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Neal

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[54] **CENTRIFUGALLY DISCHARGING SCOOP SHOVEL ASSEMBLY**

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[52] **U.S. Cl.** **37/91,** 37/189, 198/143

[51] **Int. Cl.** **E02f 5/08**

[58] **Field of Search**.....37/91–97, 189, 190; 198/143

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[57] **ABSTRACT**

A scoop shovel assembly having a rotatable arm carrying shovels at the opposite ends thereof. Each shovel has a pivotable bottom wall held in the closed position by a resilient latch member. Means are provided on the shovel for disabling each latch member at a predetermined point in the path of rotation of the associated shovel enabling the bottomwall to swing open by centrifugal forces.

9 Claims, 6 Drawing Figures

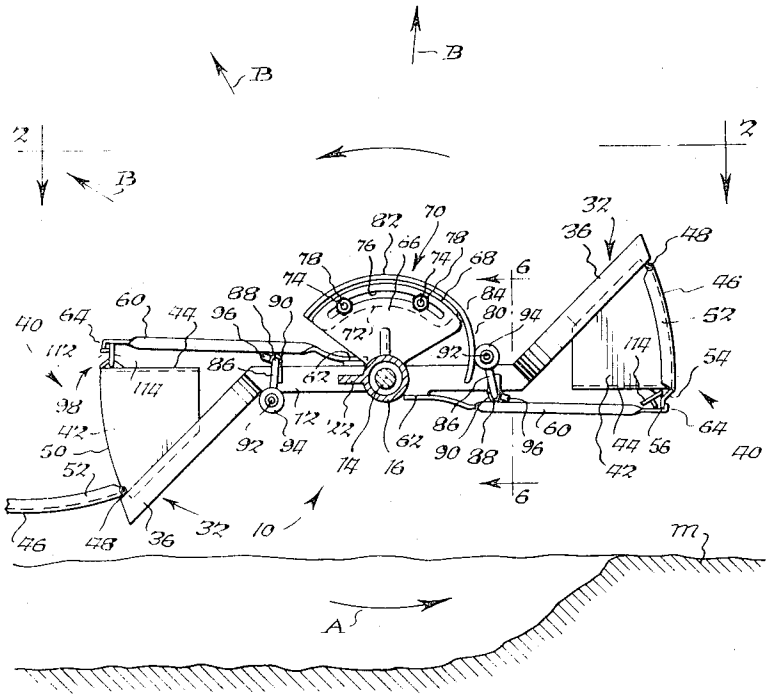


Fig. 1.

