May 2, 1967 R. A. SNOOK 3,316,977

SCREEN CONVEYOR WITH GROUND ENGAGING SCOOP

Filed April 15, 1964 2 Sheets-Sheet 1

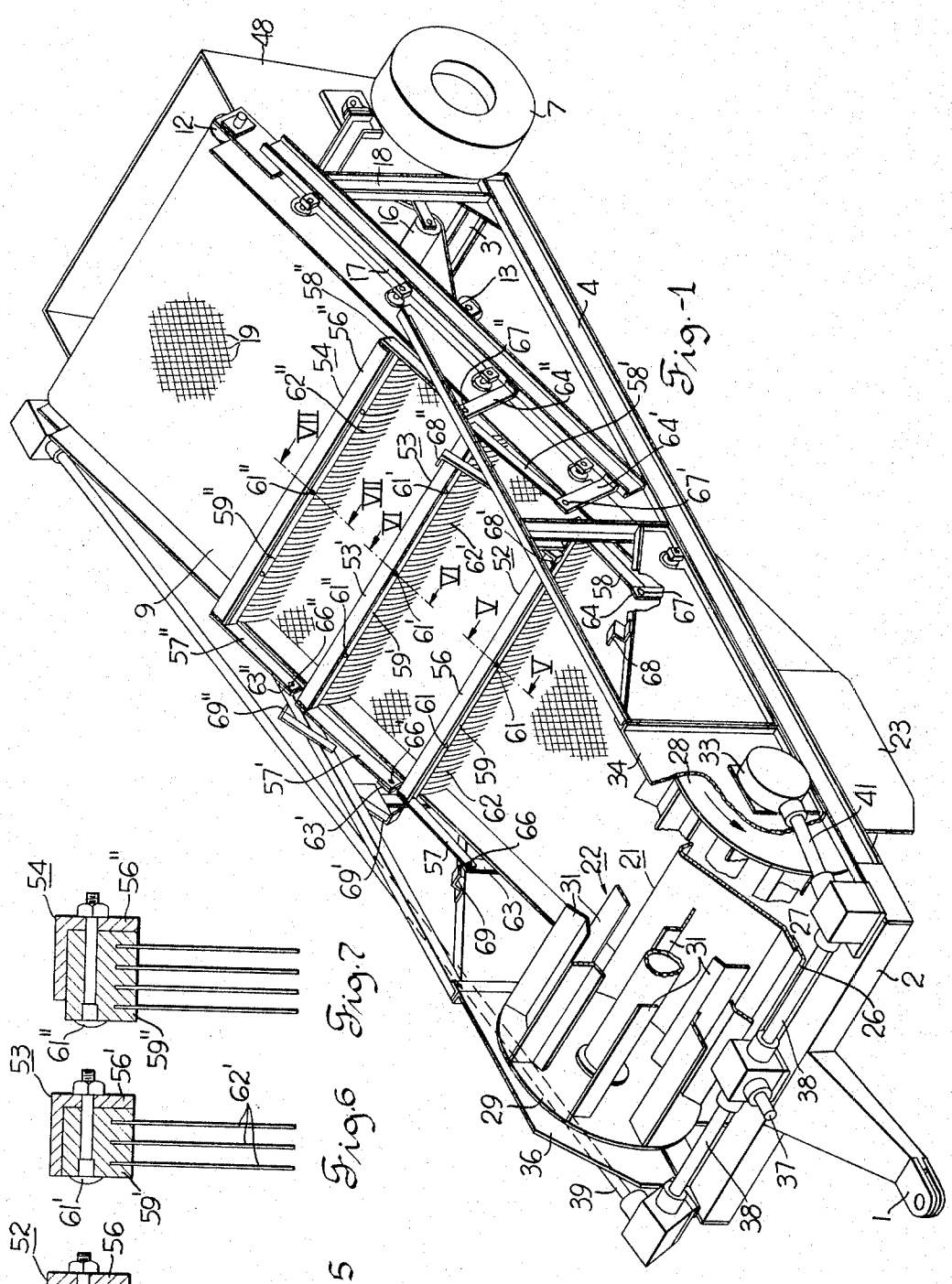

