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[54] **BEACH-CLEANING VEHICLE**
5 Claims, 5 Drawing Figs.

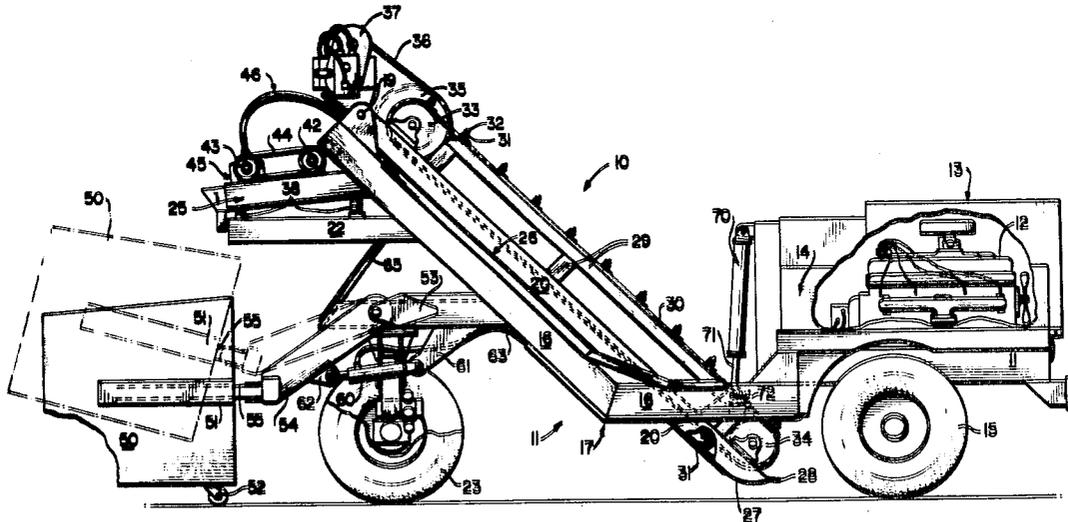
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171/101
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- [50] Field of Search..... 171/63,
101, 114, 119, 120, 126, 127, 132

