

AN APPARATUS FOR CLEANING SYNTHETIC GRASS**FIELD OF THE INVENTION**

The present invention relates to an apparatus which can be used for cleaning a surface such as a synthetic grass tennis court or an equivalent surface generally subject to weathering and the accumulation of dust, moulds and mildew.

BACKGROUND OF THE INVENTION

At present there are no apparatuses available which can effectively clean synthetic grass surface. Typically synthetic grass is very durable. Sand normally collects at the bottom of the synthetic grass and grime, mould and mildew collects on external fibres of the synthetic grass leading to premature degradation and a reduction in performance.

Because the synthetic grass is porous whenever rain falls sand and other particulate material rises to the surface of the synthetic grass fibres leading to a degradation in quality and consequential problems for the sporting activity for which the synthetic grass is being used.

Sweeping a synthetic grass surface with a brush is normally ineffective because not all particulate material is moved and when it is moved it tends to spray in all directions. Furthermore, brushing does not effectively remove organic matter such as mould and mildew.

Moreover, to attempt to clean an entire tennis court using such a method in conjunction with washing detergent would be extremely time consuming. Accordingly, there is a need for an apparatus which can effectively remove particulate material as well as organic material such as mould and mildew from deep in the synthetic grass.

SUMMARY OF THE INVENTION

According to the present invention there is provided an apparatus for cleaning synthetic grass comprising a frame including a brushing means for brushing a ground surface, a suction means connected to a particle collection zone located at the periphery of the brushing

means and a driving means connected to the brushing means and operable to activate the brushing means to brush a surface.

Preferably the driving means is adapted to be
5 connected to an external drive source.

The external drive source may be derived from a rotary hoe.

It is preferred that the driving means comprises at least one pulley which is arranged to be connected to a
10 drive pulley of a drive shaft.

According to one embodiment the apparatus is adapted to be connected to a drive shaft.

The end of the drive shaft may be provided with a drive pulley which can be connected with the drive means
15 through drive belts or a gear assembly.

The drive means may comprise a brush means drive shaft connected to a brush drive pulley.

The brush means drive shaft preferably comprises a flex drive or telescopic drive.

20 The drive means may comprise belt driven pulleys.

Preferably the frame comprises a suction chute.

The frame preferably comprises a drive means housing.

The frame may comprise an impeller chamber.

25 According to one embodiment the frame comprises a brush means holder.

The brush means may comprise a rotatable brush.

The brush may be supported on a horizontal axial.

The axial may be supported on side support members.

30 Preferably the brush is cylindrical.

The frame may comprise a brush cover.

The brush axial may be connected to a gear box.

Preferably the brush comprises radial brush elements extending from a central shaft.

35 It is preferred that the cover comprises an upper section having an opening therein.

The opening may be connected to the suction means.

The cover preferably comprises a curved upper

surface.

Preferably the cover comprises an opening in a front or back section thereof.

5 The apparatus may include at least one baffle located under the cover.

Preferably the apparatus includes at least one baffle located adjacent the brush means.

One baffle may extend from a lower section of the cover.

10 The cover preferably covers substantially 90% of the brush.

The cover bottom section may be arranged adjacent a ground surface over which the apparatus is to be used.

15 It is preferred that the cover comprises a hood with the brush substantially fully enclosed except for a slight gap between the ground surface and its bottom section.

The brush is preferably adjustable vertically and/or horizontally with respect to the frame.

20 The brush may be lowered or raised with respect to the ground so as to adjust the degree of abrasion between the brush elements and the ground surface over which it operates.

25 It is preferred the first baffle is located in front of the brush.

A second baffle may be located behind the brush.

The first baffle may extend from the lower section of the cover to the collection zone above the brush.

30 The second baffle may extend from the lower section of the cover to the collection zone above the brush.

It is preferred that the first baffle overlaps the second baffle.

Alternatively the second baffle overlaps the first baffle.

35 It is preferred that the overlapping first and second baffles create a serpentine path leading to the opening.

The collection zone may include the overlapping

first and second baffles and the serpentine path.

Preferably the suction means chute is connected at one end to the opening.

5 The suction means chute is preferably connected at a lower end to the opening.

One of the baffles may be located across a major part of the opening.

Each baffle may be curved.