Fig. 1

Fig. 7

Fig. 6

Fig. 5

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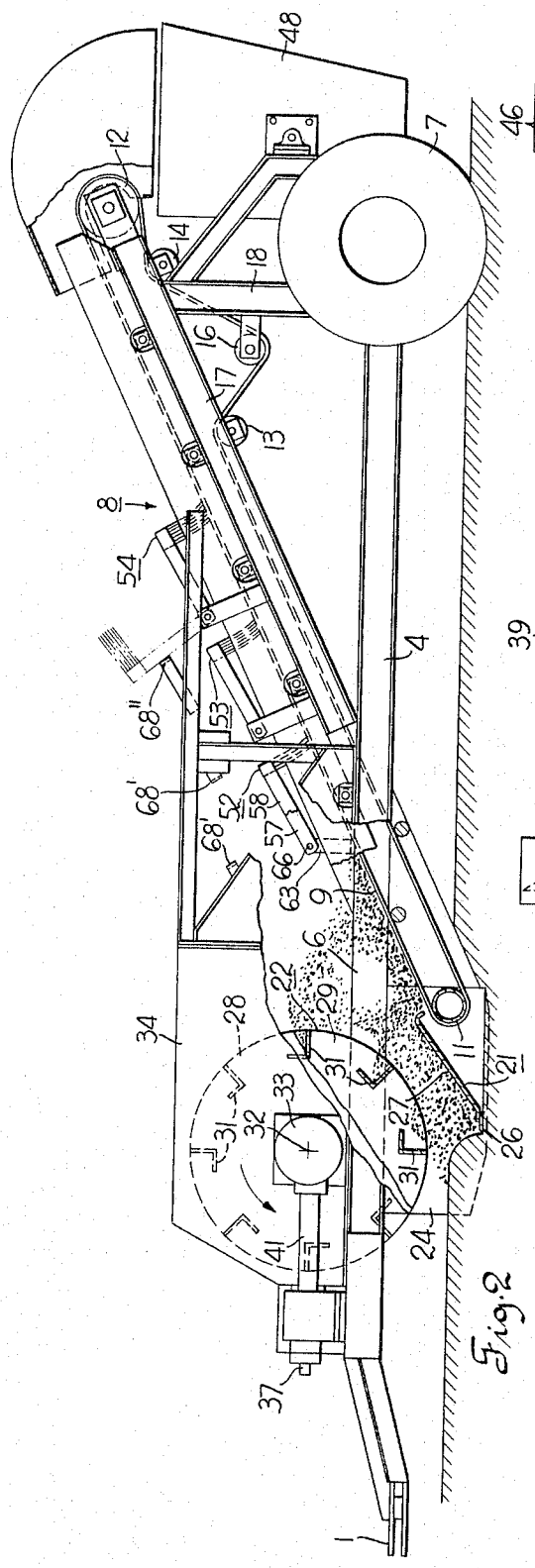

