July 28, 1964 C. P. DE BIASI 3,142,341

SAND SCREEN EQUIPMENT

Filed May 24, 1961 2 Sheets-Sheet 1

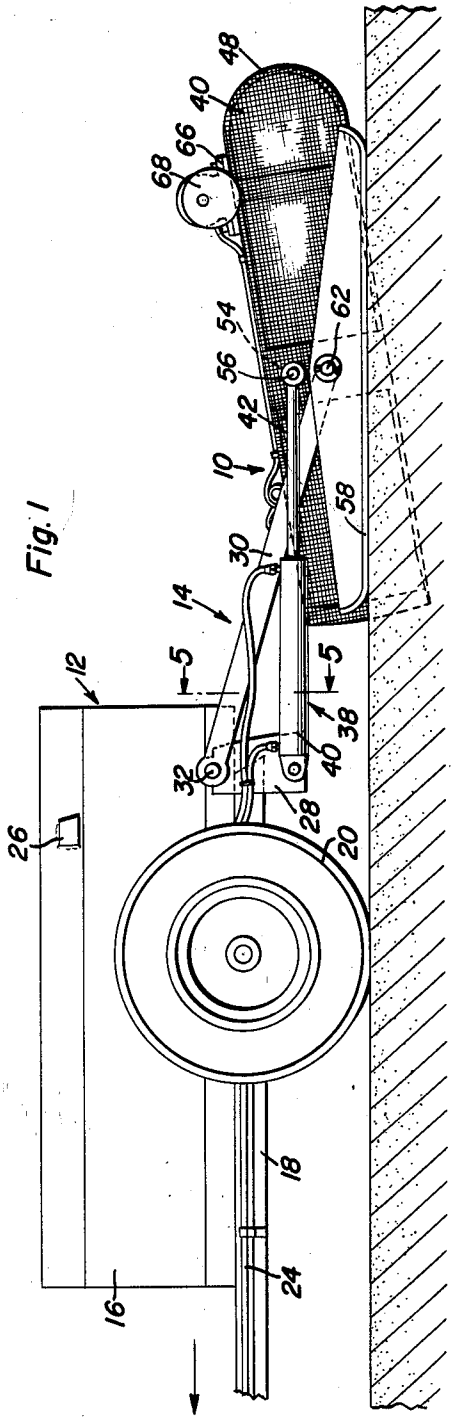


Fig. 1

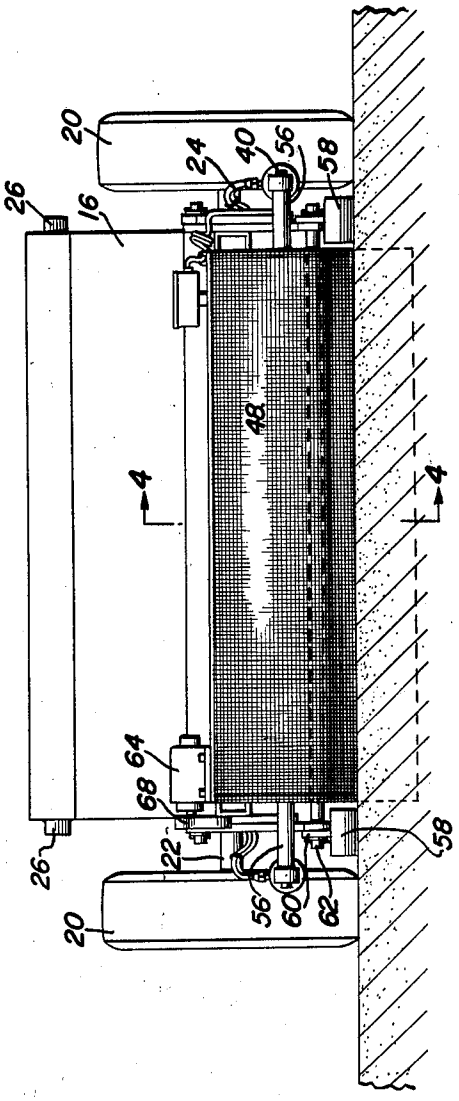


Fig. 2

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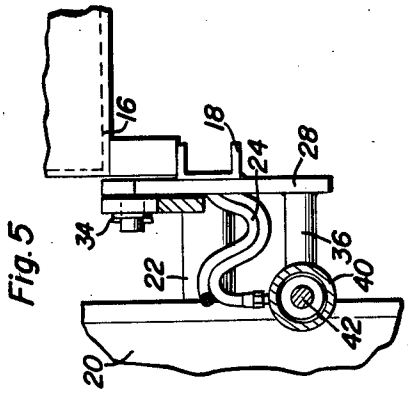


