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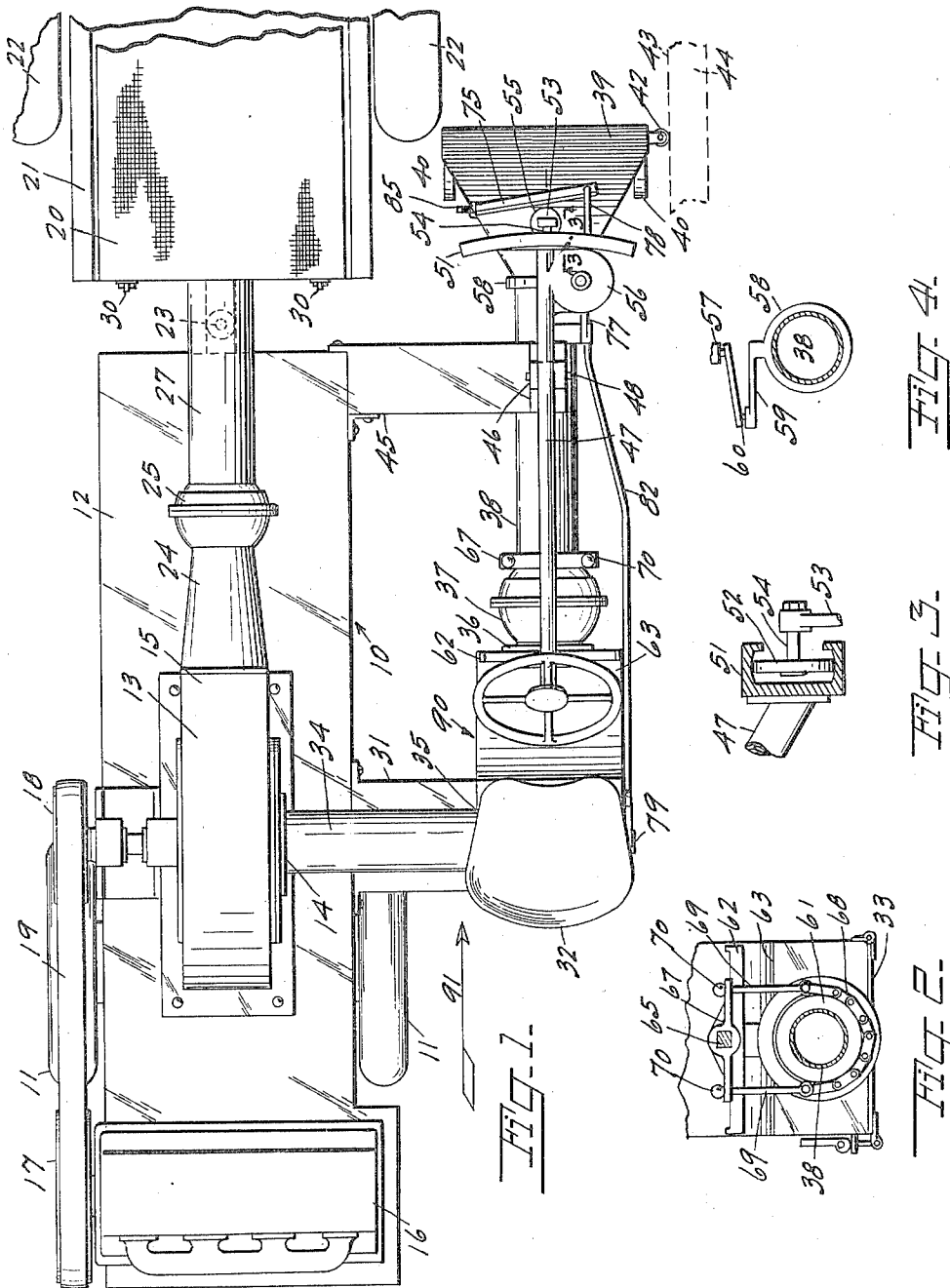
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2,496,028

