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(54) A brush assembly

(57) The present invention is directed towards a brush assembly (200) for a road sweeping vehicle, the brush assembly comprising a driven brush having brushing elements (108) adapted to engage a surface to be swept (110); wherein, the brush assembly further comprises a cover (202, 500) surrounding the driven brush, the cover having an opening on an underside of the cover adjacent the surface to be swept, to allow distal ends (109) of the brushing elements to engage with the surface to be swept. The advantage of providing a cover surrounding the driven brush, with the cover having an opening on the underside of the cover, that is the opening is adjacent the surface to be swept such as to allow distal ends of the brushing elements to engage with the surface, is that the noise generated by the rotation of the brush and by the engagement of the brush with the surface to be swept is greatly attenuated and/or absorbed by the cover thus minimising the disturbance caused to bystanders and persons in the vicinity of the brush assembly.

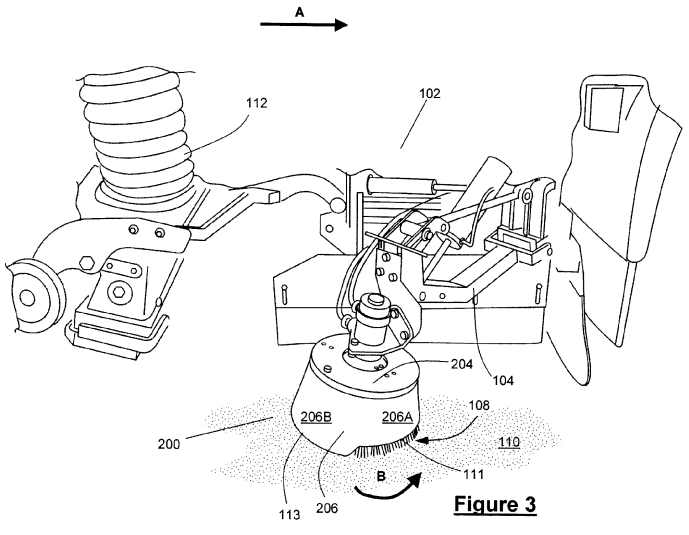

Figure 3

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Description

[0001] The present invention relates to a brush assembly.

[0002] In particular, it relates to a brush assembly forming part of a sweeping attachment on a sweeping vehicle. The brush assemblies of this type typically comprise a driven brush having brushing elements adapted to engage with a surface to be swept, which is normally a roadway, a pathway, and/or, a gutter adjacent the roadway or pathway.

[0003] It is common for local authorities to make use of such sweeping vehicles to keep the roadways and pathways clean and devoid of rubbish and other natural debris such as leaves, twigs and branches. Such sweeping vehicles may also be used to maintain large areas of walkways and plazas clear of litter and rubbish such as those areas found in amusement parks, sports arenas and the like. For the purposes of the specification hereinbelow, the term "road sweeping vehicle" has been used although it will be appreciated that the sweeping vehicle may not necessarily be of the road sweeping type, and may indeed not necessarily be a vehicle having a driver's cab. The present invention will be understood to equally apply to any sweepers where a brush assembly is employed, such as walk-behind sweepers, mini sweeping vehicles used for pedestrianised areas and other such sweepers using driven brushes.

[0004] A road sweeping vehicle may be adapted to carry out a variety of sweeping operations. For example the road sweeping vehicle may have a sweeping attachment at the front thereof for sweeping large areas as the vehicle travels forward. Alternatively or additionally, the road sweeping vehicle may comprise a gutter sweeping attachment at the side of the road sweeping vehicle, adapted to sweep the gutter of the roadway or pathway, as the vehicle travels adjacent the gutter. These road sweeping attachments may be motorised to provide improved sweeping performance. The sweeping attachments may move in a reciprocating and/or rotating manner themselves, in addition to non-driven movement caused by the movement of the vehicle. Furthermore, the road sweeping vehicles may comprises means for spraying liquid and/or disinfectant onto a surface to be swept, in order to loosen debris and/or disinfect the surface to be swept as well.

[0005] A disadvantage of such road sweeping vehicles is that a lot of noise is generated by the sweeping attachments, and in particular the brush assemblies, as they engage in the intended sweeping action. This noise is irritating to those in the vicinity of the road sweeping vehicle. This is particularly the case when the road sweeping vehicle is used early in the morning or late at night; although, these time periods are considered to be most convenient for sweeping roadways and pathways as there is minimal traffic and pedestrians on the roadways and pathways respectively at these times; thus, the road sweeping vehicles do not become an obstacle for other vehicles and do not become a disruption to traffic and pedestrians. However, the noise generated by the sweeping attachments of the road sweeping vehicle is particularly unacceptable early in the morning and late at night.

[0006] Moreover, the operator of the road sweeping vehicle is subjected to the constant noise of the brush assemblies in operation. Protective ear plugs and ear defenders are normally provided to such operators, however, it is not uncommon for the operators to remove the ear protection devices for comfort reasons, and it is therefore desired to minimize the amount of noise generated by the road sweeping vehicles so that lighter, more comfortable ear protection devices may be used.

[0007] A further known problem with road sweeping vehicles, where the driven rotary brush rotates to sweep the debris and litter in towards a suction hose assembly on the road sweeping vehicle, for collection by the road sweeping vehicle, is that the debris and litter may be thrown outwardly by the driven rotary brush. The debris or litter will be thrown outwardly from the road sweeping vehicle when the brushing elements only make partial contact with the debris. The movement of the brushing elements cause the debris to be accelerated in a tangential direction from the brushing elements, without the brushing elements having sufficient grip on the debris to direct the debris inwardly towards the suction hose assembly. This debris which is thrown from the road sweeping vehicle may cause injury to the operator of the vehicle, particularly where the operator is using a walk behind sweeper, or may cause injury to bystander.

[0008] A further disadvantage of current road sweeping vehicles, where debris and litter is thrown outwardly from the road sweeping vehicle, is that the debris and litter is actually dispersed about the vicinity of the road sweeping vehicle. Therefore, the road sweeping vehicle has the effect of actually dispersing, albeit a small portion of, the debris and litter, as opposed to collecting the debris and litter. This is clearly contrary to the intended purpose of the road sweeping vehicle.

[0009] Lastly, the life cycle of the brushing elements is important from a commercial aspect, particularly where the road sweeping vehicles are used by governmental and local county council organisations. These organisations will have a large number of vehicles under their care and may be operating with tight budgets which are open to intense scrutiny, thus relatively minor units costs can accumulate and have a significant impact on such tight budgets. Where the substantially entire brushing elements are exposed to the effects of the weather, the brushing elements may wear away quicker. This exposure will shorten the lifetime of the brushes and the brushing elements will need to replaced more frequently leading to an increase in the operational cost of running the road sweeping vehicles.

[0010] It is an object therefore of the present invention to provide a brush assembly that overcomes at least some of the above-mentioned problems

Statements of Invention

[0011] The present invention is directed towards a brush assembly for a road sweeping vehicle, the brush assembly comprising a driven brush having brushing elements adapted to engage a surface to be swept; wherein, the brush assembly further comprises a cover surrounding the driven brush, the cover having an opening on an underside of the cover adjacent the surface to be swept, to allow distal ends of the brushing elements to engage with the surface to be swept.

[0012] The advantage of providing a cover surrounding the driven brush, with the cover having an opening on the underside of the cover, that is the opening is adjacent the surface to be swept such as to allow distal ends of the brushing elements to engage with the surface to be swept, is that the noise generated by the rotation of the brush and by the engagement of the brush with the surface to be swept is greatly attenuated and absorbed by the cover thus minimising the disturbance caused to bystanders and persons in the vicinity of the brush assembly.

[0013] In a further embodiment, the cover comprises a securing plate and a skirt depending from the securing plate.

[0014] In a further embodiment, the driven brush is a rotary driven brush; the securing plate is a substantial circular securing plate; and, the skirt is a substantially cylindrical skirt which surrounds the brushing elements on the rotary driven brush, wherein, an uppermost edge of the substantial cylindrical skirt is connected to the securing plate, and, a lowermost edge is arranged to terminate above the surface to be swept.

[0015] In a further embodiment, the skirt is formed from a skirt material with an area mass of at least 3kg/m2. Skirt materials with this type of area mass are seen to be particularly adept at reducing the level of noise emanating from the brush assembly.

[0016] In a further embodiment, the skirt material is a reinforced synthetic rubber material. In a further embodiment, the skirt material is a heavy duty plastics.

[0017] In a further embodiment, the cover is fixed in place and the driven brush moves within the cover without the cover itself moving. This embodiment is advantageous as the stationary cover will not produce any noise and the wear and tear on the stationary cover will be minimised as it does not rotate about a point causing friction at such a point.

