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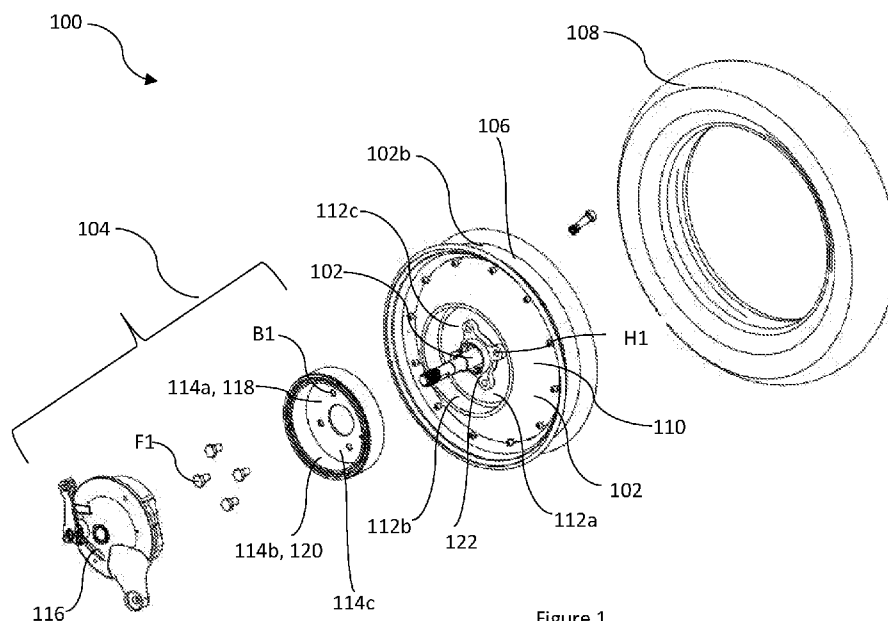


Figure 1

(57) Abstract: The present invention relates to a wheel assembly (100) of the vehicle. The wheel assembly comprises a prime mover assembly (102) and a brake assembly. The prime mover assembly comprises a stationary member (102a) and a rotating member (102b). The rotating member (102b) is attached to a first member (106) of the wheel assembly (100). The prime mover assembly (102) further comprises a pair of left (110) and right second members (111). One of the left second member (110) and the right second member (111) is configured to have an annular opening (112). The annular opening (112) is configured to receive a portion of a brake assembly (104) to detachably attach with one of the left second member (110) and right second member (111). The technical problem of brake liner being in-built with one of the side covers of the prime mover assembly (102) is solved by the present invention.

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TITLE OF INVENTION**WHEEL ASSEMBLY FOR A VEHICLE****FIELD OF THE INVENTION**

[001] The present invention relates to a wheel assembly of a vehicle. More particularly, the present invention relates to a wheel assembly having a detachable brake assembly.

BACKGROUND OF THE INVENTION

5 [002] Conventionally, electric vehicles and hybrid vehicles have motorized wheels (hub/traction motor wheels). In such wheels, a brakes liner is casted with hub motor i.e., the brake liner is casted with one of the side covers of the hub motor. In case of frequent brake applications, rapid wear of brake liner might take place which necessitates rapid replacement of the brake liner. Since the brake liner is an integral part of the side cover of
10 the hub motor, replacement of the brake liner requires replacement of the side cover or the entire hub motor, which is undesirable. Also, the replacement of side cover in non-controlled conditions might pose risk of sealant compromise which results in entry of water in the hub motor, which is undesirable. Owing to above-mentioned problems, the high warranty period of the hub motor is also compromised which results in costs to
15 manufacturer as well as customer dissatisfaction. Also, independent assessment of the brake assembly or the hub motor is difficult when brake liner is in-built with the hub motor. Moreover, servicing of hub motors with in-built brake liner poses a challenge as the entire hub motor needs to be handled for servicing either the hub motor or the brake assembly.

[003] One obvious solution to overcome one or more problems of prior arts is either to
20 increase the hardness of drum liner or decrease the hardness of brake shoe. However,

such obvious solution is not feasible, as in both the cases, the wearing rate of brake shoe will increase which require rapid replacement of brake shoe. Change in hardness may also impact the brake performance.

[004] Another obvious solution to overcome one or more problems of prior art may be to increase thickness of the brake liner. However, in such a case, lever travel will be more which may require brake lever adjustment or in some cases shoe movement after certain wearing may not be possible because of limited movement of lever.