VACUUM STREET CLEANER

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2 Sheets-Sheet 1



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2 Sheets-Sheet 2

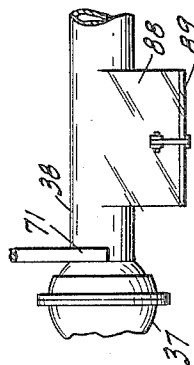
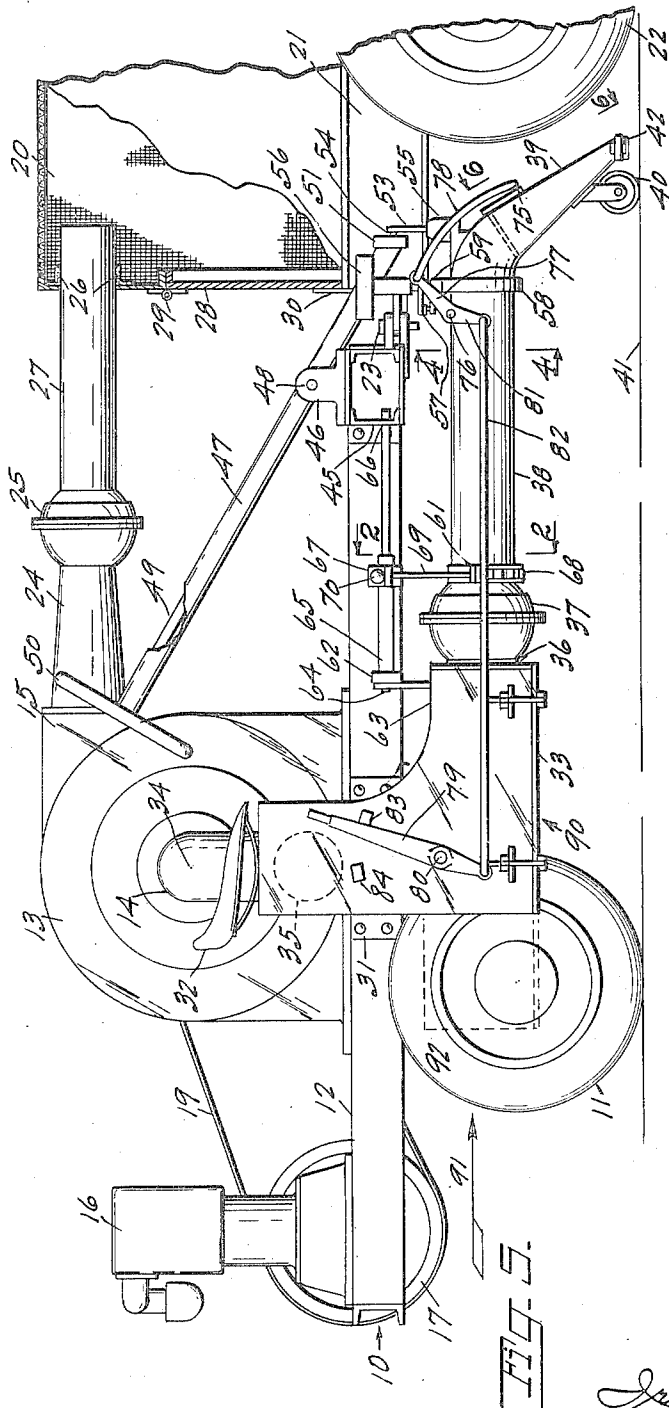


FIG. 6

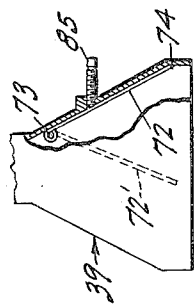


FIG. 7

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UNITED STATES PATENT OFFICE

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VACUUM STREET CLEANER

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6 Claims. (Cl. 15—340)