[0018] In a further embodiment, the skirt comprises a front skirt piece and a rear skirt piece; whereby, the front skirt piece is substantially arranged to face into the direction of translational movement of the brush assembly, and, the rear skirt piece is substantially arranged to face away from the direction of translational movement of the brush assembly; with the rear skirt piece extending further toward the surface to be swept than the front skirt piece, such that the distal ends of the brushing elements passing adjacent the front skirt piece are more exposed than the brushing elements passing adjacent the rear skirt piece.

[0019] The advantage of providing a skirt with a front skirt piece and a rear skirt piece is that the distal ends of the brushing elements passing adjacent the front skirt piece are more exposed than the brushing elements passing adjacent the rear skirt piece, and this allows the distal ends of the brushing elements passing adjacent the front skirt piece to produce a more effective brushing action, whilst contemporaneously the distal ends of the brushing elements passing adjacent the rear skirt piece are covered so as to minimise the level of noise emanating from the brushing elements of the brush passing adjacent the rear skirt piece. In a preferred embodiment, the rear skirt piece faces in the direction away from the road sweeping vehicle and toward potential bystanders and nearby persons which could be affected by the level of noise emanating from the brush assembly.

[0020] In a further embodiment, the rear skirt piece comprises a skirt length which is substantially equal to the length of the brushing elements of the brush. In this embodiment, the absorption and attenuation of the noise from the brush assembly is increased by matching the skirt length to the length of the brushing elements.

[0021] In a further embodiment, the front skirt piece is substantially arranged to face into the direction of translational movement of the brush assembly and to face towards a side of the road sweeping vehicle mounting the brush assembly.

[0022] In a further embodiment, the front skirt piece comprises a plurality of skirt portions of differing skirt lengths to produce a front skirt piece with a stepped lowermost edge. A plurality of skirt portions of differing skirt lengths, producing a front skirt piece with a stepped lowermost edge, facilitates a particularly efficient sweeping action of the brushing elements from the outermost side of the road sweeping vehicle towards an innermost side of the road sweeping vehicle, such that debris and litter is swept by the exposed distal ends of the brushing elements from the front of the brush assembly around towards the body of the road sweeping vehicle where a suction hose is preferably located to the rear of the brush assembly so as to collect the debris and litter.

[0023] In a further embodiment, the front skirt piece, with the stepped lowermost edge, comprises a shortest skirt portion, having a shortest skirt length, located on an inner side, adjacent the road sweeping vehicle mounting the brush assembly; and, a longest skirt portion, having a longest skirt length, located on an outermost side, remote from the road sweeping vehicle mounting the brush assembly. This arrangement balances the need for noise attenuation and absorption, and, an efficient sweeping action.

[0024] In a further embodiment, the front skirt piece, with the stepped lowermost edge, comprises one or more intermediate skirt portions arranged between the longest skirt portion and the shortest skirt portion; wherein, each of the intermediate skirt portions comprise different skirt

lengths; and, the intermediate skirt portions are arranged in sequential order such that the skirt lengths of the intermediate skirt portions shorten in sequential order from the longest skirt portion located on an outmost side remote from the road sweeping vehicle in to the shortest skirt portion located adjacent the road sweeping vehicle.

[0025] In a further embodiment, the securing plate comprises an upper securing plate and a lower securing plate, with the skirt connected between the upper securing plate and the lower securing plate.

[0026] In a further embodiment, the lower securing plate is substantially annular. In a further embodiment, the upper securing plate comprises two semi-circular securing plates. This allow for relatively easy assembly and fitting of the cover to an existing brush on a road sweeping vehicle.

[0027] The present invention is further directed towards a road sweeping vehicle comprising the brush assembly as described hereinabove. The present invention is particularly suited to road sweeping vehicles with the brush assemblies mounted to the front corners of the road sweeping vehicles and/or along a side of the road sweeping vehicle.

[0028] According to the invention there is provided a brush assembly for a road sweeping vehicle, the brush assembly comprising a driven brush having brushing elements adapted to engage a surface to be swept; wherein, the brush assembly further comprises a cover surrounding the driven brush, the cover having an opening to allow the brushing elements to engage the surface to be swept.

[0029] In this way, the cover surrounding the driven brush will absorb much of the sound generated by the driven brush as it sweeps. This greatly reduces the level of noise emitted by the driven brush as it works.

[0030] In one embodiment of the invention there is provided a brush assembly in which the cover comprises a securing portion and a skirt extending therefrom. This is a particularly effective construction of brush assembly.

[0031] In another embodiment of the invention there is provided a brush assembly in which the skirt is formed from a material with an area mass of at least 3kg/m2. Ideally the material has an area mass between 7 and 8 kg/m^2. Material of this nature provides good airborne sound insulation and is also resistant to wear. Preferably the material is a reinforced synthetic rubber material

[0032] In a further embodiment of the invention there is provided a brush assembly in which the cover is fixed in place and the driven brush moves within the cover. In this way, any noise that might be generated by the movement of the cover is eliminated. Furthermore, wear on the cover is reduced.

[0033] In an alternative embodiment of the invention there is provided a brush assembly in which a first portion of the skirt extends further than a second portion of the skirt. In this way, the brushing elements in the portion of the brush associated with the shorter second portion of the skirt are more exposed at their distal ends than the remaining brushing elements. This allows for significant noise reduction without a reduction in sweeping efficiency.

[0034] In a further embodiment of the invention there is provided a brush assembly in which the second portion of the skirt faces the direction of translational movement of the brush assembly. In this way, the most efficient sweeping action of the brush assembly is directed at the area to be swept.

[0035] In an alternative embodiment of the invention there is provided a brush assembly in which the second portion extends around to face the centre line axis of the vehicle. This facilitates the sweeping action of the brushing elements from the outside of the vehicle towards the centre of the vehicle. Swept material is brought by the exposed brush tips from the front of the brush assembly around to the main vehicle body where a suction hose is located behind the brush.

[0036] In an embodiment of the invention the driven brush is a rotary brush. A rotary brush is a common road sweeping attachment that can generate much noise while in use and therefore benefits greatly when used in the brush assembly of the invention.

[0037] In one embodiment of the invention there is provided a brush assembly mounted on a support arm. This is a particularly convenient manner of mounting the brush assembly.

[0038] According to a further aspect of the invention there is provided a road sweeping vehicle comprising the brush assembly of the invention. Such a road sweeping vehicle would provide efficient sweeping performance with low noise emissions.

Detailed Description of the Invention

[0039] The invention will now be more clearly understood from the following description of an embodiment thereof given by way of example only with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a prior art brush assembly;

Figure 2 is a perspective view of a portion of a road sweeping vehicle comprising a brush assembly made up of a rotary brush and a brush cover in accordance with the present invention;

Figure 3 is a perspective view of the brush assembly of Figure 2;

Figure 4(a) is a top view of the brush assembly of Figure 2;

Figure 4(b) is a front view of the brush assembly of Figure 2;

Figure 4(c) is an inner side view of the brush assem-

bly of Figure 2;

Figure 4(d) is an outer side view of the brush assembly of Figure 2;

Figure 5(a) is a top view of a brush cover in accordance with an alternative embodiment of the present invention;

Figure 5(b) is a partial side view the brush cover of Figure 5(a);

Figure 6(a) is a bottom plan view of an upper securing plate of the brush cover of Figure 5(a);

Figure 6(b) is a bottom plan view of two semi-circular plate sections of the upper securing plate of the brush cover of Figure 5(a);

Figure 6(c) is a bottom plan view of the upper securing plate of Figure 6(a) connected to a lower securing plate of the brush cover of Figure 5(a);

Figure 7(a) is a plan view of an intermediate skirt portion, in an unfurled state, of a front skirt piece of the brush cover of Figure 5(a);

Figure 7(b) is a plan view of a shortest skirt portion, in an unfurled state, of the front skirt piece of the brush cover of Figure 5(a); and,

Figure 7(c) is a plan view of a rear skirt piece, in an unfurled state, of the skirt on the brush cover of Figure 5(a).

[0040] Referring to the drawings, and initially to Figure 1 thereof, there is shown a prior art brush assembly, indicated generally by the reference numeral 100. The prior art brush assembly 100 is mounted on a side of a road sweeping vehicle, partially shown and indicated generally by reference numeral 102.

[0041] The road sweeping vehicle 102 has a direction of translational forward movement indicated by reference arrow A.

[0042] The prior art brush assembly 100 is mounted on a support arm 104 to extend outwardly from the side of the road sweeping vehicle 102. The prior art brush assembly 100 comprises a rotary driven brush 105 which rotates in a circular direction as indicated by reference arrow B.