[005] Another obvious solution to detach the brake assembly with the prime mover assembly is to use a disc brake system for rear wheel assembly. However, replacement of brake assembly with disc brake configuration requires major changes in the whole brake system which may be expensive and may also add some additional weight to the system.

[006] In view thereof, there is a need-felt to overcome at least the above-mentioned disadvantages of the prior art.

SUMMARY OF THE INVENTION

[007] In one aspect of the invention, a wheel assembly for a vehicle is disclosed. The wheel assembly comprises a prime mover assembly and a brake assembly. The prime mover assembly comprises a stationary member and a rotating member. The rotating member is attached to a first member of the wheel assembly. The prime mover assembly further comprises a pair of left and right second members. One of the left second member and the right second member is configured to have an annular opening. The annular opening is configured to detachably receive a portion of a brake assembly.

[008] In an embodiment, the first member is a rim of the wheel. In other words, the rotating member is connected to the rim of the wheel. The left second member is a left side

cover and the right second member is a right side cover. The left side cover and the right side cover extend between the stationary member and the rotating member. One of the left side cover and the right side cover has the annular opening. The annular opening has a base and a wall extending from the periphery of the wall. The annular opening defines a first enclosure to detachably receive the portion of the brake assembly. The portion of the brake assembly in context of the present invention is a brake drum. The brake drum comprises a brake drum base and a brake drum wall. The brake drum wall extends from the periphery of the brake drum base to define a second enclosure. The second enclosure is adapted for receiving a brake panel sub-assembly. The brake drum also comprises an outer surface and an inner surface. The inner surface of the brake drum faces the brake panel sub-assembly and is lined with a brake liner.

[009] In an embodiment, the base of the annular opening comprises one or more mounting holes and the brake drum base also comprises one or more mounting holes. For detachably assembling the brake drum in the annular opening, the one or more mounting holes on the brake drum base are aligned with the one or more mounting holes on the base of the annular opening and fastened with one or more fasteners such as not being limited to screw, bolts, nuts and the likes. It is to be understood that in such an arrangement, a longitudinal axis of the one or more fasteners is parallel to a rotational axis of the wheel assembly.

[010] In an embodiment, the base of the annular opening comprises an embossed portion having one or more mounting holes. In one non-limiting example, the embossed portion is star shaped. The base of the brake drum wall also comprises one or more mounting holes. For detachably assembling the brake drum in the annular opening, the one or more mounting holes on the embossed portion are adapted to align with one or more mounting

holes on the brake drum base and fastened with one or more fasteners such as not being limited to screw, bolts, nuts and the likes. It is to be understood that in such an arrangement, a longitudinal axis of the one or more fasteners is parallel to the rotational axis of the wheel assembly.

5 [011] In an embodiment, the annular opening is surrounded by a first flange extending in lateral outward direction of the wheel assembly. The lateral outward direction of the vehicle is parallel to the rotational axis of the wheel assembly. The first flange comprises one or more mounting holes. The brake drum wall also comprises one or more mounting holes. For detachably assembling the brake drum in the annular opening, the one or more
10 mounting holes on the first flange are adapted to align with the one or more mounting holes on the brake drum wall and fastened with one or more fasteners such as, not being limited to screw, bolts, nuts and the likes. It is to be understood that in such an arrangement, a longitudinal axis of the one or more fasteners is perpendicular to the rotational axis of the wheel assembly.

15 [012] In an embodiment, the brake drum wall extends between a first end and a second end. The first end is integrally connected with the brake drum base and the second end comprises a second flange which extends outwardly in a direction perpendicular to the rotational axis of the wheel assembly. The second flange has one or more mounting holes. A portion of one of the left side cover and the right side cover also comprises one or more
20 mounting holes. For detachably assembling the brake drum in the annular opening, the one or more mounting holes on the second flange are adapted to align with the one or more mounting holes on the portion of the side cover outside the opening and fastened with one or more fasteners such as, not being limited to screw, bolts, nuts and the likes. It is to be

understood that in such an arrangement, a longitudinal axis of the one or more fasteners is parallel to the rotational axis of the wheel assembly.