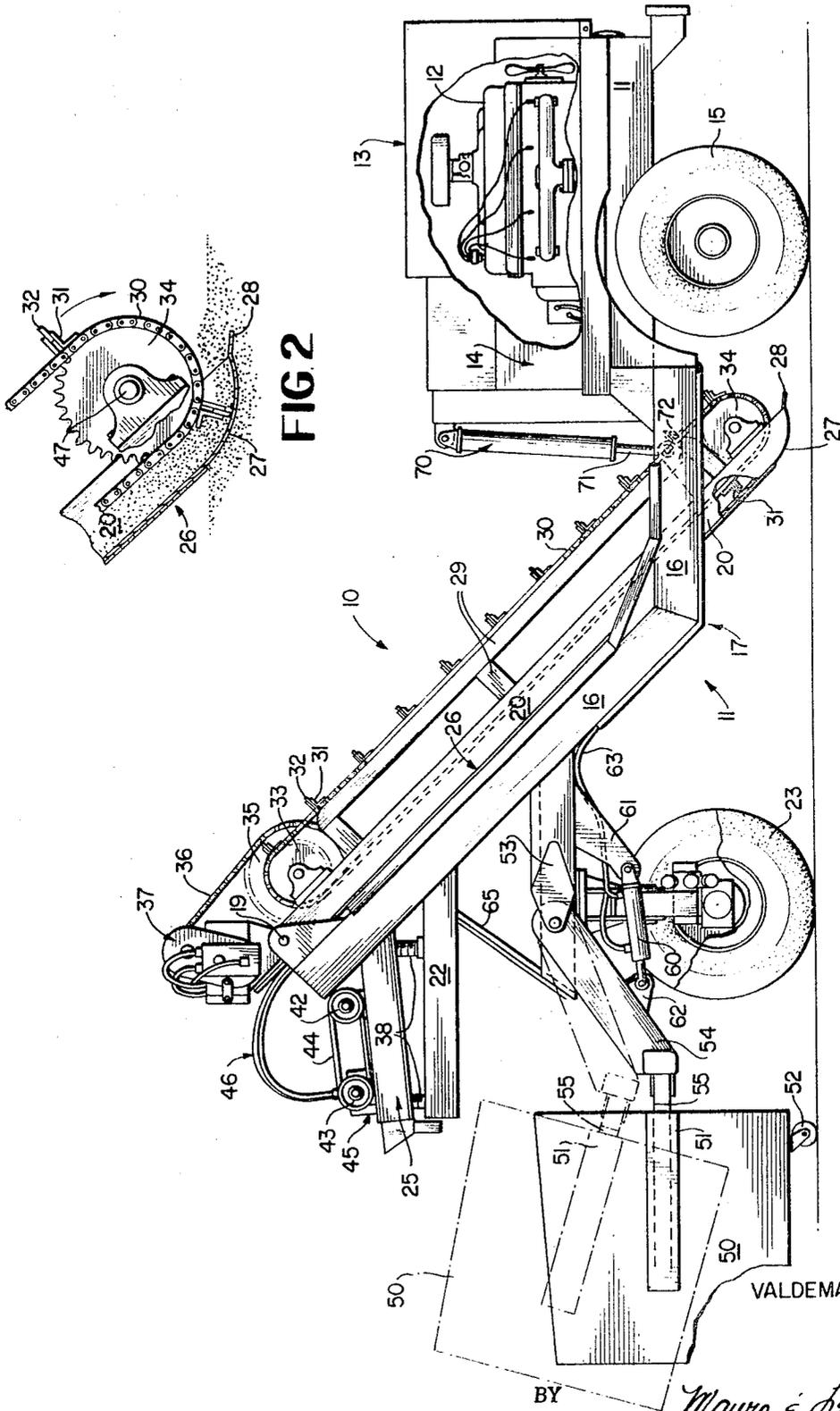
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ABSTRACT: The vehicle is of the type adapted to move over the ground and by means of a scoop, elevator, shaker screen and receptacle, to separate large particles of the ground surface retrieved from smaller particles thereof, such as beach sand from trash contained therein, and to return the former to the ground or beach, while retaining the larger particles (trash) in the receptacle for transport elsewhere. The vehicle is equipped with an engine, for propulsion, from which power takeoffs operate hydraulic systems which in turn operate: a pivoted conveyor equipped with a ground scoop at its lower end, engaging the ground with a selective ground penetration; the conveyor feeding onto a powered shaker or separator screen, the screen serving to free and return to ground small particles passable through the mesh thereof, while retaining and passing into a bin the larger particles for discard or other usage; a bin, located adjacent the delivery end of said screen, the bin being mounted on the vehicle by raising and lowering arms. The vehicle is 4-wheel drive and steered by the rear wheels to reduce torque in the conveyor scoop in its ground engagement and to assist coverage of a complete area without gaps. The wheel arrangement further allows the shaker device to discharge to the rear of (and hence covering) the tracks made by the vehicle. All controls are trained forward to a single operator.