[0043] The rotary driven brush 105 comprises a substantially disk-like plate 106 from which a plurality of brushing elements 108 depend. The prior art brush assembly 100 is mounted on a support arm 104 along a side of the road sweeping vehicle 102, at a mounting point 107 which is connected to a substantially central point on the disk-like plate 106. The support arm 104 controls vertical and horizontal movement of the prior art brush assembly 100. In use, the disk-like plate 106 will be held to be substantially horizontal and will rotate about the mounting point 107, such that brushing elements 108 engage against a surface to be swept 110. The rotary driven brush 105 rotates in a full circle, in a direction inwardly towards the road sweeping vehicle 102 as indicated by reference arrow B, such that the rotational movement of the rotary driven brush 105 urges swept debris, litter and material within the reach of the rotary driven brush 105 inwards towards a body of the road sweeping vehicle 102. It will be understood that a rotary brush having a reciprocating action may be alternatively used for road sweeping vehicles. A suction hose assembly 112 mounted on the road sweeping vehicle 102 collects all of the debris, litter and material.

[0044] Such a prior art brush assembly 100 is commonly used for road sweeping and in particular sweeping gutters as found along a roadside.

[0045] Referring now to Figures 2, 3, 4(a), 4(b), 4(c) and 4(d) inclusive, wherein like parts previously described have been assigned the same reference numerals, there is shown a brush assembly according to the invention and indicated generally by reference numeral 200.

[0046] The brush assembly 200 comprises a rotary driven brush, of the same type or similar to, the prior art brush assembly of Figure 1; with the brush assembly 200 further comprising a cover 202 in accordance with the present invention.

[0047] The cover 202 comprises a securing plate 204 and a skirt 206 depending from the securing plate 204.

[0048] The securing plate 204 lies on top of and encloses the disk-like plate of the rotary driven brush and the skirt 206 substantially surrounds the brushing elements 108, with the skirt 206 having an opening (not shown) on its underside (not shown) so that the brushing elements 108 are uncovered and may engage with the surface to be swept 110.

[0049] A front skirt piece 206A of the skirt 206, that is the front skirt piece 206A of skirt 206 facing in the direction of travel A of the road sweeping vehicle 102, comprises a slightly shorter skirt length than a rear skirt piece 206B of the skirt 206, which comprises a slightly longer skirt length; such that a distal end 109 of the brushing elements 108 partially project beyond a lowermost edge 111 of the front skirt piece 206A but not beyond a lowermost edge 113 of the rear skirt piece 206B, whose skirt length is substantially equal to the length of the brushing elements 108. That is to say, the rear skirt piece 206B of the skirt 206 is substantially the same length as the brushing elements 108. It will be understood that in the present embodiment, the skirt 206 comprising the front skirt piece 206A and the rear skirt piece 206B are of a unitary piece of material, although in other embodiments, the front skirt piece 206A and the rear skirt piece 206B may be separate pieces of material.

[0050] The front skirt piece 206A extends around to face in both the direction of travel A of the brush assembly

200, which is in the same plane as, or parallel to, a centre line axis of the road sweeping vehicle 102, and, also towards the side of the road sweeping vehicle 102. This ensures that the brushing elements 108 sweep debris and litter and other rubbish towards the suction hose assembly 112 mounted on the road sweeping vehicle 102 as the cover 202, and in particular the arrangement of the front skirt piece 206A and the rear skirt piece 206B, urges debris and litter in this direction by also preventing debris and litter from being thrown outwardly from the brush assembly 200 by the brushing elements 108. This is best seen in Figures 4(c) and 4(d), where the front skirt piece 206A and the rear skirt piece 206B are shown from an inner side view of the brush assembly 200 and from an outer side view of the brush assembly 200 respectively.

[0051] As can be particularly seen in Figures 4(a) to 4(d), the securing plate 204 comprises a bracket 400 for mounting the cover 202 on to the support arm of the road sweeping vehicle 102. In this way, the cover 202 does not rotate with the rotary brush itself. As such, the cover 202 does not produce any noise as the cover 202 is stationary. Furthermore, the cover 202 does not increase the load on a brush-rotating motor (not shown), as the cover 202 is mounted on the support arm of the road sweeping vehicle 102 and not on the brush-rotating motor. Moreover, as the cover 202 is a substantially stationary, the cover 202 will endure minimal wear while in use.

[0052] The cover 202 is designed and dimensioned to fit as closely as possible around the rotary driven brush so as to improve noise reduction by absorbing, attenuating and/or subduing the level of noise before the noise can propagate or emanate from the brush assembly 200, and in particular from around the edges of the cover 202.

[0053] The cover 202 also protects the brushing elements 108 from being exposed to the effects of the weather, and thus the cover 202 can prolong the operational lifetime of the brushing elements.

[0054] Furthermore, the cover 202 can prevent debris from being expelled outwardly by the brushing elements, and dispersing debris about the vicinity of the road sweeping vehicle.

[0055] Referring now to Figures 5(a), 5(b), 6(a), 6(b), 6(c), 7(a), 7(b) and 7(c), in which like parts previously described have been assigned the same reference numerals, there is shown an alternative embodiment of a brush cover, indicated generally by reference numeral 500.

[0056] The brush cover 500 comprises an upper securing plate 502, a lower securing plate 516, and, a two-piece skirt 206 comprising a rear skirt piece 206B, and a front skirt piece 506.

[0057] The upper securing plate 502 is formed of two substantially semi-circular plates 502A, 502B. Each semi-circular plate 502A, 502B comprises an arcuate keyhole-shaped slot 508, which is adapted to allow the brush cover 500 to be mounted to the support arm of the road sweeping vehicle, using the fixing bolts of the brush rotating motor (not shown). The semi-circular plates 502A, 502B of the securing plate 502 allow the securing plate 502 to be separated when the brush cover 500 is fitted or removed from the brush drive shaft. The use of the keyhole-shaped slots 508 mean the mounting bracket as described in relation to the previous embodiment, and shown by reference numeral 400 in Figure 4, is not required for this current embodiment.

[0058] With particular reference to Figures 6(a) and 6(b), one of the semi-circular plates 502A comprises a lip 600 for overlapping with a straight edge 602 on the other semi-circular plate 502B when the two semi-circular plates 502A, 502B are connected to form the securing plate 502.

[0059] The substantially annular shaped lower securing plate 516 may be seen in Figure 6(c) mounted beneath the upper securing plate 502, wherein a plurality of mounting protrusions 606 located around a circumferential portion of the upper securing plate 502 are used to mount the lower securing plate 516 on the upper securing plate 502 through receiving holes 604 on the lower securing plate 516.

[0060] The front skirt piece 506 and the rear skirt piece 206B are bolted to a rim of the lower securing plate 516 which is connected to the upper securing plate 502. The front skirt piece 506 and the rear skirt piece 206B may be removed and replaced as required. In the lifetime of the driven rotary brush, the brushing elements thereof will reduce significantly in length, due to wear. In such cases, one or more of the skirt pieces 206B, 506 may be replaced with alternatives piece having shorter skirt lengths.

[0061] In Figure 5(a), it can be seen that the front skirt piece 506 comprises a plurality of skirt portions 510, 512, 514A, 514B of differing skirt lengths, as indicated by reference numerals x, y and z in Figure 5(a). Thus, a lowermost edge 518 of the front skirt piece 506, which is the edge adjacent the surface to be swept, is stepped. The front piece skirt 506 comprises three skirt portions in Figure 5(a), although it will be readily appreciated that any number of skirt portions may be used to create a stepped lowermost edge 518 on the front skirt piece 506. Alternatively a sloped lowermost edge may be provided on the front skirt piece 506, with the slope of the lowermost edge inclining from an outermost side, remote from the road sweeping vehicle, to an innermost side, adjacent the road sweeping vehicle.

[0062] Each of the differing skirt lengths x, y and z respectively permit an increasingly greater amount of a distal end of the brushing elements to protrude from beneath the lowermost edge of the front skirt piece 506. The greater the amount of the distal ends of the brushing elements which protrude from beneath the lowermost edge 518 of the front skirt piece 506, the more effective the sweeping action. However, the problem is that the greater the amount of the distal ends of the brushing elements which protrude from beneath the lowermost edge 518 of the front skirt piece 506, the more noisy the sweeping action.

A stepped lowermost edge 518 attempts to balance the efficiency of the sweeping action against the noisiness of the sweeping action.

[0063] The shortest skirt portion 510, in terms of skirt length, extending a distance x from the securing plate 502 to its lowermost edge 518, is the radially largest skirt portion. The intermediate skirt portion 512, extending a distance y, from the securing plate 502 to its lowermost edge 518, where the distance y is greater than the distance x, is contiguous with the shortest skirt portion 510. The longest skirt portion 514, extends a distance z, from the securing plate 502 to its lowermost edge 518, with z being greater than y. The longest skirt portion 514 comprises two separate end skirt portions 514A, 514B, where each separate end skirt portion 514A, 514B is contiguous with the rear skirt piece 504. It will be appreciated that the presence of the longest skirt piece 512B is not necessary in alternative embodiments.