[013] In an embodiment, the base of the annular opening comprises one or more bosses. The one or more bosses have one or more mounting holes. The brake drum base also
5 comprises one or more mounting holes. For detachably assembling the brake drum in the annular opening, the one or more mounting holes of the bosses are adapted to align with the one or more mounting holes of the brake drum base and fastened with one or more fasteners such as not being limited to screw, bolts, nuts and the likes. It is to be understood that in such an arrangement, axis of the one or more fasteners is parallel to the rotational
10 axis of the wheel assembly.

[014] In an embodiment, the brake drum wall comprises one or more projections and the wall of the annular opening comprises one or more slots. The one or more projections of the brake drum wall are adapted to securely fit into the one or more slots of the wall of the annular opening. For detachably assembling the brake drum in the annular opening, the
15 one or more projections of the brake drum wall are fitted into the one or more slots of the wall of the annular opening.

[015] In an embodiment, the brake drum wall comprises one or more slots and the wall of the annular opening comprises one or more projections. The one or more slots of the brake drum wall are adapted to securely fit into the one or more projections of the wall of the
20 annular opening. For detachably assembling the brake drum in the annular opening, the one or more projections of the wall of the opening are fitted into the one or more slots of the brake drum wall.

[016] In an embodiment, the brake drum is made of a first material and the brake liner is made of a second material. In one non-limiting example, the first material and the second

material are same. In another non-limiting example, the first material and the second material are different.

BRIEF DESCRIPTION OF THE DRAWINGS

5 [017] Reference will be made to embodiments of the invention, examples of which may be illustrated in accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in context of these embodiments, it should be understood that it is not intended to limit the scope of the invention to these particular embodiments.

10 Figure 1 illustrates an exploded view of a wheel assembly of a vehicle, in accordance with a first embodiment of the present invention.

Figure 2 illustrates a partially exploded view of the wheel assembly, in accordance with the first embodiment of the present invention.

15 Figure 3 illustrates an exploded view of a brake drum and a prime mover assembly, in accordance with the first embodiment of the present invention.

Figure 4 illustrates assembled view of the brake drum on the prime mover assembly, in accordance with the first embodiment of the present invention.

Figure 5 illustrates a perspective view of the brake drum, in accordance with the first embodiment of the present invention.

20 Figure 6a illustrates a schematic view of the brake drum, in accordance with the first embodiment of the present invention.

Figure 6b illustrates a sectional view of Figure 6a cut along line A-A, in accordance with the first embodiment of the present invention.

Figure 7 illustrates a partially exploded view of a wheel assembly, in accordance with a second embodiment of the present invention.

Figure 8 illustrates assembled view of a brake drum on a prime mover assembly, in accordance with the second embodiment of the present invention.

5 Figure 9 illustrates a perspective view of the brake drum, in accordance with the second embodiment of the present invention.

Figure 10 illustrates a perspective rear view of a brake drum, in accordance with a third embodiment of the present invention.

10 Figure 11 illustrates a perspective front view of the brake drum, in accordance with a third embodiment of the present invention.

Figure 12a illustrates assembled view of the brake drum on the prime mover assembly, in accordance with the third embodiment of the present invention.

Figure 12b illustrates sectional view of Figure 12a cut along line B-B, in accordance with the third embodiment of the present invention.

15 Figure 13 illustrates a perspective view of a brake drum, in accordance with the fourth embodiment of the present invention.

Figure 14 illustrates a perspective view of a prime mover assembly, in accordance with the fourth embodiment of the present invention.

20 Figure 15 illustrates a perspective view of a prime mover assembly, in accordance with a fifth embodiment of the present invention.

Figure 16a illustrates a schematic view of the wheel assembly of the vehicle, in accordance with the fifth embodiment of the present invention.

Figure 16b illustrates sectional view of Figure 16a cut along line C-C, in accordance with the fifth embodiment of the present invention.

Figure 17 illustrates a perspective view of the wheel assembly of the vehicle, in accordance with different embodiments of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

5 [018] Various features and embodiments of the present invention here will be discernible from the following further description thereof, set out hereunder.

[019] The term “vehicle” in the present invention relates to all types of hybrid and electric vehicle wherein the prime mover assembly is disposed on a wheel of the vehicle. The term “vehicle” includes saddle type vehicles such as, not being limited to, bicycle, scooters and
10 motorcycles as well as passenger vehicles such as cars, trucks and rickshaws.

