lifting device on the cleaning vehicle or the additional cleaning vehicle, the dirty-water tank above the larger dirty-water tank and opening the dirty-water tank so that the dirty water will flow into the larger dirty-water tank.
4. Method according to claim 1, 2 or 3, **characterized in that** the clean-water tank, if empty, is filled with clean water from a larger water tank situated on the tank lorry.
5. Method according to one of the preceding claims, **characterized in that** the clean water is converted into steam before it is sprayed onto the floor to be cleaned.
6. Method according to one of the preceding claims, **characterized in that** the dirt in the water settles in the larger dirty-water tank and after settling the cleansed water is discharged.
7. Method according to one of the preceding claims, **characterized in that** the spraying is performed by a number of nozzles in a row which move back and forth in a direction transverse to the direction the vehicle is moving and which rotate as well.
8. Cleaning vehicle suitable for application to the method according to one of the preceding claims comprising a frame, four wheels, a clean-water tank, and a spray unit with nozzles, which spray unit is connected to the clean-water tank, **characterized in that** the spray unit comprises a number of nozzles in a row which can move back and forth in a direction transverse to the direction the vehicle is moving.
9. Cleaning vehicle according to claim 8, **characterized in that** the nozzles, furthermore, can rotate about an axis.
10. Cleaning vehicle according to claim 8 or 9, **charac-**

terized in that the cleaning vehicle comprises two axles situated one behind the other in the direction of travel, in which on each of the axles there are two of the wheels, where the wheels on one of the axles can be put at an angle of at least 45° with respect to the wheels on the other axle. 5

11. Cleaning vehicle according to claim 10, **characterized in that** the spray unit moves in the same direction as the wheels of one of the axles. 10

12. Cleaning vehicle according to one of the preceding claims 8 to 11 inclusive, **characterized in that** the cleaning vehicle, furthermore, comprises a suction unit as well as a dirty-water tank which is connected to the suction unit, in which the suction unit is situated behind the spray unit and preferably moves with the spray unit and that the cleaning vehicle comprises a lifting device with which the dirty-water tank can be brought above a larger tank for the purpose of emptying the dirty-water tank. 15 20

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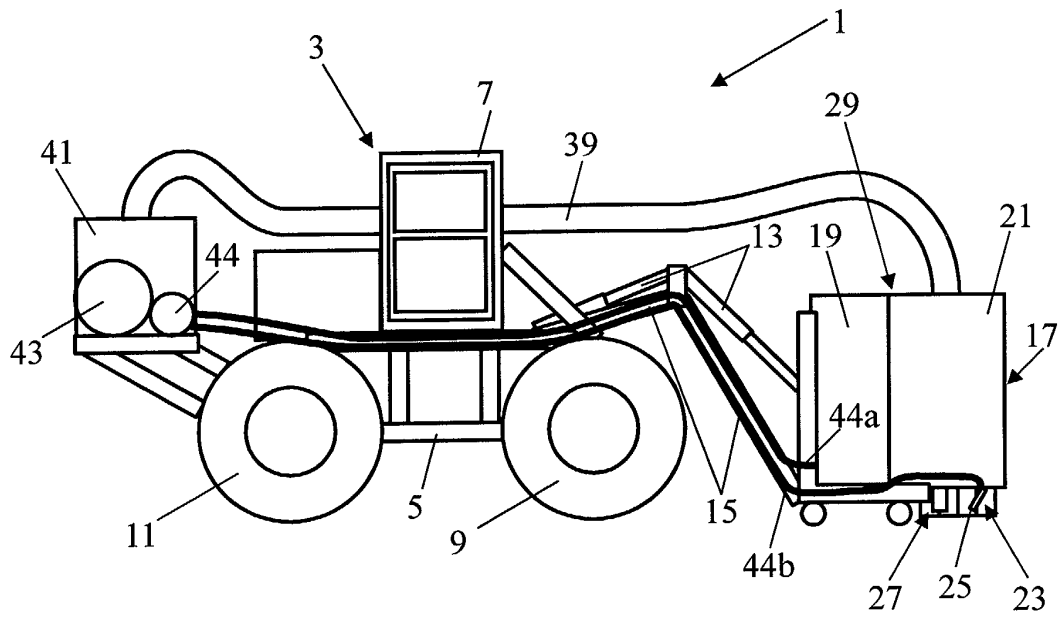