[0064] The stepped nature of the lowermost edge 518 of the front skirt piece 506 is to optimise the amount of the brushing element that is exposed by the front skirt piece 506. As the distal ends of the brushing elements (not shown) rotate past the frontward facing, front skirt piece 506 of the brush cover 500 from the outer most side, facing away from the road sweeping vehicle (not shown), towards the innermost side facing towards the body of the road sweeping vehicle, increasingly more of the brushing element is exposed as the skirt length is shortened in a stepwise manner.

[0065] As hereinbefore mentioned, the skirt length may be alternatively shortened in a continuous linear sloped manner or a continuous arcuate manner. This shortening of the skirt length is particularly important to the present invention as it facilitates the most efficient sweeping action close to the road sweeping vehicle and maximises the noise barrier properties of the skirt and cover on the side facing noise receivers and bystanders.

[0066] The skirt is formed from a reinforced synthetic rubber material. Material of this nature provides good airborne sound insulation and is also resistant to wear. The skirt may also be formed of any tough flexible material such as rubber or polymer, or indeed any heavy duty plastics or fabrics. A synthesis or composite of materials may also be used for the skirt.

[0067] The skirt may be formed from a single layer of material or combination of two or more layers. The skirt may comprise a single piece of material or it may comprise a plurality of pieces. In the case of a plurality of pieces, the pieces may be connected together along their length or may simply be connected to the securing plate of the cover to as to extend therefrom, in parallel to each other. Such an arrangement may comprise overlapping or non-overlapping adjacent strips. Furthermore, such strips may be double over such that both free ends thereof are connected to the securing plate.

[0068] Whatever the construction of the skirt, it will ideally have an area mass preferably between 7 kg/m^2 and 8 kg/m^2, but is at least 3 kg/m^2. A skirt of such a construction has a good airborne sound insulation rating across a frequency range of 1kHz to 8kHz. This ensures that the sound energy travelling through the skirt is negligible in comparison to the sound energy flanking it. Furthermore, the skirt must be sufficiently durable to withstand the friction of the brushing elements.

[0069] Throughout the specification, the term driven brush is used to refer to a brush whose sweeping movement is additional to that which would be imparted to a brush fixed to a moving vehicle. The term driven brush refers to a brush having a motor or other actuation means that causes the brush to spin, rotate, reciprocate or move in some other sweeping motion.

[0070] While the invention is described herein in relation to a rotary brush suitable for gutter sweeping, it will be understood by the person skilled in the art that the invention may be adapted for use with other driven road sweeping brushes. In particular, it will be understood that the invention may be used with rotary brushes whose brushing elements project from the axis of rotation of the brush, as well as those brushes whose brushing elements project substantially in parallel to their axis of rotation as described herein. Furthermore, the invention may be used with brush adapted to reciprocate in a substantially straight line.

[0071] It will be understood by the person skilled in the art that the term brushing elements may be understood to refer to bristles or other such filaments, either natural or synthetic, that may be used to provide a sweeping action in a sweeping brush.

[0072] The terms "comprise" and "include", and any variations thereof required for grammatical reasons, are to be considered as interchangeable and accorded the widest possible interpretation.

[0073] It will be understood that the components shown in any of the drawings are not necessarily drawn to scale, and, like parts shown in several drawings are designated the same reference numerals.

[0074] The invention is not limited to the embodiments hereinbefore described which may be varied in both construction and detail.

Claims

1. A brush assembly (200) for a road sweeping vehicle (102), the brush assembly comprising a driven brush having brushing elements (108) adapted to engage a surface to be swept (110); wherein, the brush assembly further comprises a cover (202, 500) surrounding the driven brush, the cover having an opening on an underside of the cover adjacent the surface to be swept, to allow distal ends (109) of the brushing elements to engage with the surface to be swept.

2. A brush assembly as claimed in claim 1, wherein, the cover comprises a securing plate (204, 502) and a skirt (206) depending from the securing plate.

3. A brush assembly as claimed in claim 2, wherein, the driven brush is a rotary driven brush; the securing plate is a substantial circular securing plate; and, the skirt is a substantially cylindrical skirt which surrounds the brushing elements on the rotary driven brush, wherein, an uppermost edge of the substantial cylindrical skirt is connected to the securing plate, and, a lowermost edge (111, 113, 518) is arranged to terminate above the surface to be swept.

4. A brush assembly as claimed in claims 1 or 2, wherein, the skirt is formed from a skirt material with an area mass of at least 3kg/m2.

5. A brush assembly as claimed in any preceding claims, wherein, the skirt material is a reinforced synthetic rubber material.

6. A brush assembly as claimed in any preceding claims, wherein, the cover is fixed in place using a bracket (400) and the driven brush moves within the cover without the cover itself moving.

7. A brush assembly as claimed in any preceding claims, wherein, the skirt comprises a front skirt piece (206A, 506) and a rear skirt piece (206B); whereby, the front skirt piece is substantially arranged to face into the direction of translational movement (A) of the brush assembly, and, the rear skirt piece is substantially arranged to face away from the direction of translational movement of the brush assembly; with the rear skirt piece extending further toward the surface to be swept than the front skirt piece such that the distal ends of the brushing elements passing adjacent the front skirt piece are more exposed than the brushing elements passing adjacent the rear skirt piece.

8. A brush assembly as claimed in claim 7, wherein, the front skirt piece is substantially arranged to face into the direction of translational movement of the brush assembly and to face towards a side of the road sweeping vehicle mounting the brush assembly.

9. A brush assembly as claimed in claims 7 or 8, wherein, the front skirt piece (506) comprises a plurality of skirt portions (510, 512, 514) of differing skirt lengths to produce a front skirt piece with a stepped lowermost edge (518).

10. A brush assembly as claimed in claim 9, wherein, the front skirt piece, with the stepped lowermost edge, comprises a shortest skirt portion (510), having a shortest skirt length, located on an inner side, adjacent the road sweeping vehicle mounting the brush assembly; and, a longest skirt portion (514), having a longest skirt length, located on an outmost side, remote from the road sweeping vehicle mounting the brush assembly.

11. A brush assembly as claimed in claim 10, wherein, the front skirt piece, with the stepped lowermost edge, comprises one or more intermediate skirt portions (512) arranged between the longest skirt portion and the shortest skirt portion; wherein,
each of the intermediate skirt portions comprise different skirt lengths; and,
the intermediate skirt portions are arranged in sequential order such that the skirt lengths of the intermediate skirt portions shorten in sequential order from the longest skirt portion located on an outermost side remote from the road sweeping vehicle in to the shortest skirt portion located adjacent the road sweeping vehicle.

12. A brush assembly as claimed in any of claims 2 to 11, wherein, the securing plate comprises an upper securing plate (502) and a lower securing plate (516), with the skirt connected between the upper securing plate and the lower securing plate.

13. A brush assembly as claimed in claim 12, wherein, the lower securing plate is substantially annular.

14. A brush assembly as claimed in claims 12 or 13, wherein, the upper securing plate comprises two semi-circular securing plates (502A, 502B).