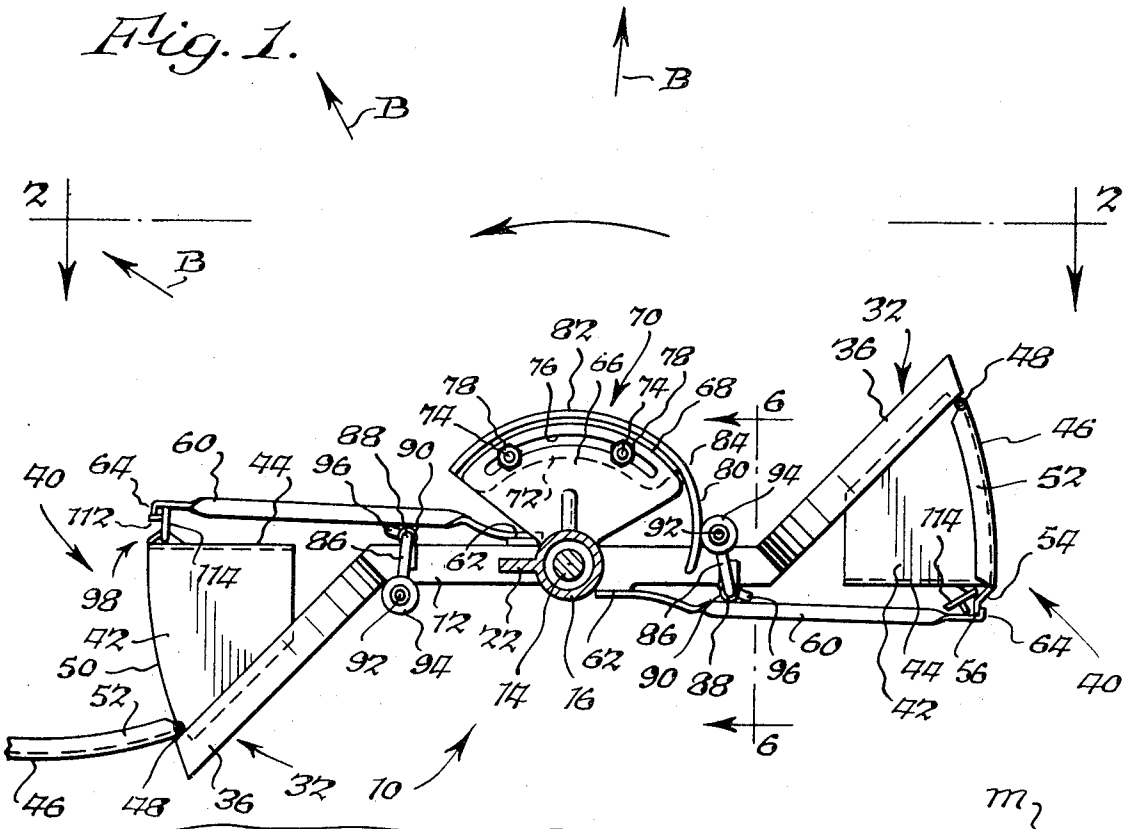
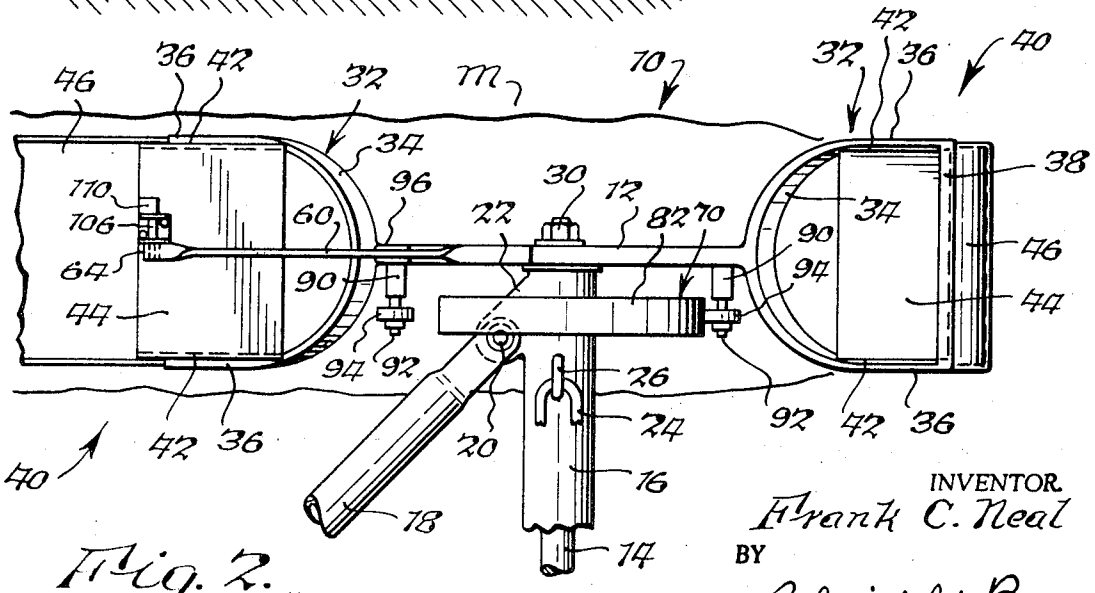