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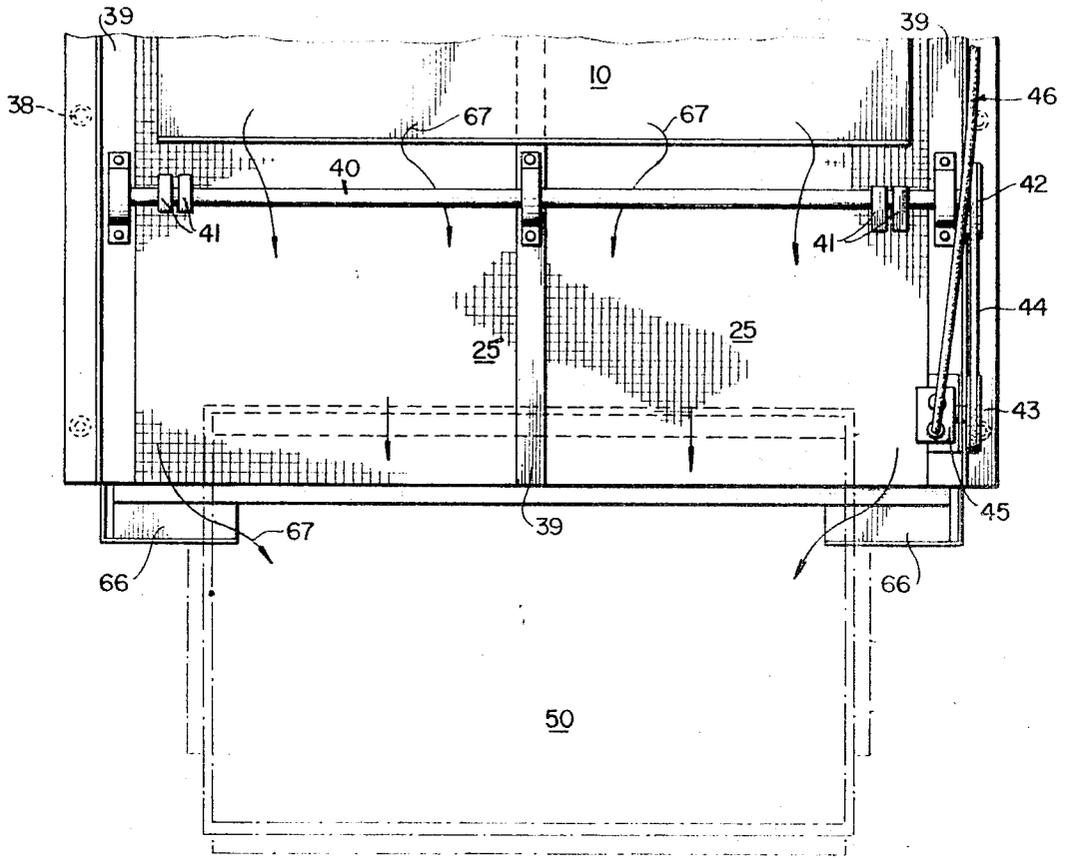