15. A road sweeping vehicle comprising the brush assembly as claimed in any preceding claims.

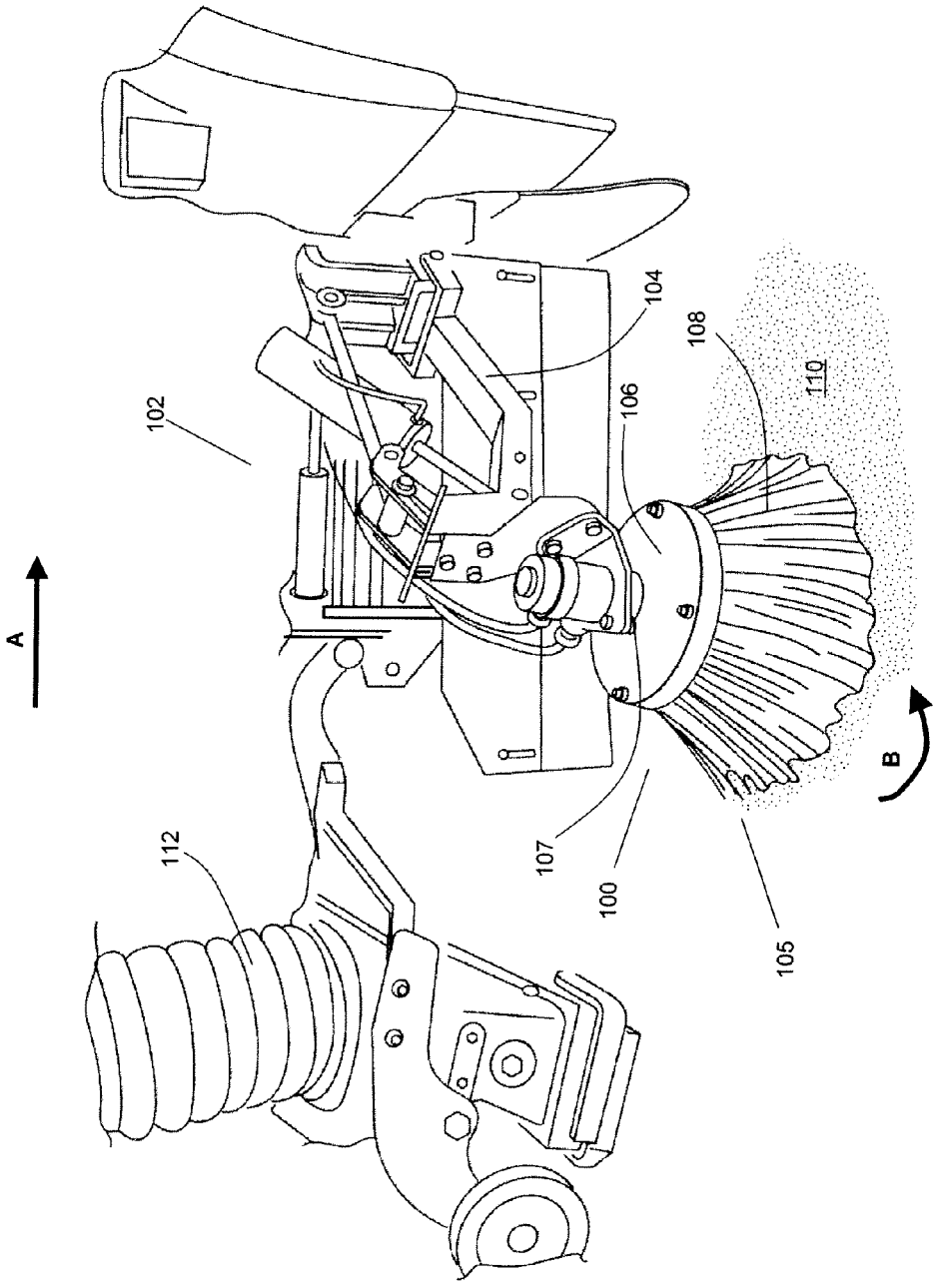


Figure 1 (PRIOR ART)