Fig. 2

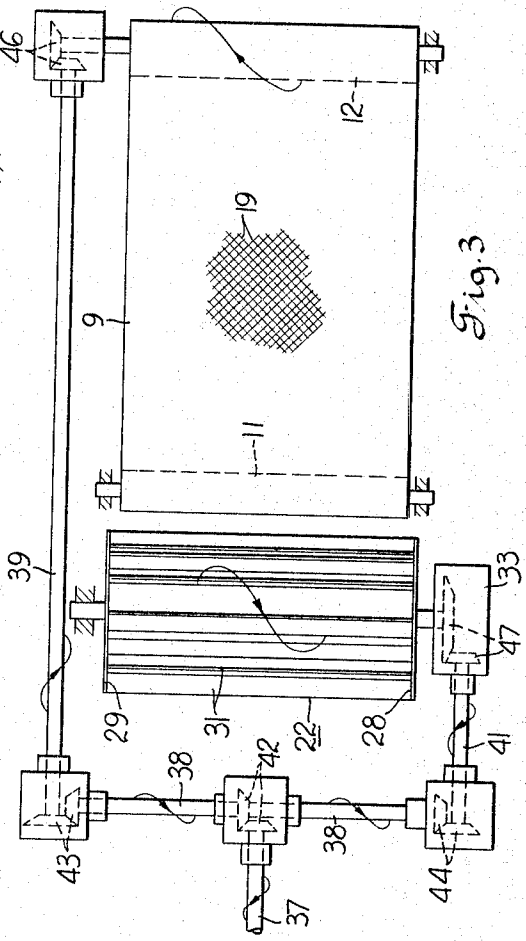

Fig. 3

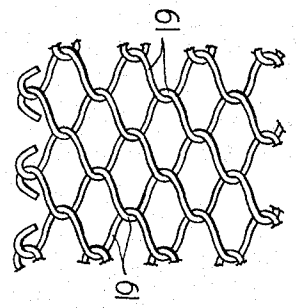

Fig. 4

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SCREEN CONVEYOR WITH GROUND ENGAGING SCOOP

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The invention relates to land treating machinery. More particularly, the invention is concerned with a mobile machine for sifting loose surface material consisting of fine particles, such as sand, and intermingled larger objects which are to be separated from the fine particles and collected in a container.

Land treating machines of the mentioned character have heretofore been known for various purposes, such as rock picking and beet harvesting, and attempts have been made to provide a machine of the same general type for collecting litter from bathing beaches. Among the problems that have been encountered in such attempts is the requirement that a beach cleaning machine must be capable of sifting large volumes of sand at a relatively fast rate of speed and that it must collect objects of widely varying sizes and types of material ranging from broken glass and bottle caps to whole bottles, fire wood and other debris. Further, in order to be practical, a beach cleaning machine should be capable of being driven by a tractor or other source of power at a speed of several miles per hour, and its power consumption should be within the limits of take-off power of commercially available tractors. Further, the machine should be capable of operating efficiently even when the sand is wet as near the shore line.

Generally, it is an object of the invention to provide an improved mobile sifting machine which will take care of the above mentioned requirements in a practical and entirely satisfactory manner.

More specifically, it is an object of the invention to provide a mobile sifting machine of the above mentioned character incorporating an improved screening mechanism which will efficiently sift relatively large quantities of beach said while the machine advances at a speed of several miles per hour, and which will collect objects of widely varying sizes and materials.

A further object of the invention is to provide a sifting machine of the above mentioned character which can be readily adapted to varying operating conditions, particularly those which are determined by the moisture content of the sand to be sifted.

A further object of the invention is to provide a sifting machine of the above mentioned character incorporating an agitating device, or several agitating devices, which can be selectively adjusted to operative or inoperative positions and by means of which the separating function of the machine can be regulated.

A still further object of the invention is to provide an improved sifting machine of the above mentioned character in which a conveyor type screening device and a drag type agitating device are combined to promote efficient sifting of sand by the screening device without preventing passage of screened out objects to the discharge end of the conveyor.

These and other objects and advantages are attained by the present invention, various novel features of which will be apparent from the description herein and are pointed out in the appended claims.

Referring to the accompanying drawings:

FIG. 1 is a perspective view of a beach cleaning machine incorporating the invention, parts of the machine being broken away and shown in section;

FIG. 2 is an elevational side view of the machine shown in FIG. 1, parts of the machine shown in FIG. 2 being broken away and shown in section;

FIG. 3 is a schematic top view of the machine shown in FIG. 2;

FIG. 4 is a detail view showing part of a wire screen belt for the machine shown in FIGS. 1, 2 and 3; and

FIGS. 5, 6 and 7 are sectional views taken on lines V—V, VI—VI and VII—VII, respectively, of FIG. 1.

