March 17, 1970 U. CAPRA 3,500,487

VEHICLE WASHING APPARATUS

Filed Feb. 23, 1968

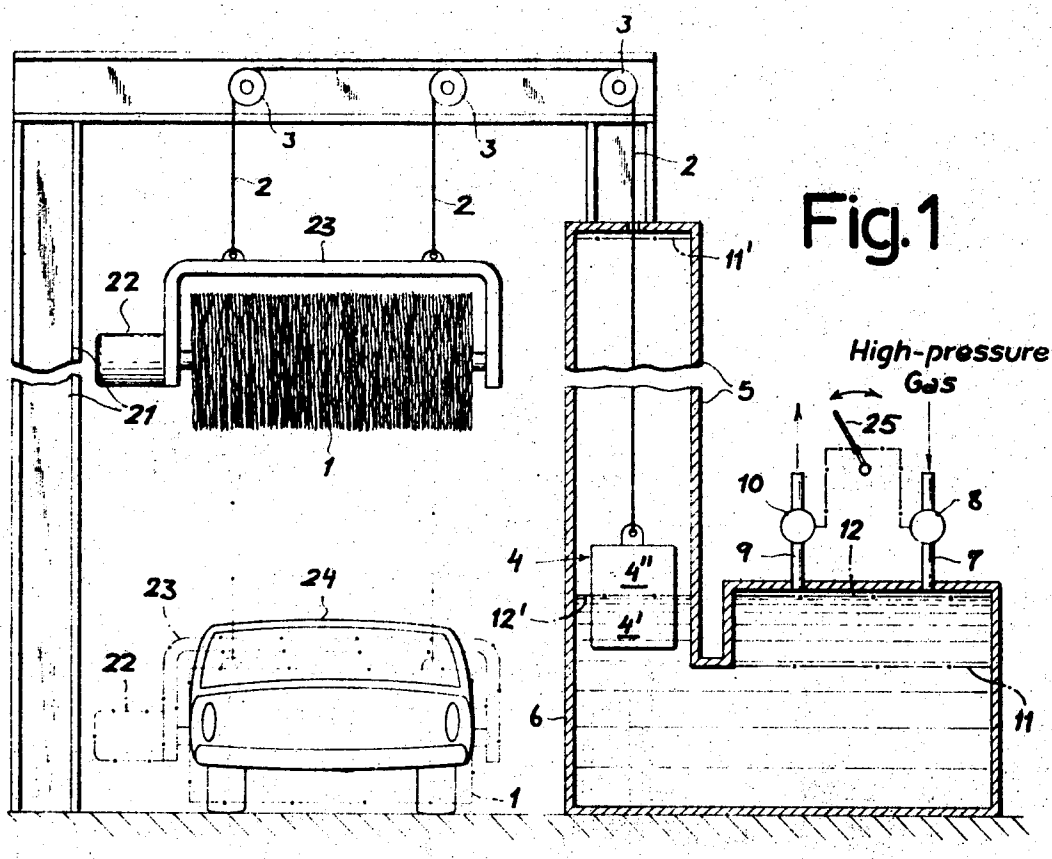


Fig. 1

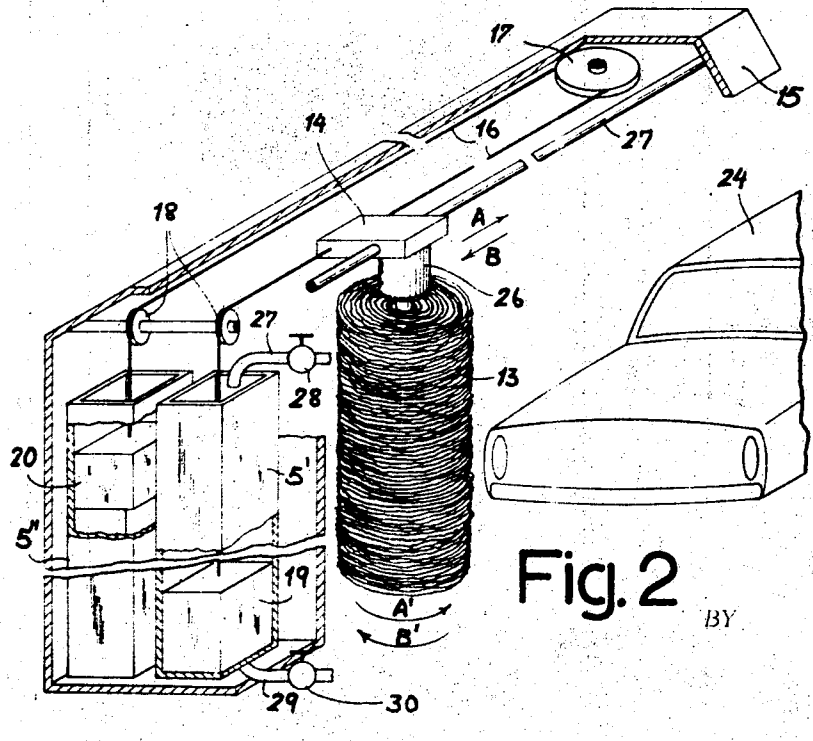


Fig. 2

Uberto Capra
INVENTOR.

BY

Karl F. Ross
Attorney

United States Patent Office 3,500,487
Patented Mar. 17, 1970

3,500,487

VEHICLE WASHING APPARATUS

Uberto Capra, Vicenza, Italy, assignor to Ceccato & C. S.p.A., Vicenza, Italy, a corporation of Italy

Filed Feb. 23, 1968, Ser. No. 707,836
Claims priority, application Italy, Mar. 10, 1967, 13,557/67; Oct. 17, 1967, 21,677/67
Int. Cl. B60s 3/06
U.S. Cl. 15—21 6 Claims

ABSTRACT OF THE DISCLOSURE

A suspended load, such as a rotary brush used for the scrubbing of vehicular bodies, is anchored to a cable having an end attached to a weight which is vertically movable in a well adapted to be alternately filled with water and drained; the gravitational pull of the weight in the empty well is sufficient to displace the load in one direction against a biasing force (e.g. gravity), whereas the biasing force together with the buoyancy of the displaced water in the filled well overbalances this gravitational pull to displace the load in the opposite direction.

My present invention relates to a means for controlledly displacing a reversible load which must move at a substantially steady rate in one or more directions.

A nonlimitative but representative example of a load of this type is a rotary brush used in the scrubbing of automobile bodies or the like in a washing station for vehicles. Such brushes are generally of cylindrical shape and rotate about their axes while contacting the body of a vehicle moving relatively thereto. In order to avoid damage to the surface of the vehicle body being scrubbed, this linear displacement must proceed at a relatively slow and more or less uniform rate; particularly during the scrubbing of the upper surface of the vehicle, the brush should be so suspended as to follow with little inertia the rising and falling contour of the vehicle body.