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This invention is an improvement over conventional street sweepers and cleaners particularly for removing dust, dry leaves, grass, and twigs, and other light and bulky material from streets because it operates solely on the suction principle with a suction nozzle adjustable vertically, laterally, and angularly, and also as to the active suction opening and therefore as to the degree of suction, and from a single location or position so that it is under instant control by the operator, for which reason it can be made to follow the contour of the surface of the street as well as that of the curb wall, and because of the adjustability of the active width of the nozzle it will clean out depressions or chuck holes. It has the further advantage in that heavy objects and materials, such as rocks, pebbles and glass, are discharged from the suction stream on the way from the nozzle to the fan or other suction producing device which is thus protected against damage. A further improvement is in the receiving and filtering means which is preferably mounted on a dump truck to which the vehicle or trailer carrying the cleaning equipment is coupled and which provides the towing means, wherefore the truck can be uncoupled from the suction cleaner vehicle and driven directly to the dump. If desired, another dump truck with receiving and filtering means can be substituted while the first one is proceeding to the dump so there will be practically no delay in the operation of the cleaner, thus increasing the area of street surface that can be cleaned in a given period of time.

The objects and advantages of the invention are as follows:

First, to provide a suction street cleaner with a suction nozzle which is universally adjustable relative to the surface of a street.

Second, to provide a suction street cleaner as outlined in which universal adjustment of the nozzle is controllable from a single manual-control position.

Third, to provide a cleaner as outlined in which the suction nozzle is adjustable as to the active width or area for adjusting the relative intensity of suction, for cleaning out chuck holes and the like.

Fourth, to provide a suction street cleaner with segregating means between the nozzle and the suction producing means, to remove heavy materials and objects from the suction stream before reaching the suction producing means to prevent damage thereto.

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Fifth, to provide a suction street cleaner with a dump truck-supported receiver and filter and with the dump truck simultaneously functioning as the towing means for the suction cleaner supporting vehicle with the vehicle quickly and conveniently attachable to and detachable from the truck, and with the truck with receiver and filter replaceable by another at will to expedite the cleaning operations and increase the area coverable within a fixed period of time.

Other objects and advantages of the invention will become apparent as the following description is read on the drawings forming a part of this specification, in which:

Fig. 1 is a top plan view of the invention, with the power driven vehicle or dump truck with receiver and filter shown fragmentarily.

Fig. 2 is a section taken on line 2—2 of Fig. 5.

Fig. 3 is a section taken on line 3—3 of Fig. 1.

Fig. 4 shows the connection between the suction line and the nozzle control mechanism and corresponds to a section taken on line 4—4 of Fig. 5.

Fig. 5 is a side elevation of Fig. 1.

Fig. 6 is a front view of the suction nozzle looking in the direction 6—6 on Fig. 5, and partly shown in section.

Fig. 7 is a modification of the heavy object and material segregating or extracting means.

The suction street cleaner is installed on a vehicle such as a trailer 10 having road wheels 11 though not limited to a two-wheel trailer as illustrated, and having a suitable bed or frame 12.

Mounted on this vehicle is a suction fan 13 having an intake 14 and a discharge 15, and driven by a prime mover such as a gasoline engine 16 through pulleys 17 and 18 and belt 19, or other suitable operative connections.

A combined cleanings receiver and dust filter 20 of any suitable conventional type is detachably mounted on a conventional dump truck 21 having road and driving wheels 22 and having coupling means 23 for detachably coupling the truck to the vehicle 10.

The discharge from the suction fan is connected to the receiver 20 through a flexible conduit, such as fabric or rubber hose, or as illustrated, a communication consisting of two sections of sheet metal pipe, one section 24 being fixedly connected to the discharge and terminating in a ball-joint coupling 25, with the other section 27 slidable in a passage 26 in the receiver which is lined with a suitable sealing material to provide a dust-tight seal around the section 27

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the other end of which section terminates in the ball-joint coupling 25; the sliding joint to the receiver and the ball-joint coupling providing the flexibility to allow for relative movements of the truck and trailer.

