

EXHIBIT

*Blasters-1003*

Dec. 5, 1961

K. BREITHER

3,011,206

VEHICLE FOR CLEANING STREETS

Filed Nov. 13, 1957

Fig. 1

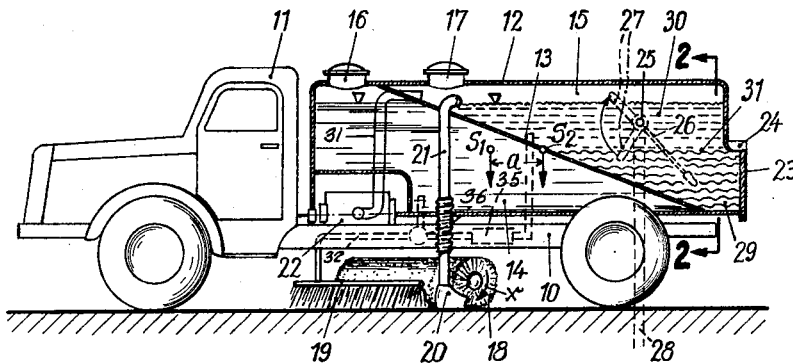


Fig. 2

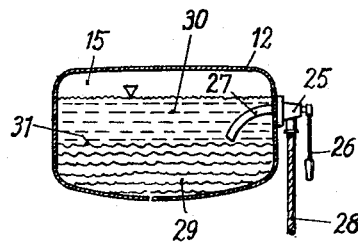


Fig. 3

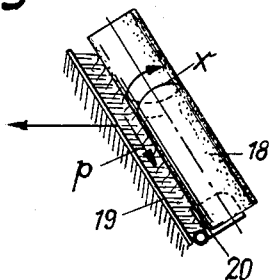
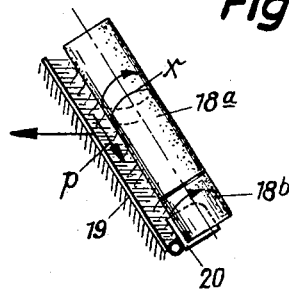


Fig. 4



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3,011,206

## VEHICLE FOR CLEANING STREETS

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Filed Nov. 13, 1957, Ser. No. 696,242  
14 Claims. (Cl. 15—320)

The present invention relates to a road cleaning vehicle.

It is a principal object of the present invention to provide a new street-cleaning vehicle which facilitates an improved and more thorough cleaning of streets, especially when the dirt to be removed has dried up or become solidified.

A further object of the present invention is to provide a new street-cleaning vehicle which wets the dirt or rubbish on the road, which sweeps the dirt substantially to one point, and which then sucks up the dirt in its wet condition.

Another object of the present invention is to provide a vehicle for carrying out the street-cleaning operation very economically despite the use of large quantities of water for wetting the dirt on the road.

A further object of the present invention is to provide a vehicle of the most functional design and the most effective weight distribution attainable.

An important feature of the present invention therefore consists in the provision of a motor vehicle which is capable of first mixing the dirt on the road with water so as to form a watery mixture and then sucking up such mixture, for example, by drawing it into a collecting tank mounted on a motor vehicle.

According to another feature of the present invention, the watery mixture thus collected in the tank may then be separated within said tank into solid particles and soiled water by allowing the solid particles to settle in the vehicle tank by gravity.

Another feature of the invention consists in the subsequent removal of the soiled water from the collecting tank, in thereafter against sucking another quantity of watery mud mixture from the street into the collecting tank and again separating the same therein into relatively solid mud and soiled water, in continuing this operation until the container is filled with relatively solid mud to a certain capacity, and in then removing the mud from the container.

A further object of the present invention is to provide a scrubbing and sweeping mechanism by means of which the muddy water, before it is sucked up, is scrubbed off the street and guided to the suction device which may be disposed, for example, in front of, laterally of, or behind the scrubbing and sweeping mechanism.

Another object of the invention is to provide means for permitting the soiled water after the solid dirt particles have been separated therefrom and preferably after having been cleaned by a filter, to be used again for wetting the dirt on the road. It will thus be possible to use a relatively small quantity of fresh water or, in other words, to make one filling of the fresh water container last for an extended operating period of the vehicle. Therefore, the term "fresh water" employed here does not indicate pure water only, but also water mixed with mud.