Fig. 5

Fig. 3

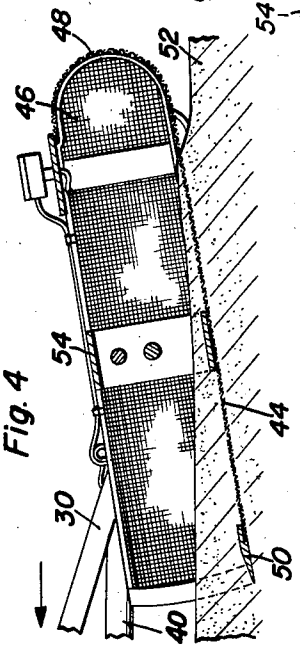


Fig. 4

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SAND SCREEN EQUIPMENT

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5 Claims. (Cl. 171—136)

The present invention generally relates to equipment for use in screening or sifting granular material for removing foreign objects therefrom and more particularly relates to such equipment which will treat sand with very little movement thereof thus rendering the device especially desirable in screening or cleaning beach sand in situ.

All beaches are faced with the problem of cleaning the sand at periodic intervals due to the accumulation of foreign material caused by tidal action or other natural causes and also by the deposit of various trash, debris and the like by persons using the beach facilities. Generally, this is accomplished by beach attendants employing manually operated rakes or the like for raking the top surface of the sand for removing foreign objects therefrom. However, this is quite slow and laborious and, at best, only cleans the surface of the sand so that foreign objects slightly underlying the surface will not normally be removed by a manual raking operation. Therefore, it is the primary object of the the present invention to provide a simple and economical device which will screen granular material such as beach sand and remove debris and refuse or any other foreign material therefrom without actually lifting the sand from its original place.

Another object of the present invention is to provide a screening device capable of being mounted on a vehicle or the like and movable from a screening position to a dumping position whereby debris, refuse or trash may be dumped into a suitable trash receiving bin or receptacle also carried by the vehicle thereby rendering the screening operation quite efficient and effective.

A very important object of the present invention is to provide sand screening equipment in which the screen element is in the form of a receptacle having vibratory mechanism mounted thereon for vibrating the screening equipment for more effectively screening the sand.

Still another object of the present invention is to provide sand screening equipment having means for magnetically attracting small ferrous metallic objects or the like in the sand which would normally pass through the screen thereby further assuring proper and effective cleaning of the sand.

Yet another feature of the present invention is to provide sand screening equipment which is quite simple in operation, composed of a minimum of operating parts and quite easily controlled from a conveying vehicle.

These together with other objects and advantages which will become subsequently apparent reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming a part hereof, wherein like numerals refer to like parts throughout, and in which:

FIGURE 1 is a side elevational view of screening equipment of the present invention illustrating the equipment attached to a trailer;

FIGURE 2 is a rear elevational view of the construction of FIGURE 1;

FIGURE 3 is a side elevational view of the construction illustrating the dump position of the screening equipment and also an intermediate position thereof;

FIGURE 4 is a longitudinal, vertical sectional view taken substantially upon a plane passing along section line 4—4 of FIGURE 2 illustrating further structural details of the sand screening equipment; and

FIGURE 5 is a detailed sectional view taken substantially upon a plane passing along section line 5—5 of

FIGURE 1 illustrating relationship of a component of the mechanism for elevating the sand screening equipment from the working or operative position to the dumping position.

Attention is now directed to the drawings, wherein sand screening equipment 10 is illustrated as being attached to a load carrying vehicle 12 by a supporting and operating mechanism 14.