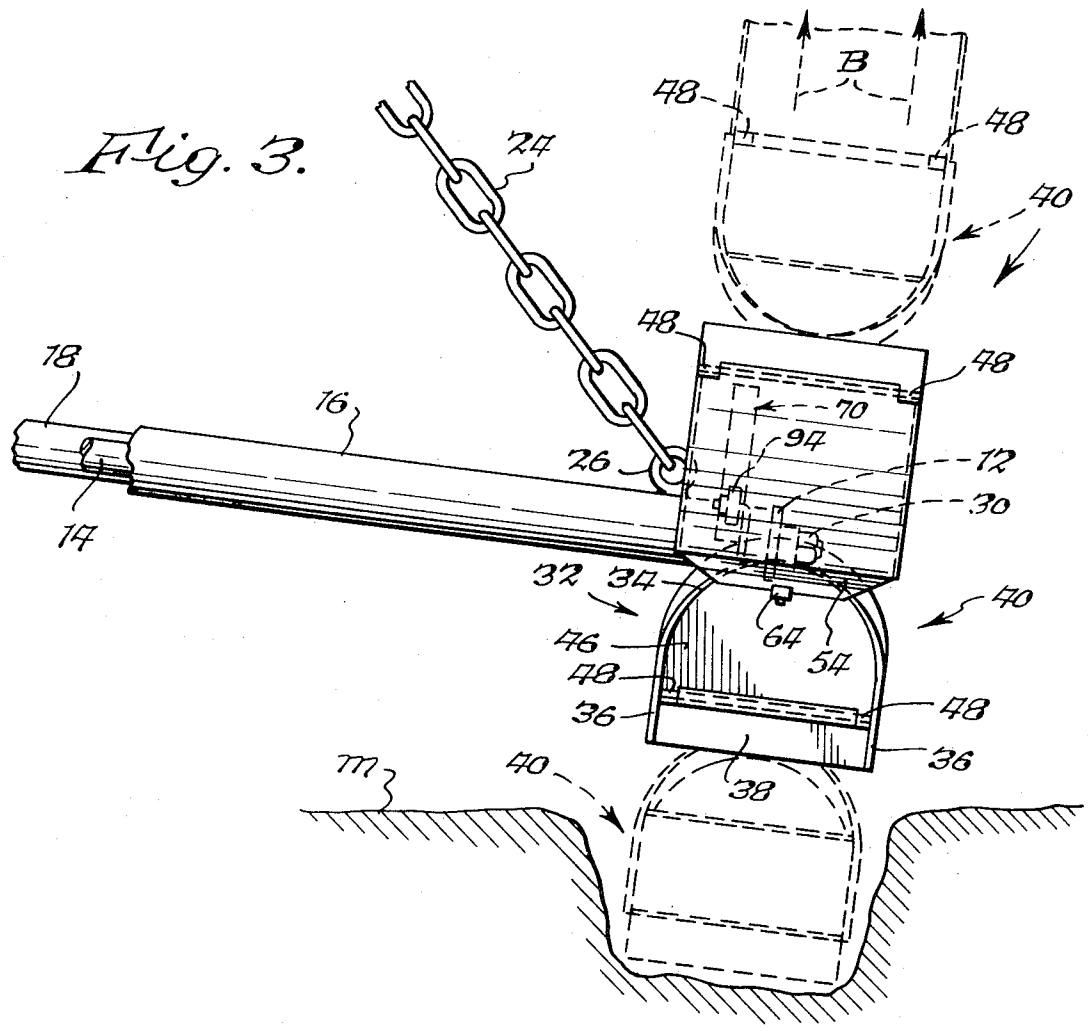