FIG. 1

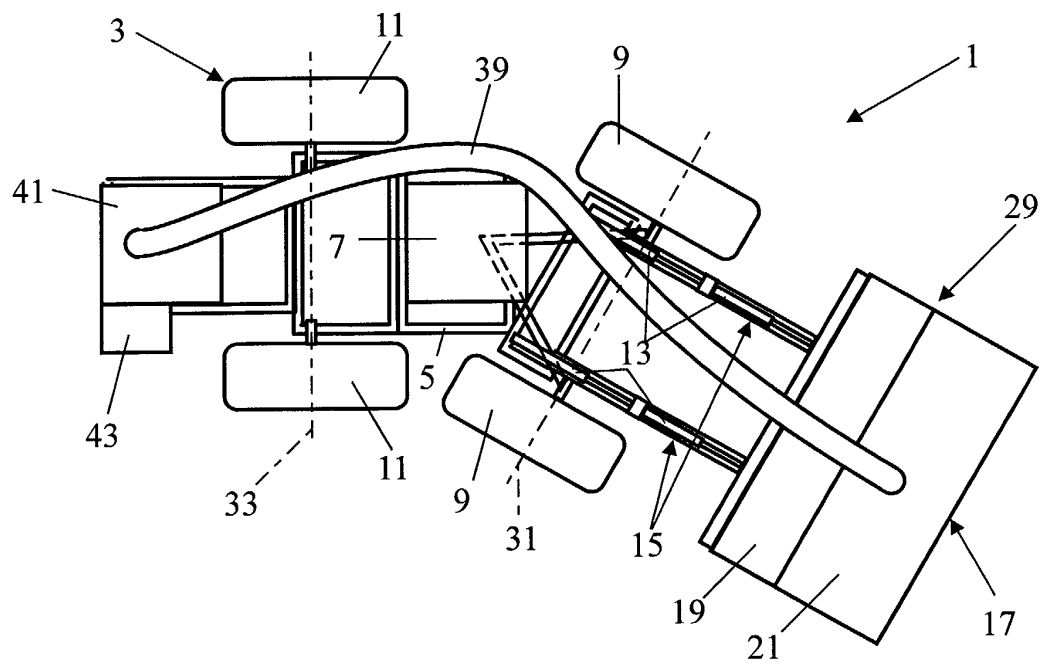


FIG. 2

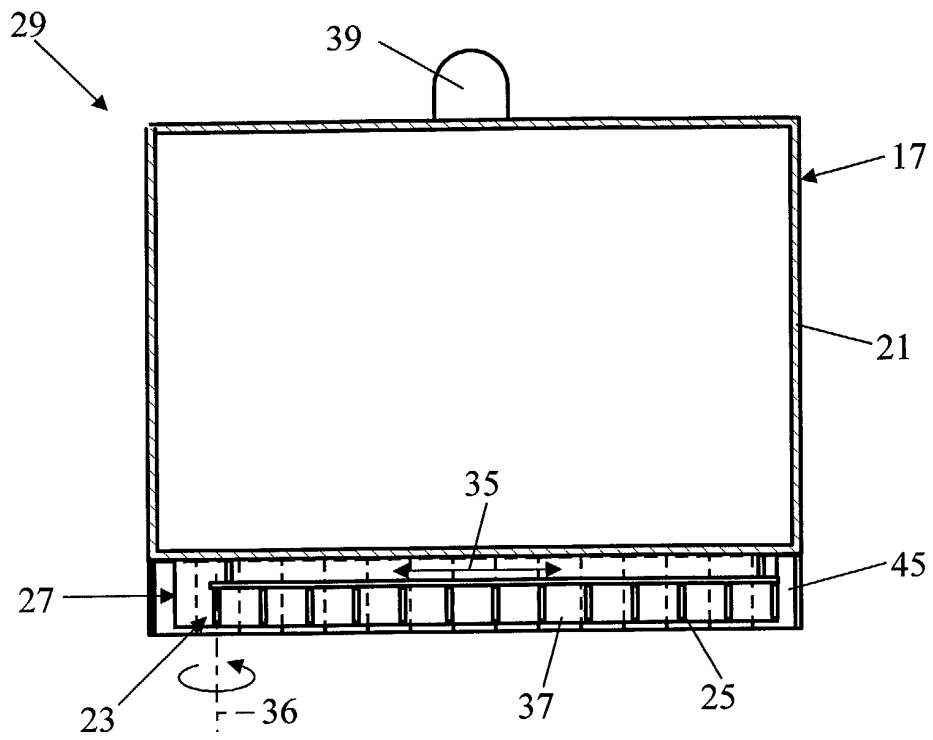


FIG. 3