The vehicle 12 is illustrated as being in the form of a trailer body 16 carried by suitable frame structure 18 and supported by the usual ground engaging wheels 20 carried by a transverse axle 22. The trailer body 16 is open at the top and the frame structure 18 may be attached to any suitable towing vehicle, not illustrated, such as a tractor truck or the like having a hydraulic pressure pump to which hydraulic lines 24 are connected. Also, the towing vehicle will have an electrical energy device such as a battery, not illustrated, with electrical connections to the trailer vehicle 12 for providing power to the necessary lights thereon so that the trailer vehicle 12 may also be towed over the road. Adjacent the top of the trailer body 16 and spaced from the rear end thereof, a lug 26 is provided at each side of the trailer body 16 to serve as a limit for upward swinging movement of the screening equipment 10 as will be explained in more detail hereinafter.

Attached to the frame structure 18 adjacent the rear thereof is a bracket 28. Each side of the trailer vehicle 12 is provided with a similar depending bracket 28 which is rigidly affixed to the frame structure 18 by welding or any other suitable fastening means. Pivotally connected to the upper end of the bracket 28 which is in the form of a plate is an elongated strut or arm 30 which is pivotally connected thereto by virtue of a laterally extending pin or stub shaft 32 rigid with the bracket plate 28 with the strut 30 being retained thereon by a removable key or pin 34 extending transversely of the free end of the pivot shaft 32.

Adjacent the lower end of each of the bracket plates 28, there is provided a laterally extending shaft 36 to which one end of a hydraulic piston and cylinder assembly 38 is attached. The piston and cylinder assembly 38 defines an arrangement which includes a cylinder 40 connected to the shaft 36 for pivotal movement together with a piston within the cylinder and a piston rod 42 extending therefrom. The piston and cylinder assembly 38 is of the double-acting type and the fluid conduits 24 are connected with fittings at opposite ends of the cylinder 40 for causing powered movement of the piston between its limits of movements within the cylinder 40. By virtue of the particular orientation of the strut 30 and the piston and cylinder assembly 38, expansion and contraction of the piston and cylinder assembly 38 will cause vertical swinging movement of the screening equipment 10 in a manner described hereinafter and the lugs 26 serve as a stop for limiting the movement of the struts 30 thereby limiting the movement of the screeening equipment 10 to a dumping position as illustrated in FIGURE 3.

The screening equipment 10 is in the form of an elongate screen mesh assembly having a bottom member 44 formed of screen mesh material, upstanding side walls 46 of screen mesh material and a curved rear end wall 48 also of screen mesh material thus defining an open ended scoop-like structure having the forward end and top portions open and substantially unobstructed with the rear end, sides and bottom being closed by the screen members 44, 46 and 48. Attached to the forward edge of the bottom screen member 44 as well as the side walls 46 is a sharpened blade 50 which serves to pass under the surface of granular material such as sand 52 so that the sand will proceed upwardly along the inner surface of the bottom screen member 44 and also along the inner sur-

face of the side wall screens 46. The mesh of the screen material is such that sand will pass therethrough but foreign material, debris, refuse and the like will be retained within the confines of the bottom member 44, side walls 46 and read end wall 48 of the screen assembly.

Disposed substantially centrally of the screen assembly which forms somewhat of a receptacle, there is provided a reinforcing plate 54 which is generally annular in configuration and extends around the interior of the receptacle. Projecting outwardly from the opposite sides of the annular plate 54 are elongated shafts 56 disposed substantially parallel to the respective shaft 36 and the free end of the adjacent piston rod 42 is pivotally connected thereto.

Disposed alongside of the side walls 46 of the screen assembly is a pair of elongate skids 58 of generally channel-shaped configuration and having upwardly curved end portions. The skids 58 each have a centrally disposed longitudinal plate 60 extending therein which is pivotally attached to the outer end of a corresponding strut 30 by virtue of a pivot shaft, fastener or the like 62.

Mounted on a supporting plate of any suitable configuration is a motor 64 such as a hydraulic motor or an electric motor 64. The motor is attached by virtue of a plate 66 to the screen assembly. The output shaft of the motor 64 is provided with an eccentric weight 68 which will cause vibration of the screen assembly when the motor 64 is actuated. The motor 64 may be either an electrical motor operated from a vehicle battery or a separate generator or the like powered by a small gasoline engine and vibration of the screening assembly will assist in the passage of the sand therethrough and will render the screening operation more effective and enable the screening of a greater volume of sand in a given time period.