FIG 3

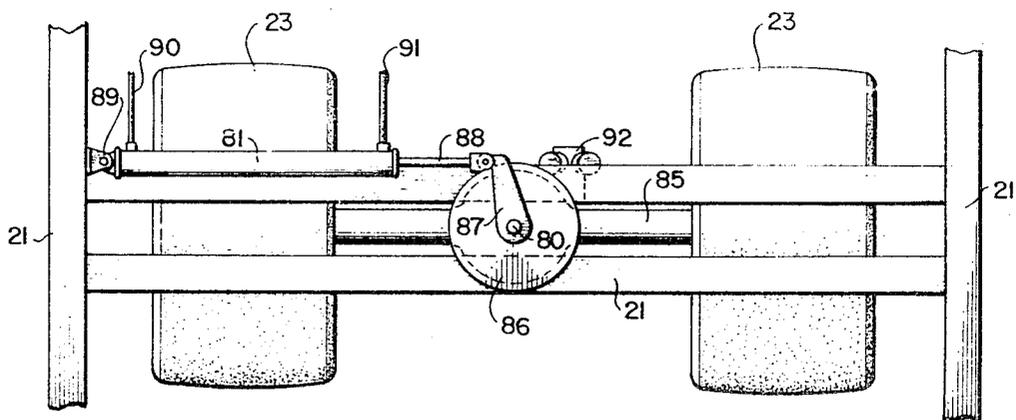


FIG 4

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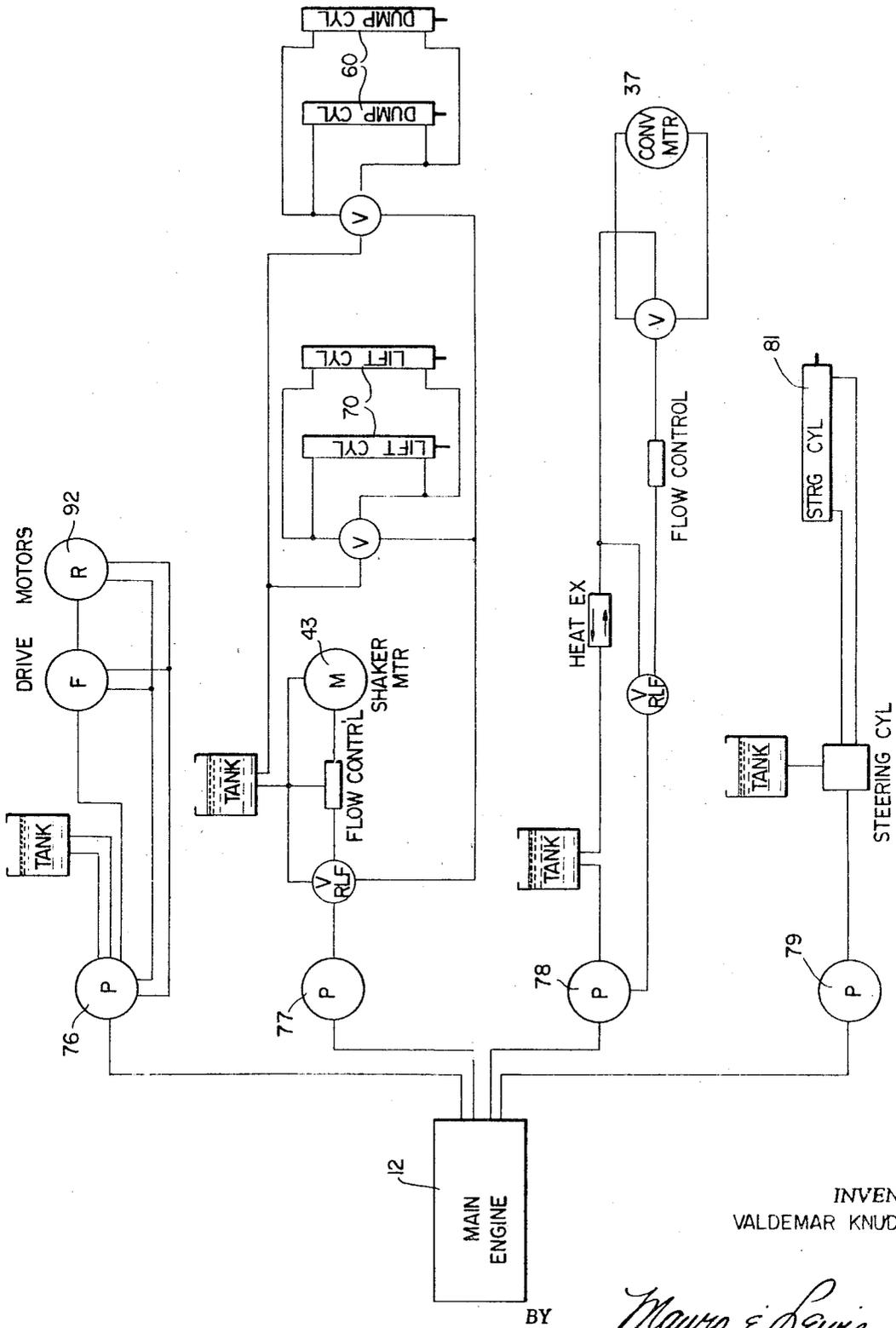


FIG 5

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BEACH-CLEANING VEHICLE

BACKGROUND OF THE INVENTION

Broadly, this invention relates to a class of vehicles intended to pass over the ground and in doing so, to remove a strip thereof for the purpose of removing large particles from small particles by means within the vehicle; in other words, a vehicular separator of one class of solids from another according to size. Such analogous vehicles include rock pickers, root and weed removers, and vehicles for harvesting underground agricultural products such as potatoes, beets, onions and peanuts.

More specifically, the invention relates to a beach-cleaning vehicle, of which a few are patented in the prior art, although it will be noted that the invention is adaptable to the other uses mentioned above.

The use of beaches throughout the world for swimming and other recreation is in many instances intense, and in such cases the sanitation problems are acute. The litter left on popular beaches in many cases defies description: despite the provision of trash receptacles and expensive manual cleaning efforts, such beaches can quickly become unsanitary and unusable. A particularly undesirable habit of beach users is simply to bury trash or garbage to avoid detection by beach guards, or to avoid taking it to the nearest trash can.