10 The suction means may comprise an impeller located at the other end of the chute.

The other end of the chute is preferably connected indirectly with a conduit for exhaust of particulate material sucked up through the chute.

15 Preferably the impeller interposes the chute and the conduit.

It is preferred that a collection receptacle is located at the end of the conduit.

The impeller is preferably located in an impeller chamber.

20 The impeller is preferably located at the top of the impeller chamber.

The conduit preferably is connected to the top of the impeller chamber.

25 The impeller is preferably mounted on a horizontal shaft with the top of its blades facing the other end of the chute.

The particle collection receptacle is preferably a dust bag or filter cartridge.

30 The impeller housing is preferably rectangular or circular.

The chute is preferably a hose.

The frame preferably includes an attachment means to enable the apparatus to be attached to a driving axle.

35 It is preferred that the apparatus is connectable to a vehicle.

According to one embodiment the apparatus includes wheels which are driven by a motor.

According to a further embodiment the apparatus

includes a seat.

According to one embodiment the brush may be turned in a horizontal plane with respect to the chute.

It is preferred that the cover can be turned with
5 the brush.

According to one embodiment the brush may be rotated clockwise or anticlockwise.

According to one embodiment the apparatus is connected to a driving assembly and may be moved up or
10 down with respect to the driving assembly by movement of a lifting arm.

According to one embodiment the apparatus comprises a support and support wheel located behind the brush.

It is preferred that raising or lowering the back
15 section of the apparatus varies the weight on the brush.

It is preferred that the opening is located in a central area of the cover.

According to another embodiment the opening is located at one end of the cover.

According to a further embodiment the brush could be replaced by a plurality of brushes.
20

It is preferred the brush rotates on a horizontal axis, although according to another variation the brush could rotate on a vertical axis with brush elements
25 directed downwardly towards the ground surface.

According to a different embodiment the brush means could include brushes rotatable in different planes.

It is preferred that the brush is a helical brush.

It is preferred that the cover comprises skids which
30 permits the hood to slide over a ground surface in the event there is contact between the cover and the ground surface, for example because the apparatus bounces.

The skids may be in the form of skis on either side of the cover, each ski extending from a front part of the
35 cover to a back part of the cover.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the present invention will now be described by way of example only with reference to

the accompanying drawings in which:

Figure 1 shows a side view of an apparatus according to a first embodiment of the present invention;

Figure 2 shows a front view of the apparatus shown
5 in Figure 1;

Figure 3 shows a left side view of an apparatus according to a second embodiment of the present invention;

Figure 4 shows a right side view of an apparatus
10 according to a second embodiment of the present invention; and

Figure 5 shows a front view of the apparatus shown in Figure 3.

DETAILED DESCRIPTION OF THE DRAWINGS

15 The apparatus consists of an impeller 11, a brush cover 12 and an interconnecting hose 13. The impeller cover 11 is a large squat cylindrical shape designed to house an impeller 14 at its upper end, an impeller pulley 15 behind the impeller 14, a flex drive pulley 16 at its
20 lower end as well as a portion of a belt drive shaft 17. The back of the impeller cover 11 is connected to a vertical backing plate 18 which extends down towards the ground and at its lower end is provided with a lifting arm 19.

25 The pulleys 15 and 16 are located at the back of the impeller cover and preferably in a chamber partitioned from the impeller 14. The backing plate 18 is designed to receive a drive shaft and a drive pulley is to be located between the pulley 15 and pulley 16 so as to be
30 connected to these pulleys 15, 16 through drive belts. The axle can be the axle of a rotary hoe with a front part of the rotary hoe removed, or alternatively could be an axle connected to the axle of a small vehicle such as a golf buggy.

35 The hose 13 extends from a front top end of the impeller cover 11 and is connected at a point directly in front of the impeller blades which are oriented in a horizontal plane. The lower end of the hose 13 is

connected to the brush cover 12 at a point at the top of the brush cover 12 and in its centre.

5 A cylindrical brush 20 is located below the brush cover 12 and is supported on a horizontal axle 21 connected to the brush cover at either end thereof. At one end as shown in Figure 2 a gearbox 22 is connected to the axle 21 to permit control of the speed of rotation of the axle 21 and associated brush 20. The gearbox is connected to a belt drive 23 which is driven by pulley 10 16.