The machine shown in FIGS. 1 and 2 is of the semi-trailer type and has a forward hitch tongue 1 by means of which it may be connected in conventional manner to the draw bar of a tractor, not shown. A vehicle frame on which the hitch tongue 1 is mounted comprises front and rear transverse frame beams 2 and 3, a longitudinal side beam 4 connecting the transverse front and rear beams at the left side of the machine, and another longitudinal beam 6, shown in FIG. 2, connecting the transverse front and rear beams at the right side of the machine; the terms right and left being used as by a person viewing the machine from the rear. At its rear end, the vehicle frame is supported on a pair of transversely spaced rubber tired wheels, only one of which is shown and designated in FIGS. 1 and 2 by the reference character 7.

A sifting device generally designated by the reference character 8 is mounted on the vehicle frame and operable to move material in a generally rearward and upward direction relative to the frame. It includes a power driven conveying element in the form of an endless perforate belt 9 which is trained about a forward transverse supporting roller 11 and a rearward transverse supporting roller 12. Auxiliary support rollers 13 and 14 and a tensioning roller 16 for the lower run of the conveyor belt 9 are suitably mounted on an upwardly and rearwardly inclined beam 17 and on a vertical beam 18 at each side of the vehicle frame.

The belt 9 comprises a consecutive series of loosely interwoven transverse wires 19 as illustrated by FIG. 4 or some similar wire arrangement providing a vertically deformable wire mesh.

Means for feeding ground surface material to the conveyor belt 9 comprise a ground engaging scoop generally designated by the reference character 21 and a feeder drum 22.

The scoop 21 comprises a pair of identical side plates 23 and 24, a transverse cutting edge 26, and a wall member 27 which extends rearwardly and upwardly from the cutting edge 26. The side plates 23 and 24 are rigidly secured in depending positions to the longitudinal side beams 4 and 6, respectively, of the vehicle frame, and the cutting edge 26 and wall member 27 extend transversely between the side plates 23 and 24 to which they are rigidly secured, as by welding, at their opposite ends.

The feeder drum 22 comprises a pair of axially spaced circular end plates 28 and 29 and a circumferential series of transverse paddles or blades 31 which are secured at their opposite ends to the inner sides of the end plates 28 and 29. The drum 22 is mounted on the vehicle frame for rotation about a transverse horizontal axis which is indicated at 32 in FIG. 2. At one end, the drum is journaled in a gear box 33 which is secured to an upstanding side wall 34 at the left side of the vehicle frame, and at its other end the drum is journaled in a bearing, not shown, which is secured to an upstanding side wall 36 at the right side of the vehicle frame. Each blade 31 is of angular cross section and presents one leg which extends in a generally radial direction, and another leg which extends from the radially inner end of the radial leg in a direction so as to lead said one leg during rotation of the drum in the normal direction which is indicated by the arrow in FIGS. 1 and 2.

Referring to FIG. 3, power for driving the conveyor belt 9 and the feeder drum 22 is derived from a tractor power take-off shaft, not shown, by means of an input shaft 37, a cross shaft 38, a long conveyor drive shaft

) at the right side of the machine, and a short feeder ive shaft **41** at the left side of the machine. A set of evel gears **42** connects the input shaft **37** in driving relaon with the cross shaft **38**; sets of bevel gears **43** and **4** connect the cross shaft **38** with the conveyor and eeder drive shafts **39** and **41**, respectively; and sets of evel gears **46** and **47** connect the shafts **39** and **41** with ıe upper supporting roller **12** for the conveyor belt **9**, ıd with the feeder drum **22**, respectively.

The bevel gear sets **42**, **43**, **44**, **46** and **47** are conructed and arranged in such a manner that rotation of ıe input shaft **37** in its normal direction will cause rear/ard and upward movement of the upper run of the conveyor belt **9**, and rearward rotation of the feeder drum **2** relative to the scoop **21**.

In operation, as the machine advances over a beach rea which is to be cleaned, sand and intermingled litter re transferred from the ground to the rearwardly and upvardly moving upper run of the conveyor belt **9** by the ombined digging and conveying action of the forwardly noving scoop **21** and by the rearward rotation of the eeder drum **22** relative to the scoop.