The screen assembly is basically rectangular in shape and the bottom member 44, the side walls 46 and the rear end wall 48 consists of a metal screen cloth having necessary structural reinforcement including a solid cutting edge at the forward edge thereof. The entire screen assembly is hinged to the struts 30 so that it may rotate for retaining material therein during the dumping cycle and expansion of the piston rod 42 of the hydraulic assembly 38 will force the screen assembly up while contraction thereof will move it down and the skids 58 are provided for maintaining the screening assembly at the proper elevation.

The struts 30 are each of fixed length and the entire screen assembly revolves about the pivotal connection between the struts 30 and the bracket plate 28. The entire screening assembly may be elevated beyond a vertical position as shown in FIGURE 3 in order to engage the stop lug 26. The pivotal points and connections between the struts 30 and the respective bracket plate 28 and the cylinder and the respective bracket plate 28 and the pivotal connections between the outer ends of the piston rods 42, the struts 30, the annular reinforcing plate 54 of the side walls 46 and the skids 58 define an arrangement which by extending and retracting the piston and cylinder assembly 38, the shape of the arrangement is varied with the result being that the entire screen assembly will rise with the system being carried beyond dead-center by momentum. When the entire system reaches dead-center the operator reverses the control and can either hold the system at that position or lower the system by allowing oil to escape. As illustrated in the drawings, the struts 30 and the cylinders 40 are not respectively hinged at a common point. By offsetting these pivotal points, the first movement when pressure is applied to the bottom of the cylinders 40 would be for the screen assembly to revolve with the forward end elevating. By providing a suitable mechanism so that the screen cannot revolve beyond a position shown in dotted line in FIGURE 3, the cylinder

pressure then raises the entire system. The entire screening assembly is then elevated to the dumping position.

In all conventional screening equipment, the objective is to recover the sand or in the case of processing gravel, it is the objective to recover stones or gravel of a particular size. Thus, the material to be processed must be picked up and passed over a screen. In cleaning beach sand, conventional procedures involve the picking up of the sand by means of buckets on an endless belt or chain after which the sand is passed over a vibrating screen and then dumped back onto the beach. Obviously, this requires a relatively large, complicated and expensive piece of machinery which is not only high in initial cost but expensive to operate and maintain since the machine must perform a considerable amount of work in picking up or elevating tons of sand simply for the objective recovering a few pounds of debris.

In the present invention, the method involved does not require that any sand whatsoever be actually picked up since all of the screening is performed with the sand left in place. In other words, the present invention does not have an objective for obtaining the said but only an objective of obtaining the debris while leaving the sand in place. The structure of the present invention screens the sand in place without picking up the sand but it will recover the debris so that the debris may be retained and subsequently disposed of.

The foregoing is considered as illustrative only of the principles of the invention. Further, since numerous modifications and changes will readily occur to those skilled in the art, it is not desired to limit the invention to the exact construction and operation shown and described, and accordingly all suitable modifications and equivalents may be resorted to, falling within the scope of the invention as claimed.

What is claimed as new is as follows:

1. Equipment for screening granular material while enabling such material to be maintained substantially in situ, said equipment comprising,

a screening assembly having laterally spaced apart upstanding side members secured to bottom and rear members to define a receptacle having substantially open and unobstructed forward and top portions, said members each being of screen mesh consruction,

an element extending between the upstanding side members in engagement with the bottom member of the screening assembly and in subjacent relationship relative to the open forward portion thereof, said element being tapered toward the open forward portion of the screening assembly to enable granular material to pass into the confines of the receptacle defined by the members of the screening assembly,

reinforcing structure disposed intermediate the open forward portion and the rear member of the screening assembly and disposed thereon adjacent the upstanding sides thereof,

pivot means for pivotally connecting mechanism to the reinforcing structure at locations thereon which are adjacent to the opposed upstanding side members of the screening assembly to enable the screening assembly to be urged from a lowered operative position whereat the screening assembly is in contact with granular material in situ to a raised dumping position whereat the screening assembly may dispose of undesired deposits which have beeen screened from such granular material,

an elongate rigid member pivotally mounted adjacent one end portion to a mobile frame structure and projecting therefrom and terminating with the other end portion pivotally mounted to the reinforcing structure of the screening assembly,

a hydraulic arrangement having piston-cylinder portions one of which is pivotally connected to the mobile frame structure with the other portion being piv-

otally connected to the reinforcing structure of the sscreening assembly,

the adjacent pivotal connections of the member and the arrangement of the mechanism to the mobile frame structure as well as the locations on the pivot means of the reinforcing structure of the screening assembly, in each instance, being spaced apart one from the other to enable the open forward portion of the screening assembly to be raised on initial actuation of the hydraulic arrangement prior to movement of the screening assembly from the lowered operating position to the raised dumping position in order to maintain such undesired deposits which may have been screened from such granular material within the confines of the receptacle defined by the members of the screening assembly.