With this arrangement, a truck 21 with a receiver and filter which has become filled with cleanings can be quickly uncoupled from the vehicle carrying the cleaning apparatus, and another truck with an empty receiver and filter can be moved into position and coupled in place of the truck 21, to proceed with the cleaning of the street while truck 21 is driven to the dump, the cleanings dumped from the receiver and filter, and then returned to replace the other truck when its receiver and filter has become filled. A door 28 hinged at the top as indicated at 29 and latched at the bottom as indicated at 30 permits direct dumping of the material from the receiver and filter by any conventional dump truck.

As illustrated, a bracket 31 is affixed to and extends laterally from the side of the trailer and is formed as a box-like structure with an operator's seat on top indicated at 32, and which box-like structure has an opening with a closure 33 therefor, to permit removal of segregated materials at will, and which materials are intercepted and collected in this box-like structure if their specific gravity or weight is too great for the reduced suction to change their course and carry them through. An intake pipe 34 communicates with the intake 14 of the fan and enters the box-like structure or interceptor as indicated at 35 through the side adjacent to the trailer, though not limited to a connection to this specific side or elevation.

This interceptor is shown as L-shaped in side elevation to provide a support for the seat 32 and simultaneously a change of course for the suction stream. The suction conduit is connected to the interceptor at 36 and consists of a ball-joint coupling 37 and a pipe 38 which terminates in a suction nozzle 39 which is supportable on casters 40 to establish the spacing between the suction end of the nozzle and the surface 41 of the street, and a side wheel 42 is provided to ride the side wall 43 of the curb 44.

A second bracket 45 extends laterally from the trailer 10 and carries a bearing 46 in which a nozzle-controlling nozzle control column 47 is pivotally supported as indicated at 48, this nozzle control column enclosing a conventional steering shaft 49 at the upper end of which a steering wheel 50 is fixedly mounted. An arcuate track 51 is fixedly mounted on the lower end of the nozzle control column 47 with the axis of the radius located at the center of the ball joint 37. A wheel 52 rides in this track as illustrated in Fig. 3 and is connected to the nozzle 39 through a connection 53 which is pivotally connected at its upper end to the wheel 52 as indicated at 54, and at its lower end through a ball-joint connection to the nozzle as indicated at 55.

The nozzle control apparatus is of conventional automotive steering unit construction and includes a column 47, with a shaft 49 passing therethrough. A control lever 57 is operated by a worm gear reduction unit 56 by means of the shaft 49, this connection between the control lever 57 and shaft 49, indicated at 56, being of the same general type and construction used for automobile control. A bearing ring 58 encompasses the pipe 38 and has a rigid arm 59 to

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which the steering lever 57 is connected through ball-joint connections 60, thus permitting rotative adjustment of the pipe 38 for angular adjustment of the nozzle.

By rotating the wheel 50 the nozzle 39 is adjusted laterally to clear uneven curbing, offsets, or other obstructions, or to operate on a new strip; and by depressing the wheel the nozzle is lifted clear of the surface of the street to clear culverts and other obstructions or projections.

Suitable means is required for changing the angularity of the nozzle to compensate for crown and for depressions or unevenness, and one means is illustrated as consisting of a sprocket 61 fixed on the nozzle-section 38 of the conduit, as close as possible to the ball joint so that little compensation for vertical and lateral movement is required. A foot treadle 62 is pivotally mounted on the foot-board 63 as indicated at 64 and has a shaft 65 fixed therein with the other end of the shaft pivotally supported in the lateral bracket 45 as indicated at 66. Secured intermediate the length of this shaft is a rocker member 67 to each end of which is secured, as by means of connecting rods 69, a chain 68. This chain is fitted just loose enough to allow the nozzle to drop to the lowest relative level at which it will be operated.