A relatively cheap and efficient beach cleaning vehicle would solve this problem, and this is the principal object of this invention. Prior art beach cleaner vehicles can be criticized for one or more of these reasons: they are cumbersome, or accomplish an inadequate job of trash separation, or require more than one operator; they may treat an inadequate beach strip to an inadequate depth of removal; some cannot be guided to cover a beach without leaving gaps; many cannot be highway driven to other beaches except by trucking or towing; many have driving means unsuited to gritty or hilly beach conditions. The invention solves these and other problems.

BRIEF SUMMARY OF THE INVENTION

The vehicle consists of a frame supported by four wheels, with the main engine located over the front wheels where the operator is also positioned with command of all controls. All four wheels are driven, the front wheels being nonsteerable, the rear wheels being steerable. The frame is configured to support a forwardly inclined trough-shaped conveyor in which operates an endless belt having paddles for shifting sand and trash upwardly and to the rear. The lower or leading end of the conveyor is equipped with a scoop whose ground penetration is adjustable as to depth due to the fact that the conveyor scoop is pivoted at its upper or rear end. Hydraulic jacks, attached to the front end of the conveyor, control the degree of tilt and hence the amount of ground penetration.

The arrangement of the conveyor scoop is further notable in that the sand penetration edge thereof is closely adjacent the front wheels of the vehicle, so that the front wheels serve to adjust constantly the depth penetration of the scoop to conditions of the terrain, such as hills or hillocks in the sand. Still further, the front wheels being nonsteerable, the conveyor scoop is in the best position to avoid sidewise torque or twisting as the rear wheels perform turns.

The scoop is shaped with regard to the turning arc of the conveyor paddles to prevent being choked by large objects or by sand compaction.

The conveyor dumps its load of mixed sand and trash from its upper end onto a shaker or separator screen, power agitated. This screen is located rearwardly above the rear wheels, and is of a mesh suitable to return sand to the ground. An apron or deflector screen insures this result. Larger articles, trash or stones for example, do not pass through the shaker screen, but are agitated rearwardly due to the rearward tilt or inclination of the screen. These articles fall into a trash bin carried by power-operated arms. These arms raise the bin from the ground into receiving position, and lower the bin

onto the ground for emptying, or for attachment of another empty bin. The arrangement is such that the vehicle may simply drive away from a loaded bin, once it has been lowered to the ground, and then back into connection with another bin.

The power drives for the conveyor and separator screen are preferably hydraulic motors; hydraulic jacks are employed for the raising and lowering of the trash bin and for tilting the conveyor; all are driven by power takeoffs from the main engine, and all controls are centralized at the operator's seat. These sealed driving and control means are highly impervious to abrasion and wear in the sandy or gritty conditions found on beaches, and resist damage from salt air or water.

BRIEF DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. 1 is a side elevation of the beach cleaning vehicle, with portions cut away to show internal parts, and with the rear trash bin 50 shown in (dotted) operative position and in (solid) removal positions;

FIG. 2 is an enlarged side detail showing the lower end of the conveyor 20 with sand scoop 27 in operative position;

FIG. 3 is a top view of a portion of the separator screen 25 showing trash bin 50 (dotted) in receiving position;

FIG. 4 is an enlarged top view in elevation showing the rear steering mechanism; and

FIG. 5 is a diagrammatic view showing the power train to all driven parts.

DETAILED DESCRIPTION OF THE DRAWINGS

In FIG. 1, the vehicle is generally designated as vehicle 10, having a frame generally designated at 11. The front portion of frame 11 supports the main engine 12 and a control section or operator's seat generally shown at 13 alongside 12. In this front section of the vehicle are also located mechanisms for driving and steering the vehicle and various other power-operated mechanisms located in the enclosure 14, which are not shown in this view for reasons of clarity. These are per se conventional, and will be described further in more detail for FIG. 5. The same applies to the controls which are on control panels accessible to the operator at 13.

Front wheels 15 are hydraulically power-driven by means similar to rear wheels 23, to be later described. Front wheels 15 are not steerable, rear wheels 23 are steerable.

Rearwardly from the vehicle front, frame 11 consists of pairs of spaced beams or girders 16 angled upwardly at 17 and terminating with fittings bored to provide pivot points for shaft 19 supporting the conveyor 20 fitted between girders 16. Girders 16 further carry extended arm portions supported by rear wheels 23. Also from girders 16 extend arms 22 which support the separator screen 25.