Another important object of the present invention consists in designing the street-cleaning vehicle in such a manner that the center of gravity of the entire tank structure containing the fresh-water container and the container for the muddy mixture remains either substantially the same or varies but slightly no matter whether the fresh-water container is filled and the mud container is empty or the mud container is filled and the

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fresh water container is empty. For attaining this object, the tank may be designed so that the two containers therein overlap each other in the longitudinal direction of the tank, for example, by providing at least one diagonal or horizontal partition inside of the tank which separates the tank into containers lying substantially one above the other.

These, as well as additional objects, features, and advantages of the present invention, will be more apparent from the following detailed description thereof, particularly when read with reference to the accompanying drawings, in which—

FIG. 1 illustrates a side view of a vehicle with a collecting tank thereon shown in cross section;

FIG. 2 illustrates a cross section of the tank taken along line 2—2 of FIG. 1;

FIG. 3 illustrates a plan view of the washing and sweeping mechanism; while

FIG. 4 illustrates a similar plan view of a modification of the washing and sweeping mechanism.

Referring to the drawings, the street-cleaning vehicle according to the invention consists of a truck having a chassis 10, and a tank 12 mounted thereon behind the driver's cab 11. By means of a partition 13 extending diagonally from a point near the upper front end of the tank to a point near its lower rear end of the tank is divided into a front container 14 substantially disposed underneath partition 13, and a rear container 15, substantially disposed above the partition. The front container 14 serves as a fresh-water container and is accessible, for example, through an opening 16 at the top which may be provided with a suitable cover, while the rear container 15 serves as a mud container and is also provided with an opening 17 which can be closed by a cover.

A scrubbing or sweeping brush 18 is mounted on chassis 10 between the front and rear wheels of the vehicle and, while the vehicle is being driven, this brush 18 is rotated by suitable driving means, not shown, in the direction indicated by the arrow. In front of the rotary brush 18 is a spraying or flushing mechanism which substantially consists of a pipe 19 extending parallel to brush 18. This pipe 19 is connected to the fresh-water container 14 by means of pipe 32 and through a plurality of openings along its length, sprays powerful jets of water directly upon the road along the entire length of the brush. The sweeping brush 18 is mounted in the usual manner so as to extend at an oblique angle to the direction of travel of the vehicle. At the rear ends of and intermediate brush 18 and spray pipe 19, a suction device 20 is mounted on chassis 10 which is connected with the interior of the mud container 15 by means of a pipe 21. A vacuum or suction pump 22 is mounted in a separate compartment which forms a recess in the fresh-water container behind the driver's seat and may, for example, be coupled to the engine of the vehicle. Pump 22 is connected by means of pipe 31 to the inside of mud container 15, which is sealed tightly toward the outside for maintaining a vacuum therein. This vacuum also extends through pipe 21 to suction device 20.

On the rear wall of tank 12, a flap 23 is hinged so as to swing upwardly to permit the mud to be removed from container 15. During the operation of the vehicle the flap is pressed tightly against the rear wall of tank 12 by suitable, easily released means, such as bolts or the like so as to seal container 15. The upper part of container 15 also contains a device for emptying the soiled water therefrom. This device consists of a pipe 27 which is mounted on a side wall of container 15 so as to be pivotable at 25 about a horizontal axis by means of a handle 26 or the like. Pipe 27 is connected to a hose 28 through which the muddy water may be con-

ducted to a suitable place, for example, a sewer or ditch.

At the beginning of the operation, the front container 14 is filled with fresh water, while the rear mud container 15 is empty. In this case, the center of gravity of the entire tank is located approximately at the point  $S_1$ . During the operation of the vehicle, the fresh water is gradually drained from container 14 through the spraying or flushing mechanism 19 and thus sprayed upon the road where it becomes mixed with the dirt on the road. The muddy water thus formed is conveyed diagonally outward by the rotary brush 18 in the direction of the arrow  $p$  and conducted toward the suction device 20 at the outer end of brush 18 and facing in the direction of rotation  $x$ . The muddy water is then sucked up by the suction device 20 and drawn into the mud container 15 by the effect of the vacuum within the container.