Fig. 2.



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Fig. 3.



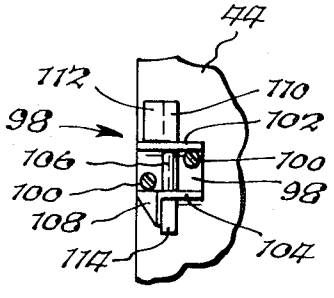


Fig. 4.

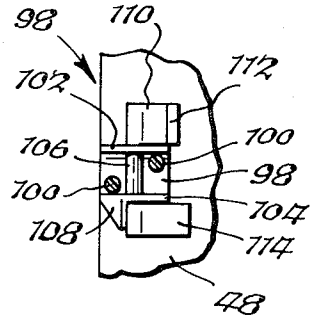


Fig. 5.

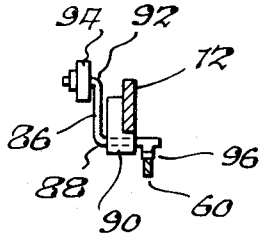


Fig. 6.

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CENTRIFUGALLY DISCHARGING SCOOP SHOVEL ASSEMBLY

BACKGROUND OF THE INVENTION

This invention relates to a scoop shovel assembly and, more particularly, to a rotatable scoop shovel assembly for use in the removal or displacement of relatively soft or loose materials.

Various types of powered shovels and scoops have been designed for excavating purposes and for other material moving or handling operations. Generally, these powered shovels are very large, cumbersome, expensive and have high power requirements. Also, they often utilize some power means for actuating a gate or closure member on the shovel for dumping the contents thereof. While such industrial shovels are satisfactory for large scale operations, they become impractical in many applications. For example, such equipment is not economically feasible for use by the average homeowner in performing relatively small jobs on his property, yet he would find it desirable to utilize a relatively small powered shovel for use in many applications in lieu of the laborious and time consuming task of manually using a hand shovel.

SUMMARY OF THE INVENTION

The rotatable scoop shovel assembly of the present invention, as hereinafter described, obviates the above noted disadvantages and provides a rotatable scoop shovel assembly which is simple and strong in construction, low in cost, rugged and durable in use, requires only a minimum of power, and which can be made relatively small for convenient attachment to existing equipment, such as the well known garden type tractor, for example.

Generally speaking, the rotatable scoop shovel assembly of the present invention comprises an arm mounted on a shaft for rotation therewith and extends radially in opposite directions from the shaft. The opposite ends of the arm are provided with shovels, each having a pivotable bottom portion or gate adapted to be swung outwardly relative to the arm for discharging the shovel contents by centrifugal forces. A latch mechanism is mounted on the arm for maintaining the gate closed during the shovel loading operation. A cam actuated means is mounted on the arm for releasing the latch mechanism during orbital movement of the shovel allowing the gate to swing open by centrifugal forces.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, partly in section, of the rotatable scoop shovel assembly constructed in accordance with the present invention;

FIG. 2 is a top plan view of the shovel assembly of FIG. 1, looking in the direction of arrows 2—2 of FIG. 1;

FIG. 3 is an end elevational view of the shovel of FIG. 1;

FIG. 4 is a fragmentary end elevational view on an enlarged scale, showing the latch supporting means used in conjunction with this invention, illustrating a position of use of such supporting means;

FIG. 5 is a view similar to FIG. 4, but showing the latch supporting means in an alternate position of rest; and

FIG. 6 is a fragmentary elevational view, on an enlarged scale and partly in section, of the latch release means used in conjunction with this invention.

DETAILED DESCRIPTION OF AN ILLUSTRATED EMBODIMENT

Referring now in detail to the drawings, there is shown in FIG. 1 a rotatable scoop shovel assembly, constructed in accordance with this invention and generally designated 10, comprising an elongated arm 12 rigidly secured to one end of a rotatable shaft 14 for rotation therewith. Shaft 14 extends through an elongated, hollow tube 16, which constitutes a part of the rotatable scoop shovel support structure and can be detachably mounted at its remote end (not shown) to the main frame of a conventional house or garden type tractor, also not shown, or to any mobile or stationary structure adapted to move tube 16 in a desired path. Other support elements can include a rod 18 attached, as by means of a fastener 20, to a lug 22 extending radially outwardly from tube 16 and a chain 24 connected to an eye member 26 projecting from tube 16. It should be understood that rod 18 and chain 24 are illustrative only of various supporting members that can be employed to support tube 16 in the proper orientation relative to the material M to be scooped.