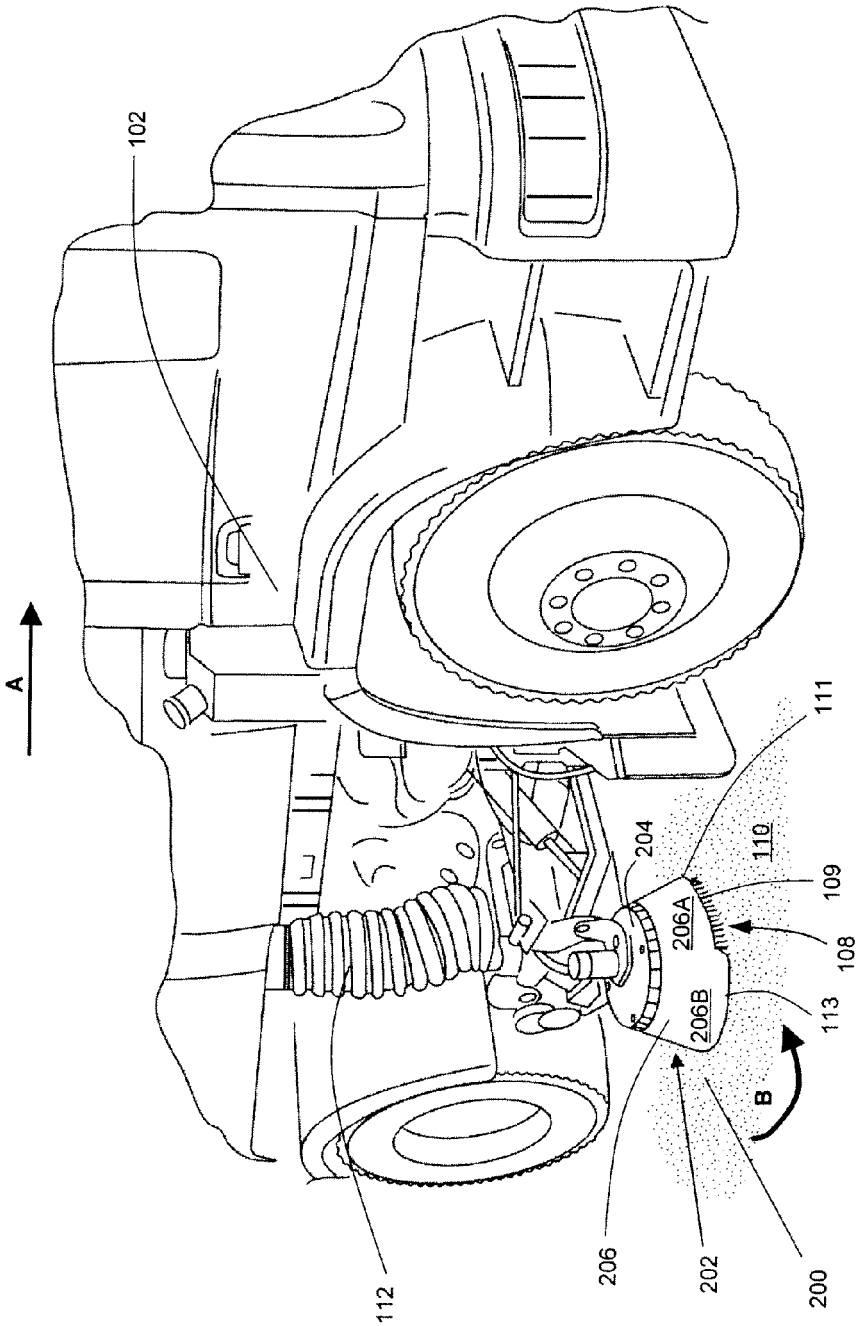


Figure 2

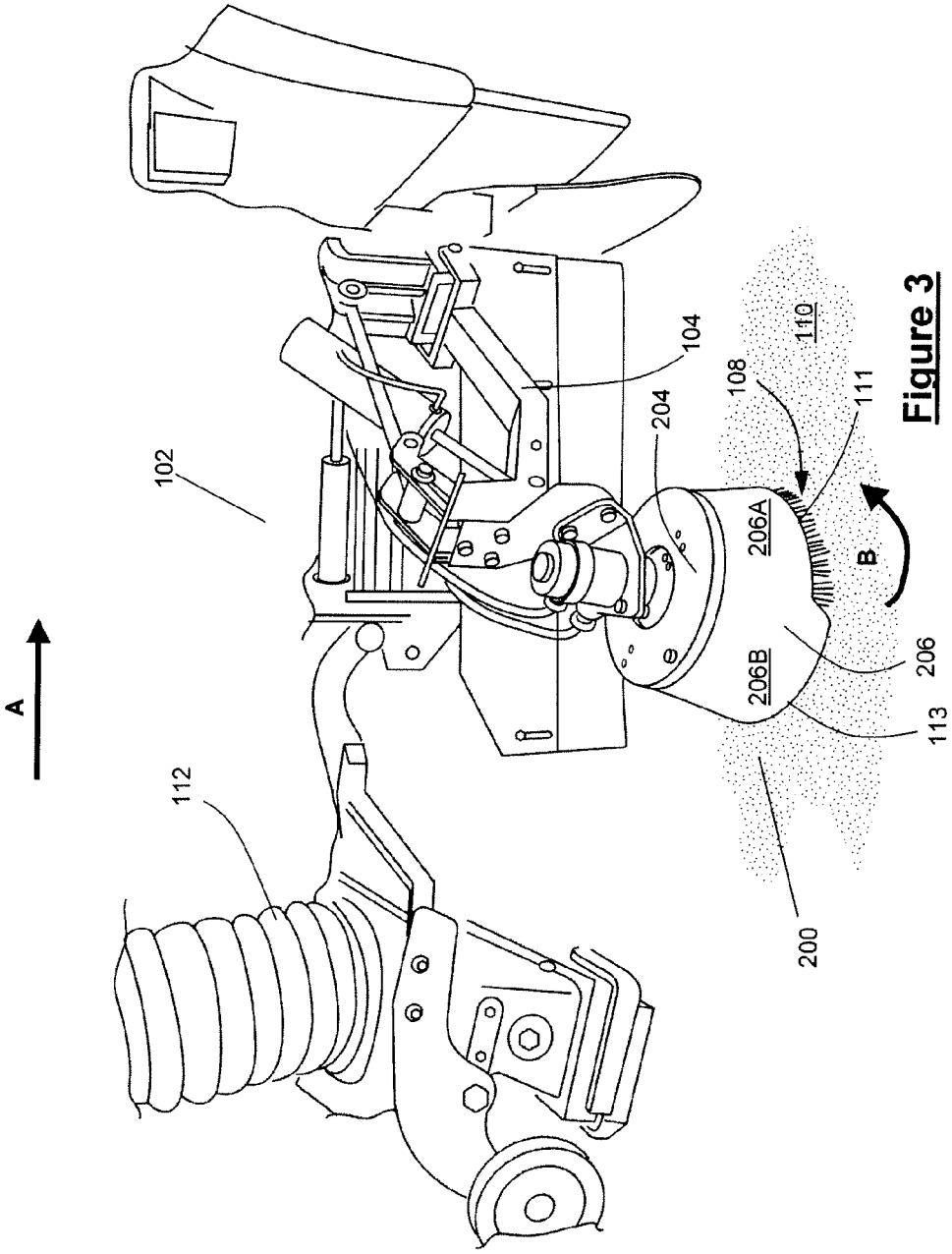


Figure 3

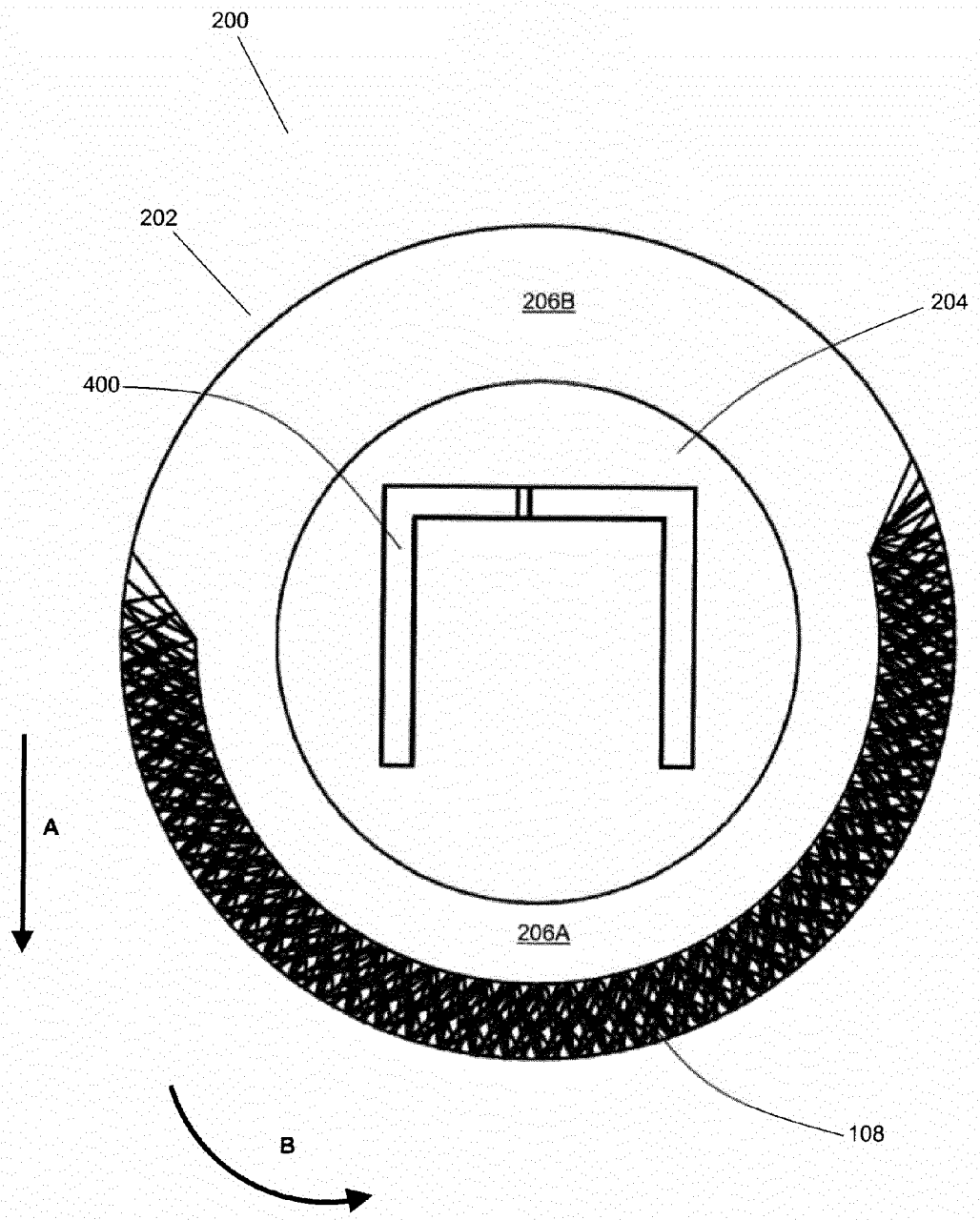


Figure 4(a)

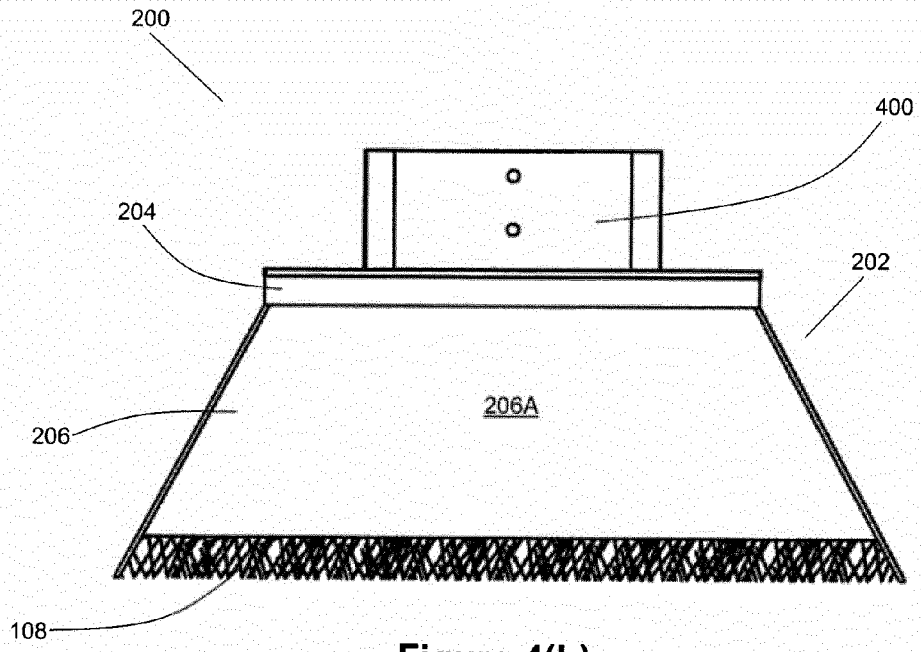


Figure 4(b)

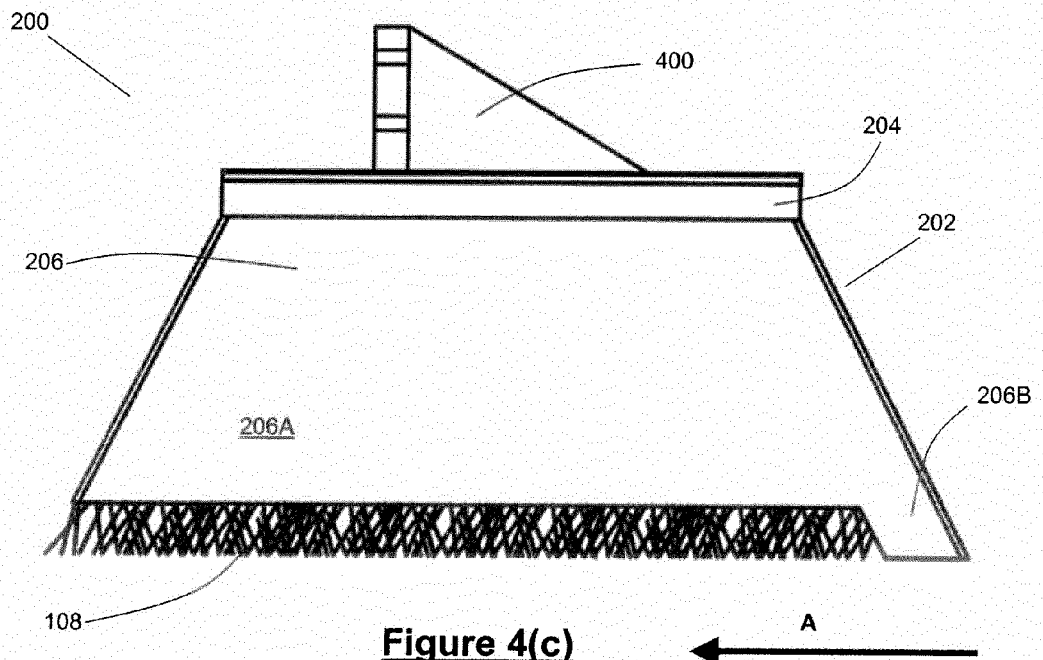


Figure 4(c)