2. The equipment as set forth in claim 1 together with vibratory means carried by said screening assembly for vibrating the screening assembly to facilitate in the screening of such granular material.

3. The equipment as set forth in claim 1 together with elongate skid means pivotally mounted to the reinforcing structure and extending in opposed directions therefrom adjacent each of the side members of the screening assembly to support the screening assembly in the lowered operating position with the skid means in contact with such granular material and for limiting penetration of the screening assembly into such granular material.

4. Apparatus for effectively screening granular material such as sand while enabling such material to be maintained substantially in situ as on a beach, said apparatus comprising,

wheel mounted ground supported mobile frame structure having a load carrying body supported thereon,

a screening assembly having upstanding side members secured to bottom and rear members to define a receptacle having substantially open and unobstructed forward and top portions,

said members each being of screen mesh construction,

an element extending between the upstanding side members of the screening assembly in engagement with the bottom member thereof in subjacent relationship relative to the open forward portion of the screening assembly,

said element being tapered toward the open forward portion of the screening assembly to enable the screening assembly to penetrate such sand in situ and to urge such sand to pass into the confines of the receptacle defined by the members of the screening assembly,

mechanism for pivotally supporting the screening assembly from the mobile frame structure and for urging said screening assembly between a lowered operating position whereat the screening assembly is in contact with such sand in situ to a raised dumping position whereat the screening assembly may dispose of undesired deposits which may have been screened from such sand by dumping such deposits into the load carrying body, said mechanism comprising

an elongate rigid device pivotally mounted adjacent one end portion to the frame structure and projecting therefrom and terminating with the other end portion thereof pivotally mounted to reinforcing structure disposed intermediate the open forward portion and the rear member of the screening assembly, and

a hydraulic arrangement having piston-cylinder portions one of which is pivotally connected to the frame structure with the other portion being pivotally connected to the reinforcing structure of the screening assembly,

the adjacent pivotal connections of the device and the arrangement of the mechanism to the mobile frame structure as well as the adjacent pivotal connections thereof to the reinforcing structure of the screening assembly, in each instance, being spaced apart one from the other to enable the open forward portion of the screening assembly to be upwardly tilted on initial actuation of the hydraulic arrangement followed by movement of the screening assembly from the lowered operating position to the raised dumping position thereof in order to maintain such undesired deposits therein which may have been screened from such sand.

5. Apparatus for effectively screening granular material while enabling such material to be maintained substantially in situ, said apparatus comprising

mobile frame structure having a load carrying body supported thereon,

a screening assembly having upstanding side members secured to bottom and rear members to define therewith a receptacle having substantially open and unobstructed forward and top portions,

said members of the screen assembly each being of screen mesh construction,

an element extending between the upstanding side members in engagement with the bottom member of the screen assembly in subjacent relationship to the open forward portion thereof,

said element being tapered toward the open forward portion of the screening assembly to urge granular material to pass into the confines of the receptacle defined by the members of the screening assembly,

reinforcing structure disposed intermediate the open forward portion and the rear member of the screening assembly,

mechanism for pivotally supporting the screening assembly from the mobile frame structure and for urging said screening assembly between lower operating and raised dumping positions, said mechanism comprising

an elongate rigid device pivotally mounted adjacent one end portion to the mobile frame structure and projecting therefrom and terminating with the other end portion thereof pivotally mounted to the reinforcing structure of the screening assembly,

a hydraulic arrangement having piston-cylinder portions one of which is pivotally connected to the mobile frame structure with the other portion being pivotally connected to the reinforcing structure of the screening assembly,

the adjacent pivotal connections of the device and the arrangement of the mechanism to the structure as well as to the reinforcing structure of the screening assembly, in each instance, being spaced apart one from the other to enable the forward open portion of the screening assembly to be raised on initial actuation of the hydraulic arrangement on movement of the screening assembly from the lower operating position to the raised dumping position in order to maintain undesired deposits therein which may have been screened from such granular material.

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