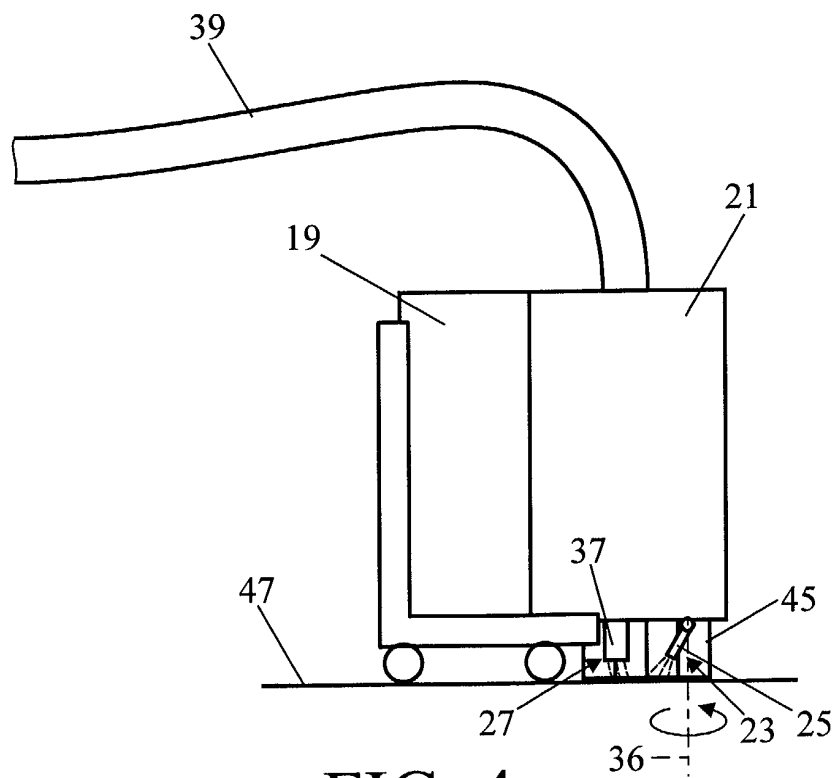


FIG. 4

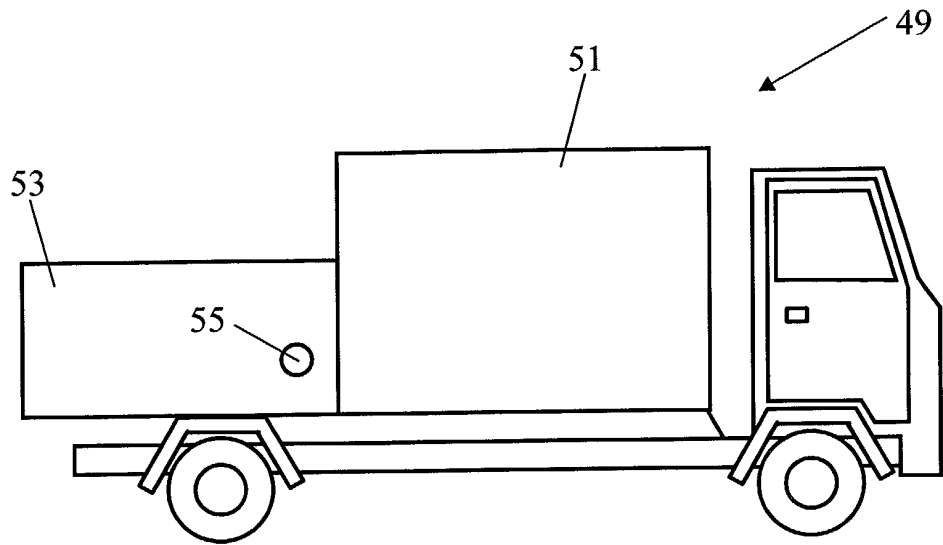


FIG. 5

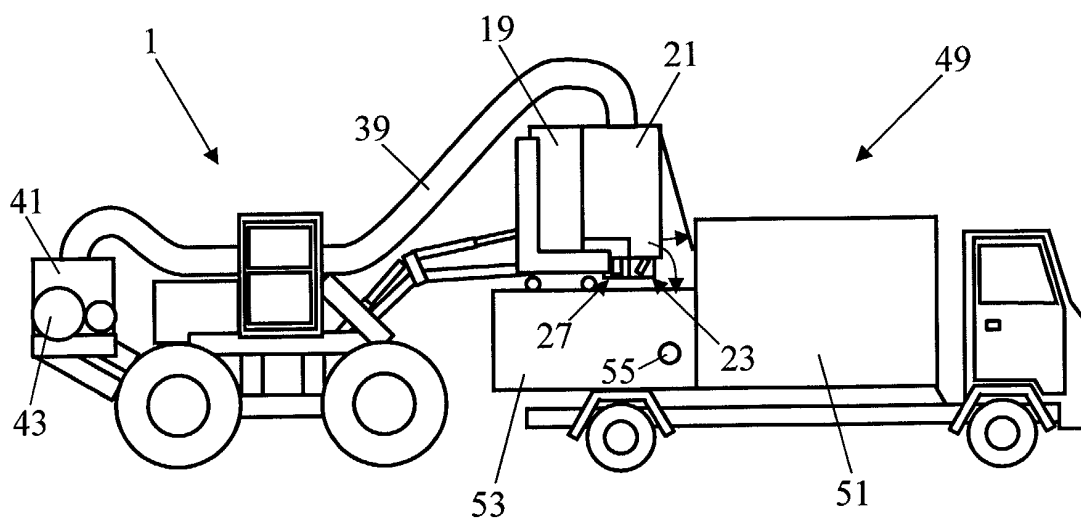


FIG. 6