Heretofore, the guidance of such brushes and similar surface-treating units required relatively complex mechanical, pneumatic or electric devices designed, in the case of a top-working brush or the like, to raise the implement into an upwardly retracted position upon the approach of the vehicle to be treated, thereafter to lower it gently upon the vehicle body and, during the ensuing relative longitudinal displacement, to sense the presence of ridges and other projections requiring a temporary elevation of the implement while allowing it otherwise to follow the contour of the vehicle. Where the relative displacement between the implement and the car body involves the shifting of a brush support along the stationary car, the driving force applied to the support must be sufficient to overcome the drag exerted by the rotating brush yet not so large as to move the brush past the vehicle at an excessive speed.

This object is realized, pursuant to my present invention, by the provision of a system wherein the movement of a load (e.g. the aforedescribed rotary brush) in a first direction takes place in response to a continuously acting biasing force whereas movement in a second, opposite direction is brought about by a weight connected with the load support via a flexible link, the weight being suspended in a well for vertical movement so as to exert an overriding gravitational pull upon the load as long as the well is empty or nearly so; to reverse the movement of the load, a liquid—preferably water—is admitted into the well to engulf the weight, the buoyancy of the liquid displaced by the weight being sufficient to overbalance the gravitational pull of the latter when added to the aforementioned biasing force. Thus, repeated

reversals of load movement are possible by successive filling and draining of the well.