The heavier mud particles will then settle in the bottom section of mud container 15, as shown in FIGS. 1 and 2 at 29, while the lighter soiled water 30 will collect above the mud. The pivotable pipe 27 which serves for draining the soiled water from container 15 is preferably adjusted to a position in which its inlet opening will be disposed slightly above the level 31 of the mud so that the soiled water 30 above the mud level 31 may be drained off through hose 28 into a ditch, sewer, or the like, and the space within container 15 thus becoming empty will become available for receiving additional muddy water. The draining may be effected by gravity or by means of a pump, for example, by a suitable connection to suction pump 22. Instead of providing a manual control of the drainage of the water from container 15, the drainage may also be carried out automatically, for example, by means of a float with an inlet thereon which is connected to hose 28 and adjusts itself.

Due to the overlapping arrangement of the two containers 14 and 15 and their separation by the diagonally inclined wall 13, the center of gravity will shift only a relatively short distance during one complete cycle of operation. Thus, while at the beginning of the street-cleaning operation, when the fresh water container 14 is full and mud container 15 is empty, the center of gravity is located substantially at the point  $S_1$ , it will shift during the operation gradually toward the rear so that, when the fresh water container 14 is empty and the mud container 15 is filled to its normal capacity, the center of gravity will be located substantially at the point  $S_2$ . The weight distribution of the vehicle is preferably designed so that the distance between these two points  $S_1$  and  $S_2$  will be no larger than one-fifth to a maximum of one-fourth of the total length of the entire tank 12.

FIG. 4 illustrates a modification of the invention in which the rotary brush is divided into two separate brushes, namely, a main brush 18a and a supplementary brush 18b at the outer end of brush 18a and coaxial therewith. By rotating brush 18b at a different speed from that of brush 18a, it is possible to conduct the muddy water still more effectively toward suction device 20 than by means of a single brush.

Although not particularly illustrated in the drawings, the invention may also be modified by providing two rotary brushes at opposite oblique angles relative to the direction of travel of the vehicle, that is, in a V-shaped arrangement converging toward the rear, and rotatable in opposite directions to each other. The suction device 20 would then be mounted centrally between or behind the converging ends of the two brushes.

Instead of merely draining and discarding the soiled water from container 15 after the same has become somewhat purified by the settling of the solid mud particles toward the bottom of the container, this water may also be utilized again for washing the road. For this purpose, a suitable switching valve 36 is provided which permits either the fresh water remaining in container 14 or the soiled water from container 15 to be used alone or to be mixed with each other before being passed to spraying

device 19. In this event, it is advisable to provide filtering means 35 and to pass the soiled water therethrough so as to purify it as much as possible before it enters into the spraying device 19 so that the nozzle openings thereof will not become clogged.

Although my invention has been illustrated and described with reference to the preferred embodiments thereof, I wish to have it understood that it is in no way limited to the details of such embodiments, but is capable of numerous modifications within the scope of the appended claims.

Having thus fully disclosed my invention, what I claim is:

1. A cleaning arrangement for cleaning dirt from a surface, comprising in combination, wheeled supporting means movable in a predetermined direction; means mounted on said supporting means for spraying fluid onto said surface to be cleaned; elongated sweeping means mounted on said wheeled supporting means and located in said predetermined direction of movement behind the surface portion sprayed by said spraying means, said sweeping means being arranged parallel to said surface and at an angle to said predetermined direction of movement so as to have in said direction a forward and a rear end, the mixture of liquid and dirt being swept by said sweeping means during movement of said wheeled supporting means in direction from said forward to said rear end thereof and collecting at said rear end; and removing means mounted also on said wheeled supporting means and located with its receiving portion in the region of said rear end of said sweeping means for removing therefrom the collected liquid-dirt mixture.

2. A cleaning arrangement for cleaning dirt from a surface, comprising in combination, wheeled supporting means movable in a predetermined direction; means mounted on said supporting means for spraying fluid onto said surface to be cleaned; elongated sweeping means mounted on said wheeled supporting means and located in said predetermined direction of movement behind the surface portion sprayed by said spraying means, said sweeping means being arranged parallel to said surface and at an angle to said predetermined direction of movement so as to have in said direction a forward and a rear end, the mixture of liquid and dirt being swept by said sweeping means during movement of said wheeled supporting means in direction from said forward to said rear end thereof and collecting at said rear end; and removing suction means mounted also on said wheeled supporting means and located with its receiving portion in the region of said rear end of said sweeping means for removing by suction therefrom the collected liquid-dirt mixture.