In view of the relative position of the adjusting means, the sprocket and chain, or the cable, will compensate for any desired elevation or depression of the nozzle, as well as for side sway, since the relative movement at the point of application will be so slight as to be almost unnoticeable, a slight freedom of the chain or cable being all that is necessary. The ball connections 70 will take care of the angular variations. Thus by depressing one side or the other of the foot treadle 62, the conduit is turned and thereby the nozzle is angularly adjusted, changing the angularity to suit crown or ditch.

Thus the operator controls the elevation and lateral position of the nozzle respectively by vertical and rotative movements of the steering wheel 50, and the angularity of the nozzle through foot operation of the treadle 62.

Obviously angular adjustment of the nozzle can be carried out by means of a lever 71 fixed at one end to the conduit and extending upwardly within reach of the operator as illustrated in Fig. 7, but such an arrangement would result in a lack of instant and simultaneous control of all adjustments.

When depressions or chuck holes are encountered, more intense suction over a lesser width is usually necessary, therefore restricting means including a blade 72 pivoted at one end near the upper end of the nozzle portion as indicated at 73 with the lower end 74 of the blade free and with the blade fitting closely within the nozzle and with the nozzle internally formed to fit all adjustments of the blade to maintain a close fit in any position, is provided.

Fixed to the upper end of the blade pivot 73 is a lever 75. This lever can be arranged to be secured in various adjusted positions for manual control at the nozzle, but is illustrated with a remote control for adjustment from the same position provided for all other adjustments, from the seat 32. Pivotally mounted intermediate its length at 76 on the conduit section 38 is a lever which has one arm 77 connected to the outer end of lever 75 through a connecting rod 78. A hand lever 79 is pivotally mounted on the side of the

interceptor as indicated at 80 and has its lower end connected to the arm 81 through a connection 82. Suitable catches or retainers are provided to hold the lever 79 in respective adjusted positions.

Obviously the elements 76 to 84 could be dispensed with as previously mentioned, with the lever 75 being directly manually adjustable; however, means for adjusting the nozzle from the operator's position is desirable if the highest efficiency is to be realized, so that the operator can adjust the nozzle when he sees the nozzle closely approaching a depression or chuck hole. A screw adjustment is also provided at 85 to limit the maximum opening or active width of the nozzle for highest efficiency for normal operation.

In Fig. 7 is shown a modification in which the interceptor for removing and storing heavy objects and materials from the suction stream between the nozzle and the fan is formed directly on the suction conduit, being formed as an enlargement 88 with a dump opening provided with a releasable closure 89. When this type is used, the intake conduit 34 curves directly from the intake of the fan to the ball joint 37, though both, the enlargement 88 and the box-like structure 90 can be used simultaneously to function in sequence to cause heavy objects and materials such as glass, rocks, pebbles, bolts, nuts, nails, and the like, to drop out of the suction stream and thus prevent their reaching the fan which might be damaged thereby, while permitting dust, leaves, twigs, grass, and all such lighter and bulky materials to pass directly to the fan and thence to the receiver 20.

As illustrated, the trailer 19 is towed in the direction of the arrow 91, moderately close to the curb for cleaning the gutter, or following some other line of demarcation, as a previously cleaned strip. The prime mover 16 is set in operation to drive the fan 13, which creates a suction through the nozzle 39.

The operator (not shown) seated on the seat 32 grasps the wheel 50 and rests his feet on the respective ends of the treadle 62. The lever 79 is normally adjusted for full opening of the nozzle. As the vehicle moves forward, the operator watches the curb or other line of demarcation such as a previously cleaned strip, raises and lowers the nozzle when obstructions such as culverts are met and passed by depressing and releasing the wheel, and clears lateral projections from the curb and follows the line of demarcation through rotative movements of the wheel 50. If the surface slopes transversely, one or the other end of the treadle 62 is depressed to angularly adjust the nozzle to the slope. When a depression or chuck hole is closely approached, the lever 79 is adjusted to restrict the nozzle to intensify the suction over a lesser width, as indicated at 72' in Fig. 4. Thus all adjustments of the nozzle are controllable from a single location or position.