The means just described can be used for the alternate raising and lowering of the load, in which case the biasing force is furnished by gravity; it can, however, also be used for horizontal displacement, with the biasing force preferably developed by a counterweight also suspended for vertical movement and attached to the load support. If desired, the counterweight may itself be disposed in a second well which is filled with liquid when the first well is drained and vice versa; in this case the two weights and their volumes (hence, their buoyancy) may be substantially equal so that approximately the same force will act upon the load in its two directions of displacement. It should be noted that, with the use of gravity for driving the load both in a forward and in a reverse direction, the motive force acting upon the load in any position thereof will be constant at least for a given direction of movement, provided of course that the free path of the weight or weights in the associates well or wells is at least as long as the range of displacement of the load; this uniform drive would not exist in the case of a system using springs or the like for driving or restraining purposes.

The invention will be described in greater detail with reference to the accompanying drawing in which:

FIG. 1 is a somewhat diagrammatic elevational view of a system for scrubbing the front, top and back of an automotive vehicle in accordance with my present improvement; and

FIG. 2 is a perspective view illustrating the application of the principles of my invention to a system for scrubbing the sides of a vehicle.

In FIG. 1 I have shown a gantry-type framework **21** on which a cylindrical brush **1**, rotatable about its horizontal axis by a motor **22**, is journaled in a yoke **23** which is suspended from the structure by cables **2** passing over rollers **3** into a well **5**. A weight **4** (or, if desired, a pair of such weights) is anchored to the two illustrated cables **2** and is vertically movable in the well between a bottom position (full lines), corresponding to a maximum elevation of load support **23**, and a top position (dot-dash lines) in which the brush **1** is at its lowest working level in contact with one of the end faces of a vehicle **24** to be scrubbed.

Well **5** communicates with a tank **6** whose sealed top has an inlet port **7** for the admission of high-pressure gas (preferably air) under the control of a shutoff valve **8** and with an inlet port **9** for venting the tank to the atmosphere under the control of a shutoff valve **10**. When valve **8** is opened and valve **10** is closed, gas from a suitable source (such as an air compressor of the type usually available at automotive service stations) enters the tank **6** to depress the liquid therein from a level **12** to a level **11**, with concurrent rise of liquid in the well **5** to substantially the top of that well. Weight member **4** is so dimensioned that the buoyancy of the liquid displaced by it, when added to the weight of the brush **1** and yoke **23**, overbalances the weight of member **4** so that the latter is floated upwardly toward its top position, allowing the brush **1** to settle gently on the vehicle **24** or to descend to the front or to the rear of that vehicle for scrubbing the end surfaces thereof. As the vehicle is driven slowly through the gantry **21**, the brush **1** is cammed upwardly by the sloping back or windshield and then moves down again after cleaning the top of the vehicle, this vertical movement being facilitated by the fact that the floating weight member **4** reduces the effective weight of the otherwise rather unwieldy brush **1**. If necessary, of course, the attendant may assist in the upward or downward movement of the brush, e.g. by manipulating the cables **2**.

At the end of the scrubbing operation, stopcock **8** is closed and stopcock **10** is opened to vent the tank **6** to the atmosphere whereby the water from well **5** is returned to the tank and raises the liquid volume therein to the level **12**. This occurs at a relatively slow rate readily controllable by the proper cracking of the valve **10**. In the same manner, the rate of lowering of the brush can be adjusted by a partial opening of valve **8**.

If the draining of the well **5** were so rapid that, owing to inertia and frictional resistance, the descending weight member **4** could not keep pace with the dropping of the liquid level, the upward force acting upon the yoke **23** and the brush **1** would be (disregarding the weight of cables **2**) the difference in weight between the member **4** and the unit **1, 23**. In practice, however, a somewhat smaller force will be effective if the escape of gas through outlet **9** is throttled, with the descending member **4** remaining partly engulfed by the liquid so that a portion **4'** thereof is immersed in water while another portion **4''** projects upwardly therefrom. Thus, the buoyancy caused by the water displaced by weight portion **4'** still cancels part of the gravitational pull of member **4** so that the load rises at a relatively slow rate. If, however, this rise is impeded by some obstacle such as the drag of the counterrotating brush along the vehicle surface, the volume of the projecting weight portion **4''** increases at the expense of that of the immersed portion **4'** to augment the available driving force. Thus, the attendant may also control the rise and fall of brush **1** by a simple handle **25** coupled with valves **8** and **10** for selectively raising and lowering the liquid level in tank **6** and therefore also in well **5** with partial draining or filling of well **5**.