The rotary speed of the feeder drum is preferably nade sufficiently high so that the surface material which s engaged by the cupped blades or paddles **31** will be ubjected to a throwing action which causes it to be disributed over a longitudinally extended area at the lower nd of the conveyor, as indicated by stippling in FIG. 2.

The upper run of the wire mesh belt **9** presents a screening area between the lower roller **11** and the upper roller **12**. In this area the sand and litter which are delivered to the conveyor in the described manner are separated from each other, the sand sifting through the perforations of the upper run of the conveyor belt and then back to the ground through the perforations of the lower run of the conveyor belt. The litter which cannot pass through the perforations of the upper run of the conveyor belt will ride up toward the upper roller **12** and when it passes over the roller it will fall into the receptacle **48**.

In order to promote the passage of sand through the perforations of the upper run of the conveyor belt **9**, the machine is equipped with three drag type agitating devices generally designated by the reference characters **52**, **53** and **54**, respectively.

The agitating device **52** comprises an angle iron **56**; a pair of mounting arms **57**, **58** which are secured, as by welding, to the opposite ends, respectively, of the angle iron **56**; an elongated brush back member **59** which is secured to the inside of the angle iron **56** by bolts **61**; and bristles **62** which are suitably secured in conventional manner in the brush back member **59** and project from one of the longitudinally extending sides of the latter. The arms **57** and **58** are pivotally connected to mounting brackets **63** and **64**, respectively, by pivot bolts **66** and **67**, the brackets **63**, **64** being rigidly secured to the vehicle frame, and the bolts **66**, **67** being aligned on a common axis which extends transversely of the conveyor **8**.

The bristles **62** of the agitating device **52** are distributed across the entire length of the brush back member **59** and are of the type used in street sweeping machines. They are relatively long and flexible but of sufficient stiffness to serve the purpose for which they are intended, namely, to promote passage of sand through the perforations of the upper run of the conveyor. The preferred material for the bristles is a plastic such as polyethylene.

In FIGS. 1 and 2, the agitating device **52** is shown in its operative position, that is, in a position of pivotal adjustment about the axis of the bolts **66**, **67** in which the tips of the bristles are in contact with the bare conveyor belt **9**. Sand and debris which have been deposited on the lower part of the conveyor are moved into engagement with the bristles **62** by the rearward and upward movement of the upper run of the conveyor belt. The upwardly moving mass of sand and debris will deflect

the bristles in a generally rearward direction but the weight of the entire brush unit which tends to swing it clockwise about the axis of the bolts **66**, **67** acts through the bristles upon the sand and tends to push it through the perforations of the conveyor belt.

Depending on operating conditions, more or less sand will move past the bristles **62** and ride upward with the conveyor belt. If the sand bed on the part of the conveyor ahead of the bristles **62** is fairly thick, the brush unit may swing upward and forward about the axis of the pivot bolts **66**, **67** to accommodate upward and rearward movement of unsifted sand and debris past the bristles **62**.

The bristles **62** are sufficiently long and flexible so that debris and litter may move past them as they ride upward and rearward on the conveyor belt. Thus, stones of various sizes, bottle caps, cinders, soft drink bottles and the like may be carried rearward and upward toward the trash bucket **48** while sand returns to the ground through the perforations of the conveyor belt.

The explanations hereinbefore with reference to the agitating device **52** similarly apply to the agitating devices **53** and **54**. The agitating device **53** comprises an angle iron **56′**, mounting arms **57′**, **58′**, brush back **59′**, fastening bolts **61′** and bristles **62′**. Brackets **63′**, **64′** mount aligned pivot bolts **66′**, **67′** for the mounting arms **57′**, **58′**.

The agitating device **54** comprises an angle iron **56″**, mounting arms **57″**, **58″**, brush back **59″**, fastening bolts **61″** and bristles **62″**. Brackets **63″**, **64″** mount aligned pivot bolts **66″**, **67″** for the mounting arms **57″**, **58″**.

The number of bristles on the brush back member **59′** is substantially greater than the number of bristles on the brush back member **59**; and the number of bristles on the brush back member **59″** is substantially greater than the number of bristles on the brush back member **59′**. As shown in FIGS. 5, 6 and 7, the brush back member **59** has two rows of bristles **62**; the brush back member **59′** has three rows; and the brush back member **59″** has four rows.