Shaft 14 is suitably journalled in bearings (not shown) carried by tube 16 and extends through a central opening provided in arm 12. The free end of shaft 14 is threaded for receiving a nut 30 for detachably attaching arm 12 to shaft 14. The other end of shaft 14 is connected to a power source (not shown) for rotating shaft 14 at a predetermined speed.

In accordance with this invention, each opposite end of arm 12 terminates in a U-shaped stirrup 32 extending outwardly at an angle to the longitudinal axis of arm 12. Each stirrup 32 comprises an arcuately shaped bight portion 34 and a pair of spaced, parallel legs 36 connected at their outer ends to the opposite ends of a cross bar 38 extending therebetween.

Rigidly secured to stirrup 32 as by means of welding for example, is a scoop shovel, generally designated 40, comprising a pair of spaced side walls 42 and a rear wall 44. For convenience of description, the end of scoop shovel 40 attached to stirrup 32 will be taken to be the forward end of the shovel and the terms forwardly, rearwardly and the like will be referenced thereto. Also, the terms top, bottom, upper, lower and the like will be referenced to shovel 40 when in its material engaging position or the lowest position shown in phantom in FIG. 3. With this in mind, shovel 40 is provided with a bottom wall in the form of a swinging gate 46 pivotally mounted to the rear edge of cross bar 38 by means of hinges 48 disposed along the rear edge of cross bar 38 151 48 adjacent the opposite ends thereof. Gate 46 is slightly arcuately curved, as shown in FIG. 1, and conforms to the curvature of the lower or outer edges 50 of side walls 42. Gate 46 is provided with flanges 52 along the lateral edges thereof extending generally normal thereto in overlapping relation with the outer edges 50 of side walls 42. The trailing edge of gate 46 is provided with a skirt 54 terminating in a flange 56 for a purpose hereinafter explained.

Means are provided for latching said swinging gate in a closed position during the scooping operation, such means comprising an elongated, resiliently yieldable

spring member 60 welded or otherwise fixedly secured at one end thereof to arm 12, as shown at 62 in FIG. 1. The other end of spring member 60 is provided with a right angularly directed lip 64 adapted to engage behind flange 56 for latching gate 46 in the closed position. The natural resiliency of spring latch member 60 causes it to be urged toward rear wall 44 of shovel 40.

Rigidly secured to tube 16 and formed integral therewith is a section plate 66 having an arcuately shaped support ledge 68 for supporting a cam 70 thereon. Cam 70 is adjustably mounted on plate 66 and to this end has a right angularly related bracket 72 provided with a suitable slot therein in general registry with an arcuate slot 76 in plate 66 for receiving bolts 74 therethrough. Thus, cam 70 can be angularly adjusted to the desired position by means of the bolt and slot arrangement and secured to plate 66 in such adjusted position by tightening nuts 78 on bolts 74.

Cam 70 is generally arcuate in outline and consists of a first arcuate cam surface 80 and a second arcuate cam surface 82 having a larger radius than cam surface 80 and merging therewith at juncture 84.

Cam follower means are mounted on arm 12 for disabling or releasing spring latch member 60 in order to allow gate 46 to swing to an open position. Such means comprises a pivotal arm 86 (FIG. 6) having a right angularly bent portion or stub shaft 88 at one end thereof jounalled for rotation in a sleeve bearing 90 welded or otherwise fixedly secured to arm 12 adjacent one end thereof. The other end of arm 86 is provided with a right angularly bent portion extending in the opposite direction from portion 88 and which serves as an axle 92 on which is rotatably journalled a cam follower in the form of a roller 94. Shaft 88 is provided with a cam projection 96 engagable with spring latch member 60.

A bracket 98 is mounted on the outer surface of shovel rear wall 44 (FIGS. 4 and 5) adjacent the outer end thereof by suitable fasteners, such as screws 100. A pair of spaced flanges 102 and 104 are provided on bracket 98 and have openings for receiving a rotatable shaft 106. A stop 108 extends laterally outwardly from flange 104 for a purpose that will hereinafter be described. A radially extending projection in the form of a tab 110 is welded or otherwise fixedly secured to one end of shaft 106 and projects radially therefrom. Tab 110 is provided with a flange 112 extending normal to the plane of tab 110. The other end of shaft 106 is provided with a projection in the form of a finger 114 fixedly secured thereto and projecting radially therefrom in the same general direction as tab 110. Tab 110 and finger 114 are mounted on the opposite ends of shaft 106 exteriorly of flanges 102 and 104.