A tee gearbox is connected to a PTO (power take-off unit) of the primary machine with axles extending out from both the sides supported by two bearing blocks on both axles with drive belt pulleys on both ends. The 15 gear box is no longer attached directly to the brush axle.

Inside the brush cover 12 a forward and rear baffle 24, 25 are provided. The front baffle 24 curves around the front of the brush 20 slightly past a point at the 20 top of the brush 20. Similarly the rear baffle 25 extends around the back of the brush to a point around the top of the brush.

Although in Figure 1 the front baffle passes over the rear baffle, in another embodiment the rear baffle 25 passes over the front baffle so that there is a small region of overlap. This creates a serpentine path for particulate material which is swept up by the brush and directed to the hose 13.

Each baffle is curved and the overlapping region 30 also has the effect of preventing particulate matter being swept directly into the hose 13 once lifted by the rotating brush 20.

At the top of the impeller cover a collection hose 26 is provided which at its opposite end is connected to 35 a dust filter 27. The dust bag would be removable to empty particulate material collected therein.

In operation it is intended that the apparatus be connected to a driving part of a rotary hoe so that the

controls on the rotary hoe will drive pulleys 15 and 16 through a drive belt assembly.

5 The belt drive 23 and gear box 22 allows the brush to be controlled independently of the rotary hoe controls and if necessary the impeller pulley could also be connected through a gear assembly to control its operation independently of the rotary hoe controls.

10 When the apparatus is switched on at the rotary hoe control the brush 20 rotates anticlockwise (referenced to Figure 1) and particulate matter and organic matter is brushed off a ground surface such as a synthetic grass tennis court.

15 It is preferred that the brush rotates at 600rpm sweeping particulate matter to the rear of the cover as the apparatus moves forward.

The combination of the rotating brushes, baffles and suction of the impellor 14 desirably separates particulate matter removed from a synthetic grass court so that sand and other heavy matter returns to the court behind the brushes as the apparatus moves forward and dust and other light material is sucked up by the impellor into the dust bag 27.

25 It is preferred that the baffles act as deflection plates which redirect heavier particulate matter such as sand back onto the court while air borne dust is sucked up through the serpentine path created by the arrangement of baffles.

30 This matter is directed by the baffles to the hose 13 due to the sucking action of the impeller 14. This material passes through the hose 13 and is directed to the sides of the impeller up into the collection hose 26 and dust bag 27. If it is necessary to force the brush upwardly or downwardly to alter the pressure of the brush filaments on the ground surface, this can be done by the using a lifting arm which lifts the position of the backing plate with respect to the rotary hoe drive assembly. An adjustment mechanism (not shown) would allow the apparatus to be fixed at a particular vertical

disposition with respect to the rotary hoe assembly. One possibility is to use a simple clamping arrangement which can be tightened when the vertical disposition of the backing plate has been determined.

5 In another embodiment a telescopic supporting bar could be used to interconnect the apparatus and the rotary hoe assembly. A pinning system could be used to fix the position of one bar within the other.

10 According to a preferred embodiment of the present invention the brush cover 12 is pivotally connected to support arms located at each end of the cover 20. These support arms extend to the back of the apparatus and through a suitable linkage are connected to a supporting frame which rides on wheels. Thus in one form of the
15 invention a vehicle is provided having a chassis and at least two wheels and the apparatus is connected to the chassis of the vehicle. The vehicle can be provided with a seat which enables a person to ride on the vehicle and operate the apparatus from a seated position.

20 The apparatus is supported by the arms and additional side arms can be provided which are connected from a lower point of the cover on either end thereof which arms are also connected to the vehicle.

In the embodiment with the pivotal cover it is
25 preferred that the cover can be pivoted through 180° so that the brush can easily be accessed for maintenance or repair or changing. It is preferred in this embodiment that the hose 13 is detachable from the impeller cover 11 and the top of the brush cover 12.

30 According to one embodiment the axle 21 is mounted on end plates at either end of the cover 12. The cover is provided with vertical slots which allow the position of the end plates to be varied so that the vertical position of the axle can be changed. This allows the
35 brush to be lowered and fixed in position as the ends of the brush wear down.

It is preferred that the impeller cover 11 and brush cover 12 are separately supported by the vehicle.