3. A cleaning arrangement for cleaning dirt from a surface, comprising in combination, wheeled supporting means movable in a predetermined direction; a container mounted on said supporting means for holding a fluid; means mounted on said supporting means for spraying said fluid onto said surface to be cleaned; elongated sweeping means mounted on said wheeled supporting means and located in said predetermined direction of movement behind the surface portion sprayed by said spraying means, said sweeping means being arranged parallel to said surface and at an angle to said predetermined direction of movement so as to have in said direction a forward and a rear end, the mixture of liquid and dirt being swept by said sweeping means during movement of said wheeled supporting means in direction from said forward to said rear end thereof and collecting at said rear end; and removing means mounted also on said wheeled supporting means and located with its receiving portion in the region of said rear end of said sweeping means for removing therefrom the collected liquid-dirt mixture.

4. A cleaning arrangement for cleaning dirt from a surface, comprising in combination, wheeled supporting means movable in a predetermined direction; means mounted on said supporting means for spraying fluid onto

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said surface to be cleaned; elongated sweeping means mounted on said wheeled supporting means and located in said predetermined direction of movement behind the surface portion sprayed by said spraying means, said sweeping means being arranged parallel to said surface and at an angle to said predetermined direction of movement so as to have in said direction a forward and a rear end, the mixture of liquid and dirt being swept by said sweeping means during movement of said wheeled supporting means in direction from said forward to said rear end thereof and collecting at said rear end; a container mounted on said supporting means; and removing means mounted also on said wheeled supporting means and located with its receiving portion in the region of said rear end of said sweeping means for removing therefrom the collected liquid-dirt mixture, said removing means having a discharging portion communicating with said container for discharging said mixture into said container.

5. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; two containers on said frame; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said other container.

6. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; two containers on said frame; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; rotary brush means mounted on said frame and having an axis of rotation extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said other container.

7. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; two containers on said frame and at least partly superimposed upon each other; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said other container.

8. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; a tank on said vehicle frame; a partition in said tank so as to divide the same into two con-

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tainers; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said other container.

9. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; a tank on said vehicle frame; an obliquely inclined partition in said tank so as to divide the same into an upper and lower container; a flushing conduit having one end connected to said lower container and an open end near said road surface for flushing the same with a liquid from said lower container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with said upper container and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said upper container.

10. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; a tank on said vehicle frame; an obliquely inclined partition in said tank so as to divide the same into an upper and lower container, said lower container being arranged forward of said upper container in said predetermined direction of movement; a flushing conduit having one end connected to said lower container and an open end near said road surface for flushing the same with a liquid from said lower container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with said upper container and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said upper container.

11. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; two containers on said frame; a flushing conduit having one end alternately connectable to either one and both of said containers and an open end near said road surface for flushing the same with a liquid from said containers so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with one of said containers and another end open adjacent said end of said sweeping means; and means for maintaining negative pressure in said one container.

12. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a prede-

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terminated direction; two containers on said frame; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; and a suction pump mounted on said vehicle frame for maintaining negative pressure in said other container.

13. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; two containers on said frame; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; means for maintaining negative pressure in said other container for drawing said mixture through said suction conduit into said other container; and a discharging conduit communicating with said other container at a point spaced from the bottom thereof, whereby a mixture of dirt and water is drawn from said road surface into said other container and, upon settling of said dirt from said mixture, a supernatant liquid may be discharged through said discharging conduit.

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14. A road cleaning vehicle for cleaning dirt from a road surface during movement of said vehicle, comprising in combination, a vehicle frame movable in a predetermined direction; two containers on said frame; a flushing conduit having one end connected to one of said containers and an open end near said road surface for flushing the same with a liquid from said one container so as to form a mixture of said liquid with said dirt; elongated sweeping means mounted on said frame and extending obliquely transversely of said predetermined direction behind the surface portion flushed by said flushing conduit for sweeping said mixture transversely to one end of said sweeping means during said movement of said frame; a suction conduit having one end communicating with the other one of said containers and another end open adjacent said end of said sweeping means; means for maintaining negative pressure in said other container for drawing said mixture through said suction conduit into said other container; and a discharging conduit communicating with said other container at a point adjustably spaced from the bottom thereof, whereby a mixture of dirt and water is drawn from said road surface into said other container and, upon settling of said dirt from said mixture, a supernatant liquid may be discharged through said discharging conduit.

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