[020] Figure 1 illustrates an exploded view of a wheel assembly 100 of a vehicle, in accordance with a first embodiment of the present invention. Figure 2 illustrates a partially exploded view of the wheel assembly 100, in accordance with the first embodiment of the present invention. Figure 3 illustrates an exploded view of a brake drum 114 on a prime
15 mover assembly 102, in accordance with the first embodiment of the present invention. Figure 4 illustrates assembled view of the brake drum 114 on the prime mover assembly 102, in accordance with the first embodiment of the present invention. Figure 5 illustrates a perspective view of the brake drum 114, in accordance with the first embodiment of the present invention. Figure 6a illustrates a schematic view of the brake drum 114, in
20 accordance with the first embodiment of the present invention. Figure 6b illustrates a sectional view of Figure 6a along line A-A of the brake drum 114 shown in Figure 6a, in accordance with the first embodiment of the present invention.

[021] As shown, the wheel assembly 100 comprises a prime mover assembly 102 and a brake assembly 104. The prime mover assembly 102 comprises a stationary member 102a

and a rotating member 102b. In one non-limiting example, the prime mover assembly 100 is a hub motor, the stationary member 102a is a stator and the rotating member is a rotor. The construction and operation of the hub motor is well known in the art and has not been discussed in detail here for the sake of brevity. Only those components have been
5 discussed which are relevant for understanding the scope of the present invention. Further, the present invention should not be construed as limiting to the hub motor and other forms of prime mover assembly 102 to which the brake assembly 104 can be detachably attached are well within the scope of the present invention.

[022] The rotating member 102b of the prime mover assembly 102 is attached to a first
10 member 106 of the wheel assembly 100. In one non-limiting example, the first member 106 is a rim of the wheel assembly 100. The rim of the wheel assembly 100 is adapted to receive a tyre 108.

[023] The prime mover assembly 102 further comprises a pair of left second member 110 and right second member 111 (as shown in Figure 12b). One of the left second member
15 110 and the right second member comprises an annular opening 112. The annular opening 112 is configured to detachably receive a portion of the brake assembly 104. In a non-limiting example, the left second member 110 is a left side cover and the right second member 111 is a right side cover. The left side cover 110 and the right side cover 111 extends between the stationary member 102a and the rotating member 102b. In other
20 words, one of the left side cover 110 and the right side cover 111 (as shown in Figure 12b) comprises the annular opening 112 for detachably receiving the portion of the brake assembly 104. The annular opening 112 comprises a base 112a and a wall 112b. The wall 112b of the annular opening 112 extends from the periphery of the base 112a to define a

first enclosure 112c. The first enclosure 112c receives the portion of the brake assembly 104.

[024] The portion of the brake assembly 104 which is received in the annular opening 112 is a brake drum 114. The brake drum 114 comprises a brake drum base 114a and a brake drum wall 114b. The brake drum wall 114b extends from a periphery of the brake drum base 114a to define a second enclosure 114c. The second enclosure 114c is adapted to receive a brake panel assembly 116 as shown in Figure 1. The brake drum wall 114b extends between a first end 114b1 and a second end 114b2. The first end 114b1 of the brake drum wall 114b is integrally connected to the brake drum base 114a. The brake drum wall 114b has an outer surface 118 and an inner surface 120. The inner surface 120 of the brake drum wall 114b faces the brake panel assembly 116 and is lined with a brake liner (not shown). The outer surface 118 of the brake drum wall 114b faces the wall of the annular opening 112b.

[025] The brake panel assembly 116 comprises components such as, not being limited to, brake shoes and mechanisms to operate the brake shoes such that, on application of a brake pedal by a rider of the vehicle, the brake shoes come in contact with the brake liner provided on the inner surface 120 of the brake drum wall 114b and stop the vehicle and, on releasing the brake pedal by the rider of the vehicle, the brake shoes move away from the brake liner provided on the inner surface 120 of the brake drum wall 114b to allow movement of the wheel assembly 100. The constructions of the brake panel assembly 116 is well known in the art and has not been discussed in detail for the sake of brevity.

[026] In the first embodiment of the present invention, the base 112a of the annular opening 112 comprises an embossed portion 122 having one or more mounting holes H1 and the brake drum base 114a also comprises one or more mounting holes B1. For

detachably assembling the brake drum 114 in the annular opening 112, the one or more mounting holes H1 of the base 112a of annular opening 112 are aligned with the one or more mounting holes B1 of the brake drum base 114a and fastened with one or more fasteners F1 such as, not being limited to, screw, bolts, nuts and the likes. It is to be understood that, in the first embodiment of the present invention, a longitudinal axis of the one or more fasteners F1 is parallel to a rotational axis R-R of the wheel assembly 100.