As shown in FIG. 2, the agitating device **54** is selectively adjustable to an inoperative position which is indicated in full lines, and to an inoperative position which is indicated in dotted lines. A stop **68″** (FIG. 2) at the left side of the machine and a corresponding stop **69″** (FIG. 1) at the right side of the machine are engageable with the arms **58″** and **57″**, respectively, to sustain the agitating device **54** in its inoperative position. Similar stops **68**, **69** and **68′**, **69′** are provided for the agitating devices **52** and **53**, respectively.

Depending on operating conditions, any of the agitating devices may be swung into or out of operative position in order to obtain the best separating function of the machine. If the machine takes only a relatively shallow cut and the sand is dry, satisfactory operation may be obtained with all of the brushes swung up to their inoperative positions. In that case there will be no power consuming drag on the conveyor belt and no unnecessary wear of the brushes.

Which brushes, and how many, should be lowered into operative position will be determined primarily by the wetness of the sand. If the sand is very wet all brushes may have to be lowered, but if it is only moderately wet, as after a rain, only the thin brush **52**, or the thicker brush **53** or the thickest brush **54**, or any combination of the three, may be used. The selection of the brushes which are to be operative also depends, to some extent, on the type of litter that is to be collected. For instance, if the litter contains a considerable amount of leafy material such as newspapers, fewer brushes may be necessary than if the litter consists mostly of solid material.

While in the foregoing a preferred embodiment of the invention has bee disclosed, it should be understood that it is not intended to limit the invention to the details of construction herein shown and described, and that the

invention includes such other forms and modifications as are embraced by the scope of the appended claims.

Having now particularly described and ascertained the nature of my said invention and the manner in which it is to be performed, I declare that what I claim is:

1. A mobile sifting machine comprising: a vehicle frame; a sifting device mounted on said frame and including a power driven wire screen conveyor presenting an upper run operable to move material in a generally rearward direction relative to said frame; means for feeding ground surface material to said conveyor, said means comprising a ground engaging scoop mounted on said frame forwardly of said conveyor and presenting a transverse cutting edge adapted to be operated below the surface of the ground and presenting a wall member extending rearwardly and upwardly from said cutting edge; a feeder drum rotatably mounted on said frame above the normal ground surface in cooperative relation to said scoop for moving the upper portion of raised ground material from the latter rearwardly toward said conveyor, a common drive means for said feeder drum and said conveyor and being operative to rotate said feeder drum at a peripheral speed sufficiently high so that material contacted thereby will be subjected to a throwing action which causes it to be distributed over an extended portion of said upper run of said conveyor; and flexible material agitating means mounted on said frame in cooperative relation to the upper run of said conveyor; wherein said flexible material agitating means includes an elongated back member and a brush assembly projecting from one of the longitudinally extending sides thereof; mounting arms secured to and extending transversely of said back member at opposite ends thereof; means connecting said mounting arms with said vehicle frame so as to position said back member in transversely extending overlying relation to said conveyor and so as to present said brush assembly in cooperative relation to the upper side of said upper conveyor run; wherein

a plurality of said elongated back members and brush assemblies are provided in said frame in overlying relation to said upper conveyor run, and spaced from each other in the longitudinal direction of said conveyor, each of said brush assemblies being in cooperative engagement with the upper side of said upper conveyor run; wherein said mounting arms are connected with said vehicle for pivotal movement about a horizontal axis extending transversely of said conveyor; said mounting arms comprising individual supports for said brush assemblies, pivot means swingably mounting said supports on said vehicle frame so as to permit selective adjustment of said brush assemblies to operative and inoperative positions with respect to said conveyor; and stop means on said frame cooperable with said supports to determine said pivotally adjusted inoperative positions, respectively, of said brush assemblies.

2. A mobile sifting machine as set forth in claim 1 wherein successive rearward brush assemblies of said plurality incorporate increasingly greater numbers of bristles.

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