Since, with the arrangement shown, there always remains a residual pool of water in well **5** at a minimum level **12'**, the weight member **4** will come to rest in that pool in a balancing position which dispenses with the need for special stops to arrest the upward motion of yoke **23**. Naturally, such stops could be provided on gantry **21** for safety's sake.

In FIG. 2 I have illustrated a generally similar brush **13** suspended, together with its drive motor **26**, from a carriage **14** which is slidable along a horizontal track **27** in a supporting frame **15**. A sheave **17** and a pair of deflecting rollers **18** on frame **15** serve for the guidance of a cable **16** anchored to carriage **14**, the ends of this cable being respectively anchored to a pair of weights **19, 20** vertically movable in two wells **5', 5''**. Means for admitting water to well **5'** and draining it therefrom have been illustrated schematically as an inlet pipe **27** with a faucet **28** and an outlet pipe **29** with a faucet **30**. Similar filling and draining means, not shown, may be provided on well **5''**.

If the well **5''** is continuously kept dry, the alternate filling and draining of well **5'** will control the displacement of carriage **14** and brush **13** in two directions along the side of vehicle **24** as indicated by arrows A and B; motor **26** may be reversibly operated to drive the brush **13** in respective directions A' and B' so as to exert a counteracting drag. In this case, the two weight members **19, 20** should be so dimensioned that, as illustrated, member **19** is heavier than member **20** when freely suspended but lighter than the latter when immersed in water, the degree of immersion being again available to control the exerted force and thereby the rate of advance. If the two weight members **19, 20** were made identical in weight and volume so that the carriage **14** moves in the direction A upon a filling of well **5'** (with well **5''** empty) and the reverse motion (arrow B) is brought about by draining the well **5'** and filling the well **5''**, the tension of the longer section of cable **16** would be reduced during reverse motion (arrow B) so that this section might slip off its roller **18**.

Again, as illustrated in FIG. 1, an easily manipulated handle may be provided for the co-ordinated control of the several valves; naturally, the arrangement of FIG. 2 may also be equipped with a water reservoir for the well **5'** (or individually for both wells) to enable its filling and draining by compressed air or gas as described in connection with FIG. 1.

Although the system of FIG. 1 has been illustrated as having a stationary gantry through which the vehicle to be scrubbed must be driven, it will be self-evident that the treating unit **1–5** could also be mounted on a platform movable along the stationary vehicle, with the tank **6** likewise mounted on that platform or connected with well **5** through flexible conduits.

I claim:

1. An apparatus for controlledly displacing a load in two mutually opposite directions, comprising a movable support for said load, said support being subject to a continuously acting biasing force tending to displace same in a first direction; a well having a height at least equal to the range of displacement of said support; weight means vertically movable in said well; flexible tie means linking said weight means with said support for exerting thereon a gravitational pull overriding said biasing force in a freely suspended state of said weight means whereby said support is displaced in an opposite second direction; inlet means for admitting into said well a liquid which, upon engulfing said weight means, develops sufficient buoyancy to let said biasing force overbalance the residual gravitational pull of said weight means whereby said support is displaced in said first direction; and outlet means for draining said liquid from said well.

2. An apparatus as defined in claim **1** wherein said support is vertically movable, said biasing force being the combined weight of said support and said load.

3. An apparatus as defined in claim **1** wherein said support is horizontally movable, further comprising counterweight means suspended for vertical motion and other flexible tie means connecting said counterweight means with said support for exerting said biasing force thereon.

4. An apparatus as defined in claim **3** wherein said counterweight means is provided with a second well adapted to be alternately filled with liquid and drained concurrently with the filling and draining, respectively, of the first well, said counterweight means having substantially the same weight and buoyancy as said weight means.

5. An apparatus as defined in claim **1**, further comprising a liquid-filled tank communicating with the bottom of said well, said inlet means including a first port leading from said tank to a source of high-pressure gas, said outlet means including a second port for venting said tank to the atmosphere.

6. The combination of an apparatus as defined in claim **1** with a rotatable cylindrical brush journaled in said support, said brush representing said load, and motor means for rotating said brush about its axis.

References Cited

UNITED STATES PATENTS

2,318,995	5/1943	Holmes	15—53
2,610,342	9/1952	Griffiths.	
2,658,216	11/1953	Shusett et al.	15—21.0

EDWARD L. ROBERTS, Primary Examiner

U.S. Cl. X.R.

248—2