It is preferred that a lever is provided on the vehicle which is connected to the brush cover 12. The lever can then be operated to lift the cover and thus the whole apparatus to one of a number predetermined
5 positions. It is preferred that the lever is essentially horizontal and extends from the front of the vehicle to the rear of the vehicle with a fulcrum point being located at the front of the vehicle. The end of the lever is provided with a handle which can be lowered to
10 lift the arms connected to the brush cover 12. This in turn raises the apparatus.

According to a second embodiment of the present invention shown in Figures 3 and 4 a motor driven apparatus 30 is provided with drive wheels 31. The
15 apparatus includes a brush cover 12 and hose 13 which connects the area under the brush cover with an impeller in the form of a centrifugal fan 32 which is located in a cavity with an outlet connected to a dust collector pipe 33 and at its end to a dust filter 34.

20 The apparatus is provided with control handlebars 35 which extend to the rear of the apparatus from a frame 47 which is supported on the wheels 31 and a small roller wheel 36 located between the brush cover 12 and the wheels 31. The roller wheels 36 provide stability and
25 preferably take much of the weight of the apparatus so that the brush is able to rotate freely without taking any vertical load due to the weight of the apparatus. In addition it is preferred that the roller wheels 36 support the apparatus so that the cover 12 and brushes
30 can be removed without the apparatus falling over.

The support wheel 36 is also connected to a support bracket connected to the partition 53.

A height control linkage 37 and support link 57 pivotally connected to the cover at upper and lower
35 points respectively enable the height of the brush and brush cover 12 to be adjusted relative to a ground surface. The linkage 37 consists of a series of components and extends to the rear of the apparatus

just below the handlebars and can be manually adjusted.

The control linkage 37 incorporates a lever 38 which at one end is pivotally connected directly to a top rear section of the brush cover 12. At a mid section the lever 38 is pivotally connected to a bracket 39 fixed to a mounting plate (partition plate) 53 the other end of the lever 38 extends through the mounting plate 53 and has an eyelet to which a flexible wire 34 is connected. This wire extends downwardly to a first pulley wheel 40 then approximately horizontally to a second pulley wheel 41 and then up again to another pulley wheel 42. The wire then extends down to pulley 41 and is fixed to a central region thereof.

Pulley wheel 42 is pivotally connected to a small link which itself is pivotally connected to a diagonally extending control lever 43 at a position close to its lowermost end. The lowermost end of the lever 43 is pivotally connected to another link 55 which extends substantially vertically and at its lowermost end is connected to another link 56 which is pivotally connected to a mid section of a trailing broom support lever 50 which extends substantially horizontally and pivotally connected to a rear section of the mounting plate 53. The control lever 43 can be operated to control both the trailing brush and the height of the brush and brush cover by moving the lever 43 up or down.

The brush (not shown) is driven through a flexible drive shaft 44 through a gear box and differential 45 which are connected directly to the engine 46 located at the rear of the vehicle and mounted on a frame 47.

A spring shown in Figure 3 (unmarked) above the gear box 49 acts to tighten or loosen the flexible drive which rotates the brushes 20.

The centrifugal fan 32 is driven by V-belts beneath cover 48. These V-belts are connected through pulleys to the gear box and differential 45.

The lower end of the belt drive shaft 44 is connected to a reduction drive gearbox 49 which controls

the speed of rotation of the shaft on which the brush is located.

As shown in the drawings for both embodiments of the invention the brush extends slightly below the brush
5 cover 12 so as to ensure that all material brushed on a ground surface is sucked up through hose 13. Depending upon the type of surface being cleaned the position of the brush can be changed with respect to the brush cover 12. It is also possible to lift the brush cover 12 to a
10 position identified by item 52 so as to allow the brush to be cleaned or changed.

In summary the apparatus of the second embodiment effectively combines the apparatus shown in Figures 1 and 2 with a driving and control assemblage. Mounting plate
15 18 shown in Figure 1 corresponds to mounting plate 53 shown in Figures 3 and 4. The brush, brush cover, hose, impeller, flexible drive shaft and height control levers are effectively the same as those shown in the first embodiment except for the addition of roller wheels 36
20 and a different height control lever assembly 37. Instead of connecting the other side of the mounting plate 18, 53 to a backhoe or other driving assembly the apparatus of the second embodiment is provided with its own driving assembly and control mechanisms.