In operation, shaft 14 is rotated at a predetermined speed in a counterclockwise direction, as viewed in FIG. 1, to rotate arm 12 and scoop shovels 40 in the same direction. With gate 46 latched closed, the various components of scoop shovels 40 and the latch mechanism are in the related position shown at the right in FIG. 1. During each revolution, a closed shovel 40 digs into material M in the direction of arrow A, scooping up such material in its arcuate path of movement and conveys the same upwardly whereupon roller 94 engages cam surface 80 and bears thereagainst. As roller 94 engages the high point or juncture 84 of cam 70, arm 86 swings outwardly in a clockwise direction as shown in FIG. 1 to effect arcuate movement of projection 96 which bears against and cams spring latch member 60 outwardly away from the rear wall of shovel 40 causing lip 64 to disengage from flange 56 thereby releasing gate 46. After gate 46 is released, the centrifugal forces acting thereon causes gate 46 to swing outwardly about hinges 48 and discharge the load by centrifugal forces in an upward radial direction as indicated by arrows B. Also, the increased clearance between spring latch member 60 and rear wall 44 enables the centrifugal forces acting on tab 110 and finger 114 to swing them outwardly about the pivot axis defined by shaft 106 from the position shown in FIG. 5 to the position shown in FIG. 4. In this latter position, tab 110 and finger 114 extend generally normal to rear wall 44 and are prevented from swinging beyond this position by the engagement of finger 114 with stop 108. As roller 94 rolls off cam surface 82 during rotation of arm 12, the resilient spring latch member 60, which is biased toward rear wall 44 of shovel 40, will engage the end portion of finger 114 as shown at the left in FIG. 1, and will be prevented from returning to its normal position so as not to interfere with the closing of gate 46, as will hereinafter appear.

Continued revolving motion of the opened shovel 40 brings the leading edge of cross bar 38, which also serves as the leading edge of the bottom wall of shovel 40, into scooping engagement with the material M. Just prior to cross bar 38 contacting material M, gate 46, which now extends downwardly below bar 38, contacts material M and, due to such impact, is driven upwardly toward its closed position. As gate 46 approaches its closed position, flange 56 thereof strikes flange 112 of tab 110 as it passes by lip 64 to pivot tab 110 along with finger 114 to release spring latch member 60 and allow lip 64 of spring latch member 60 to engage behind flange 56 and maintain gate 46 in the closed position. Thus, shovel 40 is closed in readiness to receive and convey another load of material to repeat the above described cycle.

As shown in FIG. 3, shaft 14 is inclined downwardly relative to a horizontal plane in order to orient arm 12 and thereby shovels 40 in an inclined plane extending at a slight angle relative to a true vertical plane. In such an orientation, shovels 40 are effective to displace material M laterally from its original location and away from the remote end of shaft 14. Of course, the angular path of revolution of shovels 40 relative to the material to be displaced can vary, as desired. Also, it should be understood that any number of shovels can be employed by providing a plurality of arms 12 on shaft 14 with each arm 12 carrying shovels 40 at the opposite ends thereof. The length of arms 12 and the sizes of shovels 40 can vary, as dictated by the specific application.

The scoop shovel of the present invention has utility in a wide variety of applications. For example, tube 16 can be detachably mounted on the main frame of a conventional house or garden type tractor with shaft 18 suitably secured to a separate power source on the tractor or operatively connected to the tractor's prime mover by suitable gear reduction means for displacing loose material on a ground surface or excavating relatively soft earthen material. Shovel assembly 10 can be used effectively to displace snow laterally in order to

clear a path through a snow covered area. Indeed, shovel assembly **10** has utility in any environment where it is desired to displace relatively soft or loose material laterally or from one vertical level to another.