Dust, leaves, grass, twigs, pebbles, glass, and other materials which litter the streets, are sucked through the nozzle and travel toward the fan within the suction stream, but at some point intermediate is an interceptor for the rocks, pebbles, glass, nails, bolts and nuts, and other materials of relatively high specific gravity, such as the box-like structure 90 or the enlargement 88, or both. At these points, because the cross-sectional area is at least twice that of the conduit, the enlargement or increased area reduces the speed of the suction stream to half

or less than half of that in the suction pipe or intake pipe, and creates eddies, thus causing the heavy materials to drop out and collect in the bottom of the interceptor, while the dust, paper, grass, leaves and the like pass on through the intake pipe to the fan where the bulky materials such as the leaves and twigs are beaten and broken up by the fan and then driven through the discharge line 24, 25, 27 to the receiver 20.

With the type of interceptor 90, in addition to the reduction in speed, at least one, and as shown two abrupt changes in direction occur with the first change vertically up and the second at right angles horizontally, and these changes occur in the area of low suction-stream speed. Obviously, heavy objects will not change their direction of travel readily in a fluid medium and will mostly travel straight against the back wall of the interceptor and then fall to the bottom, while those that make the up-turn will mostly be projected against the top wall in the space above the intake to the fan. This assures complete removal of all relatively heavy materials and objects.

When the receiver 20 is filled to capacity, the truck 21 is stopped and uncoupled from the trailer 10. Another truck 21 with receiver and filter 20 can be moved into position and coupled to the trailer 10 to proceed immediately with the cleaning of the street, or the same truck can proceed to the dump, release the catches 30 on the receiver, hoist the front end of the truck body which will cause the cleanings to flow out of the opening for which the door 28 serves as a closure, after which the truck can return and be recoupled to the trailer to proceed with the cleaning.

When the interceptor requires emptying, it can be dumped onto the street, or into a wheelbarrow or the like. The volume of the interceptor below the suction pipe or ball joint connection should be sufficient to function as storage throughout a considerable run of the suction cleaner. Obviously, the box-like structure can be extended rearwardly to increase the storage capacity and which would likewise increase the efficiency of the interceptor, the extension being indicated in dotted lines at 92.

I claim:

1. In a street cleaner including a vehicle and suction means and a nozzle; nozzle adjusting means comprising; a conduit extending normally parallel to the path of the vehicle and consisting of a fixed section connected to the suction means, and an adjustable section swivelly connected to said fixed section for universal adjustment of the adjustable section, and having the nozzle mounted on the end of the adjustable section; a nozzle control column having a horizontal pivotal support intermediate its length on said vehicle and having a steering wheel at its upper end and having connection at its lower end to the nozzle for vertical adjustments of the nozzle relative to a street surface; said steering wheel having a steering connection to said nozzle for lateral adjustments relative to a line of demarcation such as a curb; and a foot treadle having operative connections to said adjustable section for rotatably adjusting the section for angular adjustments of the nozzle relative to a street surface.

2. A suction cleaner, comprising; a vehicle; a support mounted on said vehicle; a suction nozzle and a two-part conduit therefor intermediately connected for universal adjustment and supported at one end by said support, and adjusting

means selectively manually operable and having connections with said conduit for adjusting said nozzle vertically, laterally, and angularly relative to a surface at will, and comprising a nozzle control column having a pivotal support intermediate its length on a horizontal axis on said support and having an operative connection at its lower end to said conduit for raising and lowering the nozzle, and manually operable means at its upper end and having a second operative connection to said conduit for lateral adjustments of the nozzle through rotative movements of said manually operable means, and a manually operable connection to said conduit for rotation of the conduit about its longitudinal axis for adjusting the angularity of said nozzle to conform to the transverse slope of a surface at will, whereby said suction nozzle is directable to conform in its travel to the contour of a line of demarcation such as a curb, and to the contour of the surface of a street, and to avoid obstructions.