25 A butterfly is incorporated between the impeller filter in the discharge side of the impeller and this allows flushing of material including water after filtration.

CLAIMS

1. An apparatus for cleaning synthetic grass comprising a frame including a brush means for brushing a ground surface, a suction means connected to a particle
5 collection zone located at the periphery of the brush means and a driving means connected to the brush means and operable to activate the brush means to brush a surface to dislodge particulate matter whereby the suction means can suck up waste matter from the
10 particulate matter.
2. An apparatus as claimed in claim 1, wherein the driving means is adapted to be connected to an external drive source.
3. An apparatus as claimed in claim 1 or claim 2,
15 wherein the frame comprises a suction chute.
4. An apparatus as claimed in claim 3, wherein the brush means comprises a rotatable brush supported on a horizontal axial.
5. An apparatus as claimed in claim 4, wherein the
20 frame comprises a brush cover which has an opening connected to the suction chute.
6. An apparatus as claimed in claim 5, wherein the cover comprises a curved upper surface.
7. An apparatus as claimed in claim 6, wherein the
25 cover substantially conceals the brush means and has a lower section which is adapted to abut close to a ground surface when the apparatus is in operation.
8. An apparatus as claimed in any one of the preceding claims a baffle means located adjacent the
30 brush means, the baffle means being adapted to deflect particulate matter dislodged from a ground surface by the brush means.
9. An apparatus as claimed in claim 8, wherein the baffle means includes a baffle arrangement which extends
35 from a lower section of the cover to an upper section.
10. An apparatus as claimed in claim 9, wherein the cover comprises a hood with the brush substantially fully enclosed except for a slight gap





between the ground surface and its bottom section.

11. An apparatus as claimed in claim 10, wherein the brush is adjustable vertically and/or horizontally with respect to the frame so as to adjust the degree of abrasion between brush elements of the brush and a ground surface over which the apparatus operates.

12. An apparatus as claimed in claim 11, wherein the baffle comprises a first baffle located in front of the brush and extending from a lower section of the cover to the collection zone above the brush.

13. An apparatus as claimed in claim 12, wherein the baffle means comprises a second baffle located behind the brush and extending from a lower section of the cover to the collection zone above the brush.

14. An apparatus as claimed in claim 13, wherein the first baffle overlaps the second baffle.

15. An apparatus as claimed in claim 14, wherein the second baffle overlaps the first baffle.

16. An apparatus as claimed in claim 15, wherein overlapping first and second baffles are adapted to create a serpentine path leading to the opening in the cover.

17. An apparatus as claimed in claim 16 wherein one of the baffles is located across a major part of the opening in the cover to separate waste matter from particulate.

18. An apparatus as claimed in claim 17, wherein the suction means comprises an impellor located in a chamber located at a distal end of the chute.

19. An apparatus as claimed in claim 18, wherein the chamber comprises an outlet connected to a conduit for exhaust of particulate material sucked up through the chute.

20. An apparatus as claimed in claim 19 comprising a drive means for driving wheels of the apparatus.



21. An apparatus as claimed in claim 20, wherein the apparatus comprises handle bars to steer the apparatus.

22. An apparatus as claimed in claim 21,
5 wherein the brush means is located in front of wheels of the apparatus.

23. An apparatus as claimed in claim 22, wherein an adjustment lever is connected to the cover and brush so as move the cover with respect to drive wheels
10 of the apparatus.

24. An apparatus as claimed in claim 23, wherein the brush is located on an axial connected to the cover.

25. An apparatus as claimed in claim 24,
15 wherein the apparatus comprises a mounting plate to which the brush means and suction means are connected on a front side thereof and to which the drive means is connected to a rear side thereof.

26. An apparatus as claimed in claim 25,
20 wherein at least one support wheel is located between a drive wheel and the brushing means to provide stability for the apparatus during operation.

27. An apparatus as claimed in claim 26, wherein the brush means comprises a flexible drive shaft
25 which enables the height of the brush means to be adjusted by the adjustment means.

28. An apparatus as claimed in claim 26, wherein the suction means and brush means are removable from the partition plate.

30 29. An apparatus substantially as hereinbefore described with reference to the accompanying drawings.



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