As a result of this invention, an improved scoop shovel assembly is provided for removing or displacing material in an improved and efficient manner by utilizing centrifugal forces to effect discharge of the shovel contents. The scoop shovel assembly can be readily attached to existing equipment, such as the well known garden type tractor, to facilitate the performance of relatively small but arduous tasks confronting the average homeowner.

A preferred embodiment of this invention having been disclosed and illustrated in detail, it is to be understood that this has been done by way of illustration only.

I claim:

1. A scoop shovel comprising: an arm mounted for rotation about a shaft extending generally normal to said arm; a shovel having a bottom wall; means supporting said shovel adjacent one end of said arm; means mounting said bottom wall on said supporting means for pivotal movement into an open and closed position; means carried by said arm for latching said bottom wall in a closed position; and means for disabling said latching means at a predetermined point in the path of travel of the shovel during rotation thereof whereby said bottom wall is free to swing into said open position under the influence of centrifugal forces.

2. A scoop shovel according to claim **1** wherein said latching means comprises an elongated resilient member mounted at one end on said arm and biased toward said shovel, the other end of said member having means engaging said bottom wall to maintain the latter closed.

3. A scoop shovel according to claim **1** including means for maintaining said latching means disabled until said bottom wall is returned to its closed position.

4. A shovel assembly comprising: means supporting a rotatable shaft; an arm mounted on said shaft and extending radially thereof in opposite directions generally normal to said shaft; means at each opposite end of said arm for supporting a shovel; each shovel having a bottom wall; means mounting said bottom wall on said shovel support means for pivotal movement into an open and closed position; means carried by said arm for latching said bottom wall of each shovel in a closed position; and means for disabling each of said latching means during rotation of its associated shovel at a predetermined point in the path of travel thereof whereby the associated bottom wall is free to swing into said open position by centrifugal forces.

5. A scoop shovel comprising: an arm mounted for rotation about a shaft extending generally normal to said arm; a shovel having a bottom wall; means supporting said shovel adjacent one end of said arm; means mounting said bottom wall on said supporting means for pivotal movement into an open and closed position; means carried by said arm for latching said bottom wall in a closed position; means for disabling said latching means at a predetermined point in the path of travel of the shovel during rotation thereof whereby said bottom wall is free to swing into said open position under the influence of centrifugal forces; said latching means comprising an elongated resilient member mounted at one end on said arm and biased toward said shovel; the other end of said member having means engaging said bottom wall to maintain the latter closed; means for supporting said shaft; said disabling means comprising a cam mounted on said shaft support means; a pivotable member carried by said arm and having a cam follower engagable with said cam; and means on said pivotable member engagable with said resilient member for urging the latter away from said shovel to disengage said bottom wall engaging means.

6. A scoop shovel according to claim **5** wherein said cam has a generally arcuate configuration and a pair of cam surfaces of different radii.

7. A scoop shovel according to claim **1** including means for adjusting said cam relative to said shaft supporting means.

8. A scoop shovel comprising: an arm mounted for rotation about a shaft extending generally normal to said arm; a shovel having a bottom wall; means supporting said shovel adjacent one end of said arm; means mounting said bottom wall on said supporting means for pivotal movement into an open and closed position; means carried by said arm for latching said bottom wall in a closed position; means for disabling said latching means at a predetermined point in the path of travel of the shovel during rotation thereof whereby said bottom wall is free to swing into said open position under the influence of centrifugal forces; means for maintaining said latching means disabled until said bottom wall is returned to its closed position; said maintaining means comprising a rotatable shaft mounted on said shovel and having a pair of projections at opposite ends thereof normally disposed in a retracted position and pivotable into an extended position by centrifugal forces upon disablement of said latching means whereby one of said projections is engagable with said latching means to maintain the latter disabled prior to the return of said bottom wall to its closed position.

9. A scoop shovel according to claim **8** wherein the other of said projections is engagable by said bottom wall upon the return of the latter to its closing position to retract said projections and disengage said one projection from said latching means.

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