3. A suction cleaner comprising; a vehicle; a two-part conduit intermediately connected for universal adjustment, a nozzle carried at one end of said conduit, and adjusting means selectively manually operable and associated with said conduit and with said nozzle for adjusting said nozzle vertically, laterally, and angularly about the longitudinal axis of the conduit at will; whereby said suction nozzle is directable to conform in its travel to the contour of a line of demarcation such as a curb, and to the contour of the surface of the street, and to avoid obstructions; said conduit having a swivel connection intermediate its length for said universal adjustment; said means for vertically and laterally adjusting said nozzle comprising, for vertical adjustment, a nozzle control column having a hand wheel at its upper end; a support carried by said vehicle; a bearing supported by said support on a horizontal axis and having said nozzle control column pivoted intermediate its length therein; said nozzle control column terminating at its other end in an arcuate track member; a track wheel for said track member, a link pivotally connected at one end to said track wheel and having a ball joint connection at its other end to said nozzle; and, for lateral adjustment, an operative connection between said hand wheel and said nozzle for lateral adjustment of said nozzle through rotation of said hand wheel, with said nozzle vertically supported through said track wheel, track member, and link.

4. A vacuum nozzle and adjusting means therefor comprising; a vehicle; a conduit consisting of a fixed section supported by said vehicle, and an adjustable section having a swivel connection to said fixed section for universal relative adjustment; said vacuum nozzle being mounted at the terminal end of said adjustable section; a support projecting from said vehicle; means for vertically and laterally adjusting said nozzle comprising a nozzle control column having a steering wheel at one end and an operative steering connection between said steering wheel and said nozzle for lateral adjustment of said nozzle through rotation of said steering wheel; a bearing supported on a horizontal axis by said support; said nozzle control column being pivotally supported intermediate its length by said bearing and terminating at the other end in an arcuate track member; a track wheel operating on said track member; a link pivotally connected

to said track wheel, and a ball joint connecting said link to said nozzle for said vertical adjustment; and means manually operable and operatively connected to said adjustable section for rotating the adjustable section of said conduit with said nozzle in either direction at will for angularly adjusting said nozzle relative to a surface.

5. A suction cleaner comprising; a vehicle; a suction line consisting of a fixed section and an adjustable section of conduit, and a ball joint connecting the sections for universal adjustment of said adjustable section, and a suction nozzle mounted on the terminal end of said adjustable section, with said adjustable section normally paralleling the path of said vehicle; a nozzle control column having a steering wheel at its upper end and swivelly connected to said nozzle at its lower end; a support projecting from said vehicle; a bearing supported by said support on a horizontal axis; said nozzle control column being pivoted intermediate its length in said bearing for vertical adjustments of said nozzle relative to a street surface; a steering connection between said steering wheel and said nozzle for lateral adjustments of said nozzle relative to a line of demarcation such as a curb; and manually controlled means operatively connected to said adjustable section for rotative adjustments of said adjustable section for angular adjustments of said nozzle relative to a street surface.

6. A suction cleaner comprising; a vehicle; a support projecting from said vehicle; a conduit having a universal joint connection intermediate its length and a nozzle mounted on one end; a dust receiver mounted on said support and having the other end of said conduit connected thereto; a bearing mounted on said support; a control column pivotally supported on a horizontal axis intermediate its length in said bearing and a shaft extending through and rotatable within said column, and manual control means on said shaft at one end of said column, and a pivotal connection from the other end of said column to said nozzle, and a second connection from the other end of said shaft to said one end of said conduit for respectively adjusting said nozzle vertically and laterally relative to a street surface; and manually controllable means having connection with said conduit for rotatably adjusting said one end for angular adjustments of said nozzle; whereby said nozzle is manually directable to conform in its travel to the contour of a line of demarcation such as a curb, and to the contour of the surface of a street, and to avoid obstructions.

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