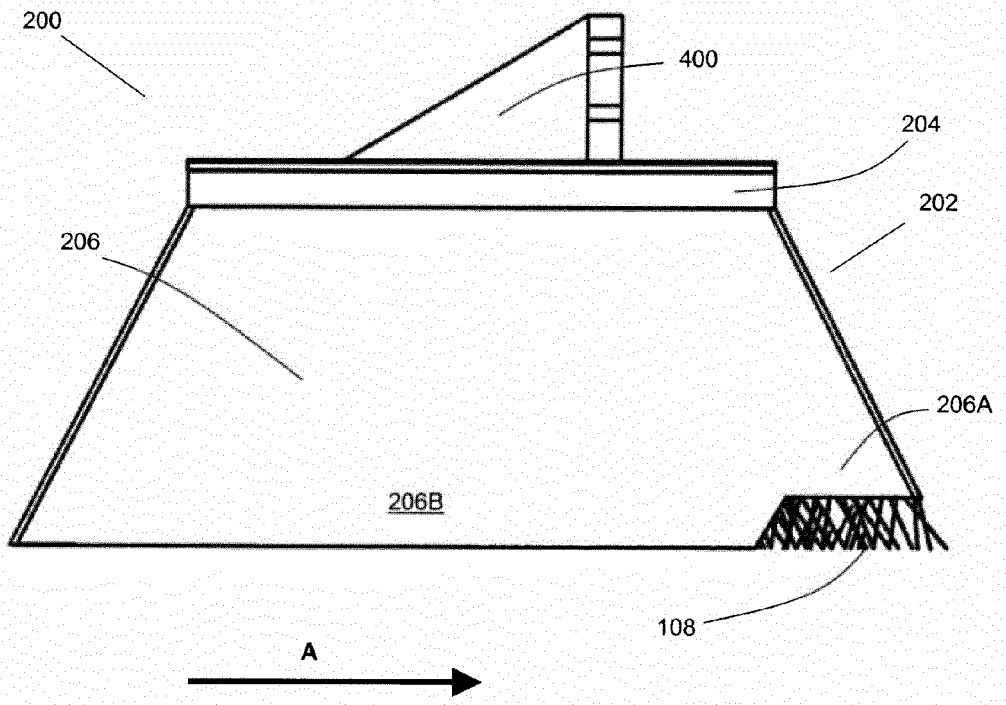


Figure 4(d)

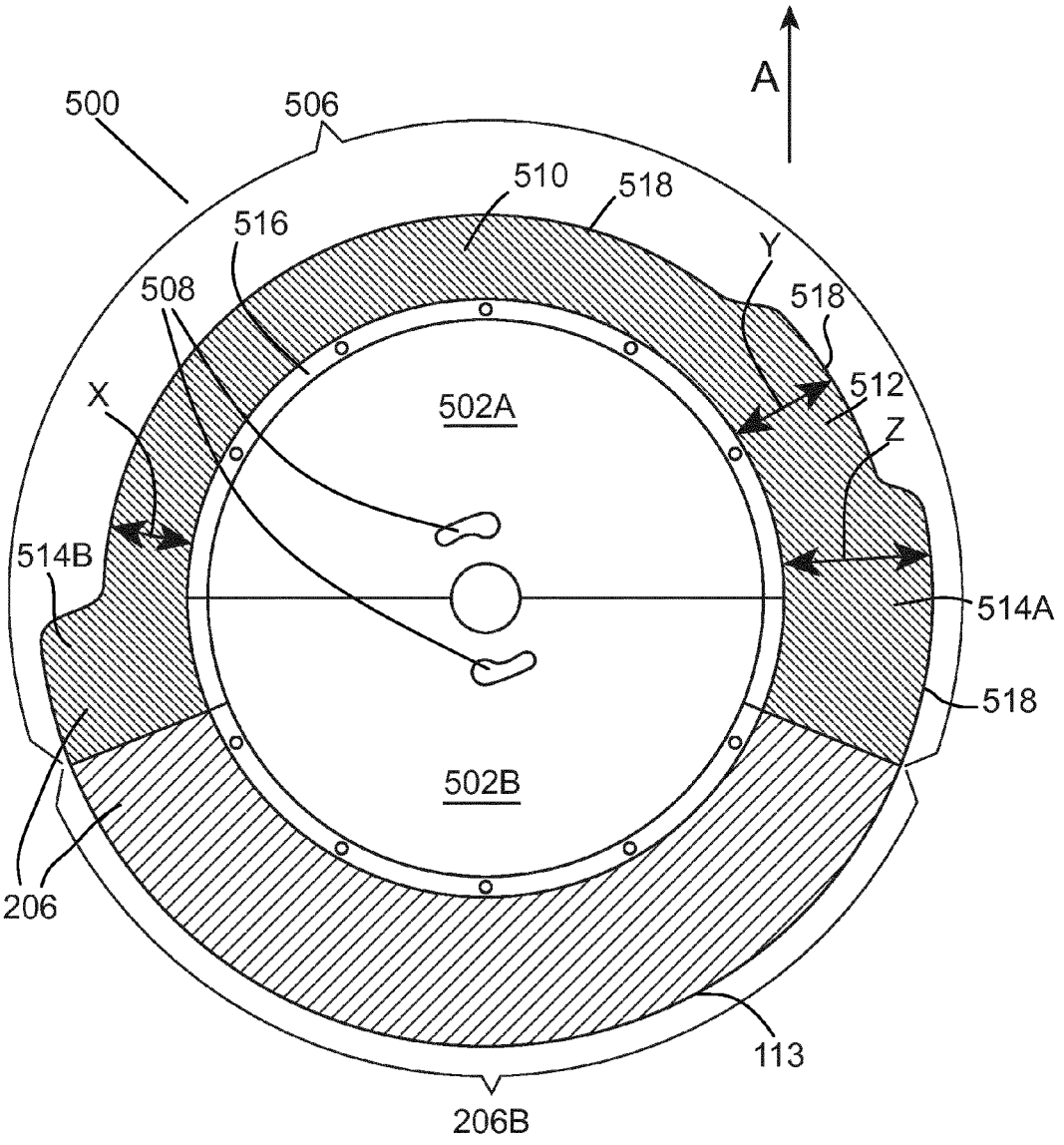

A
500
506
510
518
516
Y
508
518
512
X
502A
Z
514B
514A
518
502B
206
113
206B

Figure 5(a)

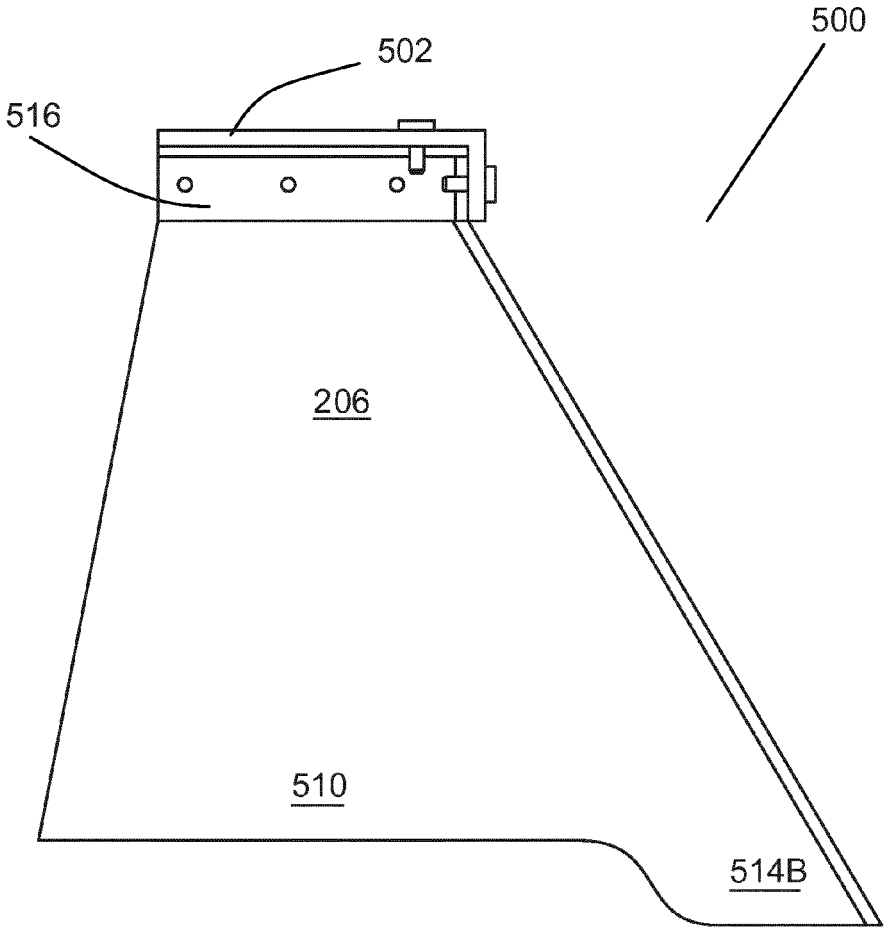


Figure 5(b)