Conveyor 20 is formed with a sluice like bottom portion 26 whose upper end pivots of shaft 19, and whose lower end terminates in the scoop 27, equipped with a replaceable scooping blade 28. Mounted above the side edges of bottom 26 is an openwork boxlike frame 29, over which are trained the spaced pairs of conveyor chains 30. Chains 30 travel in unison and spaced between them laterally are the conveyor paddles 31 equipped with replaceable wear shoes 32.

Chains 30 are trained around pairs of sprocket wheels 33 and 34, wheels 33 being mounted on a common driving shaft with sprocket 35 which is in turn driven by chain 36 sprocketed to a fluid driven motor 37, the power source and controls for which lead back to engine 12 and section 13.

Conveyor 20 is rendered tiltable upon the axis of shaft 19 and the angle of tilt which controls depth penetration of scoop 27 is adjusted by the attachment to its lower end of a pair of hydraulic jacks 70, whose pistons 71 are pivotally attached to brackets 72 carried by conveyor 20. The actuation of jacks 70 are again controlled by fluid power and valve means to be further explained. FIG. 2 shows an enlarged view of the scoop 27 formed on conveyor 20, in active position for sand penetra-

tion. Scoop 27 is shown to be shaped in a curve closely defining the sweep of the paddles around the axis of the sprocket 34 to prevent the presence of any reduced areas of compaction which would lead to the jamming of intake material, shown in dotted line (granular).

As seen in FIGS. 1 and 3, separator screen 25 is carried by supporting arms 22 extending from frame portion 16. Screen 25 is supported by four sets of springs 38 which are adjustable with respect to the horizontal attitude of the vehicle so that screen 25 is normally rearwardly tilted. Screen 25 is mounted in a frame 39 over which is mounted an eccentrically vibrated shaft 40 by means of eccentrically mounted weights 41. Shaft 40 is power-rotated, causing weights 41 to vibrate shaft 40 and hence screen 25, by means of pulleys 42 and 43 connected together by belt 44, pulley 43 being shafted to hydraulic motor 45. From motor 45, fluid and control lines 46 lead to control section 13 and engine 12.

In FIGS. 1 and 3, the trash bin 50 is shown (dotted) in elevated position to receive trash or large solids not passable through shaker screen 25. The fine particles such as sand, fall to the ground to the rear of wheels 23. To ensure this result and to protect rear wheels 23 from windblown sand and grit, an apron or baffle screen 65 is attached to arms 22 of the frame 11, as seen in FIG. 1.

The rear wheel driving and steering mechanism will next be described with reference to FIGS. 1 and 4. FIG. 4 is a top view with some parts broken away and some parts omitted, wherein frame 21 and rear wheels 23 are shown as indicated in FIG. 1. Wheels 23 are connected to frame 21 through an axle 85 which pivots horizontally around a pintle located in the base of shaft 80. Shaft 80 is mounted vertically through swivel plate 86 and connects to lever 87. Lever 87 in turn connects with the piston end of hydraulic steering jack 81 pivoted to frame 21 at fitting 89. Fluid lines 90, 91 lead to the control console at 13, FIG. 1, which mounts a control valve. Shaft 80 is pivoted on its vertical axis by actuation of jack 81, thus turning axle 85 and wheels 23 on the horizontal axis. In FIG. 4 is also shown a hydraulic motor 92 for driving wheels 23 by conventional hydraulic power means leading to engine 12, not shown in detail.

Further as seen in FIG. 1, trash bin 50 is equipped with a pair of slotted straps 51 and ground wheels 52, the latter for manual handling of the bin when detached from vehicle 10. Arms 21 of frame 11 carry side fittings to which are pivoted the folding lift arms 54 whose extensions are shaped to mate into the sockets formed by straps 51. When so connected, bin 50 is raised or lowered by use of the hydraulic jacks 60 connected between fittings 61 on arms 21 and fittings 62 on arms 54. Fluid and control lines 63 lead to the control section 13 and motor 12. Sluices 66, FIG. 3, aid in guiding large trash rearwardly across screen 25 into bin 50, arrows 67 showing the flow of this material.