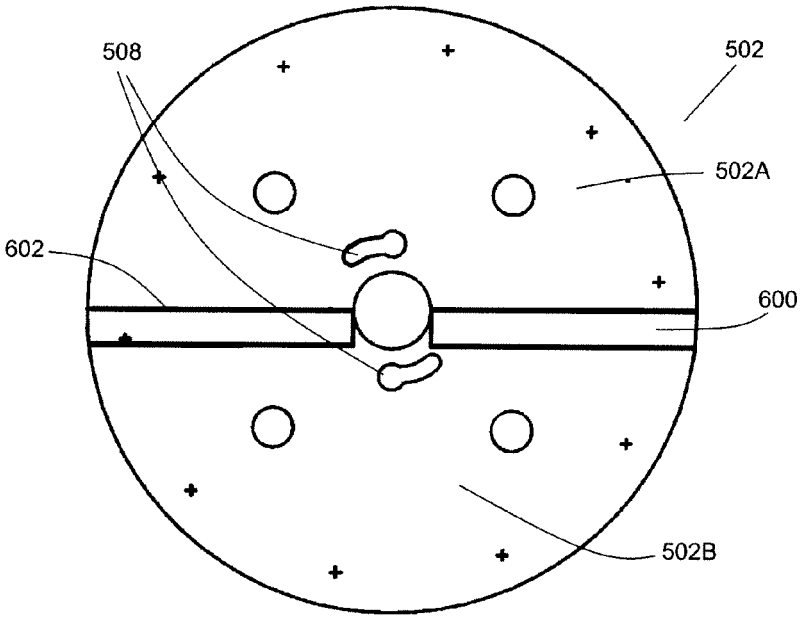
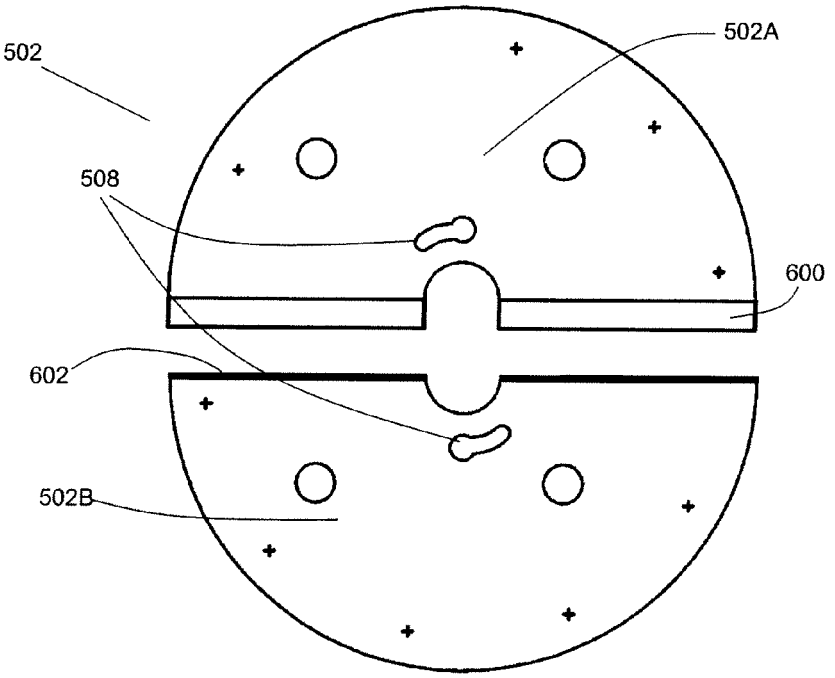


Figure 6(a)

Figure 6(b)



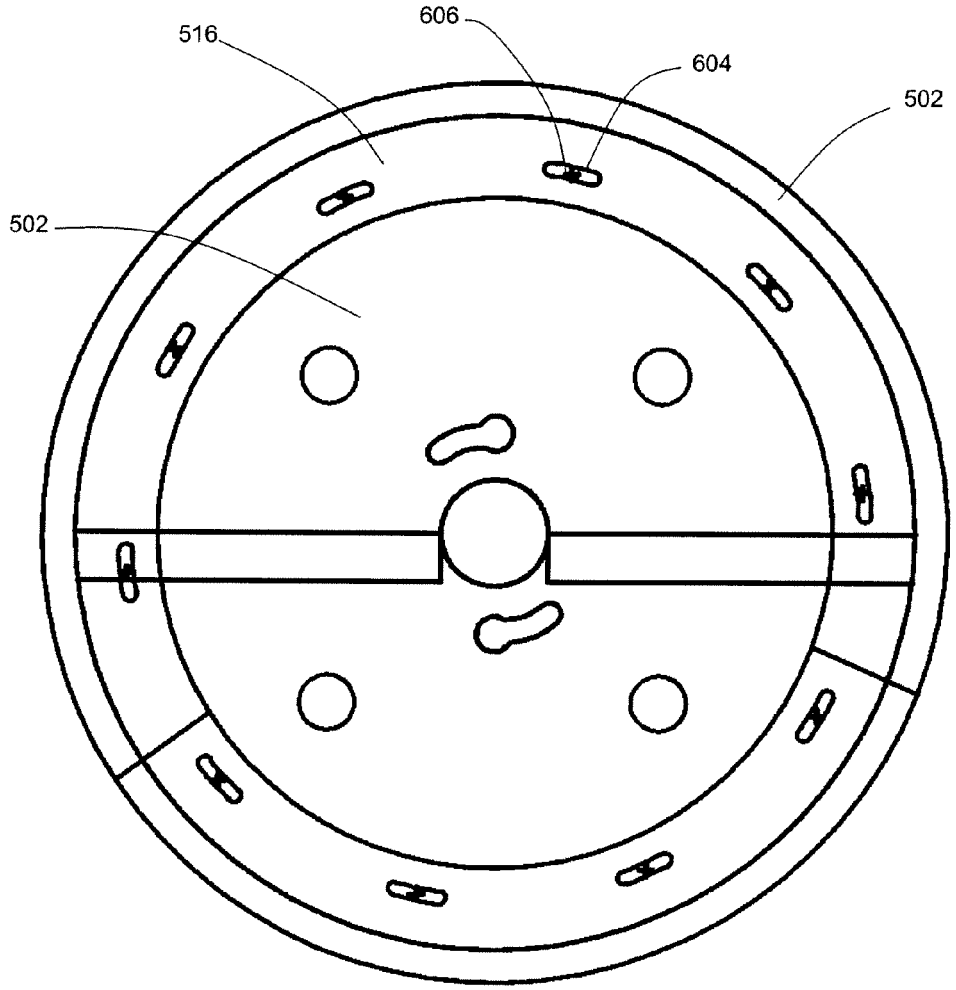


Figure 6(c)

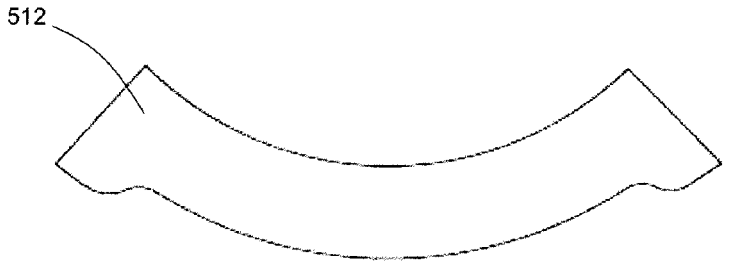


Figure 7(a)

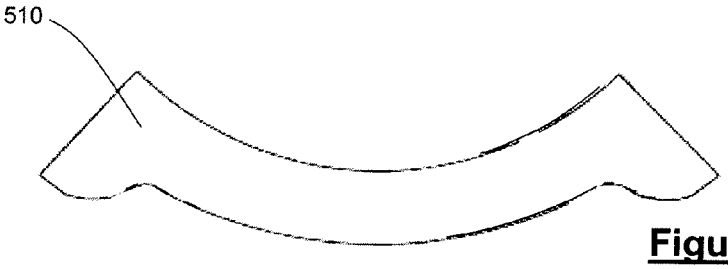


Figure 7(b)

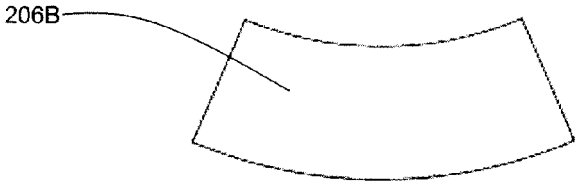


Figure 7(c)