FIG. 5 shows in diagrammatic form, the four power takeoffs, pumps 76, 77, 78, 79, leading to the driven items, these being the front and rear wheels, the lift cylinders for adjusting conveyor 25, the bin lifting cylinders, the conveyor drive motor, and the rear wheel steering. In this view, the numerals identify parts previously described, to which legends are also applied.

MODE OF OPERATION

The vehicle 10 is driven onto a beach to be cleaned, with conveyor 20 and an empty bin 50 in elevated position. Using jacks 70, conveyor 20 is lowered into the sand so that scoop 27 penetrates to a suitable depth, usually 6 inches or less. The conveyor paddles 31 are actuated via motor 37 and the vehicle is driven along the beach, the speed of movement of the paddles being adjusted to the driven speed of the vehicle. Vibration of the shaker is started.

Sand and trash will now be scooped from the beach to the top of conveyor 20 and dumped onto the shaker 25, the sand passing through this screen and back onto the beach to the rear of wheels 23. Trash or objects larger than sand will pass across screen 25 and fall into bin 50.

When bin 50 is full, it may be lowered into ground contact by lowering arms 54, 55, whereupon bin 50 may be separated from vehicle 10 by driving away from it.

Bin 50 may then be manually dumped or another empty bin placed on the vehicle.

Alternatively, a full bin 50 may be lowered onto another vehicle such as a flat bed truck, and it, with others like it, may be driven away to a disposal area.

What I claim is:

1. In a vehicle for beach cleaning or the like intended to separate from ground material comprising relatively large articles such as trash or refuse from relatively small natural particles such as beach sand to be returned to the ground, the combination of: a vehicle chassis equipped with front and rear wheels; a source of power means connected for moving said vehicle and other power-operated devices carried by said chassis described below; said front wheels being nonsteerable; said rear wheels being steerable by connections to a control station on the chassis, said station being equipped with controls for driving means and for operating all power means; said power-operated devices further including a pivoted conveyor mounted internally within said chassis in such manner that the forward end of said conveyor may be inclined forwardly toward the front end of said chassis, said conveyor having at its front end a power-operated scoop located adjacent the said vehicle front wheels; means adjusting the angle of tilt of said conveyor relative to said chassis and consequently the selected depth of ground penetration of said scoop; said conveyor extending rearwardly to a terminus defined as a delivery area to the rear of said rear wheels, said conveyor being constructed in the structure of a chute containing power-operated lifting means for transporting all material delivered into said lifting means by said scoop to said delivery area; a rearwardly inclined power-agitated screen having a forward material-receiving portion located beneath the delivery end of said scoop, the rear portion of said screen extending further rearwardly, said screen having a mesh and a configuration designed to spread and allow passage therethrough of said smaller particles back onto the ground behind the vehicle in a manner to cover substantially uniformly the track width of the vehicle during operational movement thereof; and a bin attached to said vehicle chassis for reception of said relatively large articles, said bin in operative position being located beneath the terminal rejection end of said screen.

2. The invention according to claim 1, wherein the bin is attached to the rear of the vehicle by a pair of coupling members, one of each being disposed on opposite sides of the bin, the rear of the vehicle chassis being provided with a pair of spaced lift arms adapted to engage said coupling members, said arms being pivoted for vertical movement and activated by power means for raising said bin off the ground into the said operative position respecting said screen, and to lower said bin when loaded back onto the ground.

3. The invention according to claim 2, wherein the bin is automatically releasable from said vehicle when said bin is on the ground, by causing driving movement of said vehicle away from said bin, said coupling means and said arms automatically disconnecting from each other in response to said movement.

4. The invention according to claim 1, wherein said conveyor includes paddle means supported by chains passing around sprockets for passing ground material through the conveyor, and wherein the scoop means is closely associated with the paddles passing around the sprockets at the receiving end of the conveyor, said scoop means being shaped in a curve uniformly defining the sweep of said paddles around said lower sprockets, thus avoiding any reduced areas between said scoop and said paddles which otherwise would cause compaction or jamming of the said ground material.

5. The invention according to claim 1, there being additionally provided to either side of said rejection end of said screen a pair of inwardly extending sluices extending sufficiently centrally over said bin to ensure delivery into said bin of said relatively large articles.