[027] Figure 7 illustrates a partially exploded view of the wheel assembly 100, in accordance with a second embodiment of the present invention. Figure 8 illustrates assembled view of the brake drum 114 on the prime mover assembly 102, in accordance with the second embodiment of the present invention. Figure 9 illustrates a perspective view of the brake drum 114, in accordance with the second embodiment of the present invention.

[028] In the second embodiment, the components of the prime mover assembly 102 such as stationary member 102a, rotating member 102b and the second members (left side cover 110 and right side cover 111) are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. Similarly, the components of the brake assembly 104 such as brake drum 114 and the brake panel assembly 116 are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. However, the construction of the brake drum 114, annular opening 112 and attachment of the brake drum 114 to the annular opening 112 is different from the first embodiment and has been discussed in detail.

[029] In the second embodiment of the present invention, a first flange 124 surrounds the annular opening 112 of the prime mover assembly 102. The first flange 124 extends in a lateral outward direction of the wheel assembly 100. In other words, the first flange 124

extends in a direction parallel to the rotational axis R-R of the wheel assembly 100 as is evident from Figure 7 and Figure 8. The first flange 124 comprises one or more mounting holes H2. The brake drum wall 114b also comprises one or more mounting holes B2. For detachably assembling the brake drum 114 in the annular opening 112, the one or more mounting holes H2 of the first flange are aligned with one or more mounting holes B2 of the brake drum wall 114b and fastened with the one or more fasteners F2. It is to be understood that, in the second embodiment of the present invention, a longitudinal axis of the one or more fasteners F2 is perpendicular to the rotational axis R-R of the wheel assembly 100. The first flange 124 provides support to the brake drum 114, keeps the brake drum 114 attached to the prime mover assembly 102 and withstand the bending load produced due to brake torque and transfer it to prime mover assembly 102.

[030] Figure 10 illustrates a perspective rear view of a brake drum 114, in accordance with a third embodiment of the present invention. Figure 11 illustrates a perspective front view of the brake drum 114, in accordance with the third embodiment of the present invention. Figure 12a illustrates assembled view of the brake drum 114 on the prime mover assembly 102, in accordance with the third embodiment of the present invention. Figure 12b illustrates sectional view of Figure 12a cut along line B-B, in accordance with the third embodiment of the present invention.

[031] In the third embodiment, the components of the prime mover assembly 102 such as stationary member 102a, rotating member 102b and annular opening 112 are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. Similarly, the components of the brake assembly 104 such as brake drum 114 and the brake panel assembly 116 are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. However, the construction of the brake

drum 114, left side cover member 110 and attachment of the brake drum 114 to the annular opening 112 is different from the first embodiment and the second embodiment and has been discussed in detail.

[032] In the third embodiment, a second flange 126 extends from the second end 114b2 of the brake drum wall 114b in a direction perpendicular to the rotational axis R-R of the wheel assembly 100. The second flange 126 comprises one or more mounting holes B3. Also, in the third embodiment, the portion of the left side cover 110 outside of the annular opening 112 comprises one or more mounting holes (not shown). For detachably assembling the brake drum 114 in the annular opening 112, the one or more mounting holes B3 on the second flange 126 are aligned with the one or more mounting holes on the portion of the left side cover 110 outside of the annular opening 112 and fastened with one or more fasteners F3. It is to be understood that, in the third embodiment of the present invention, a longitudinal axis of the one or more fasteners F3 is parallel to the rotational axis R-R of the wheel assembly 100.

[033] Figure 13 illustrates a perspective view of a brake drum 114, in accordance with the fourth embodiment of the present invention. Figure 14 illustrates a perspective view of a prime mover assembly 102, in accordance with the fourth embodiment of the present invention.

[034] In the fourth embodiment, the components of the prime mover assembly 102 such as stationary member 102a, rotating member 102b and the second members (left side cover 110 and right side cover 111) are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. Similarly, the components of the brake assembly 104 such as brake drum 114 and the brake panel assembly 116 are same as discussed in the first embodiment and have not been reproduced herein for the sake of

brevity. However, the construction of the brake drum 114, annular opening 112 and attachment of the brake drum 114 to the annular opening 112 is different from the first embodiment, second embodiment and the third embodiment and has been discussed in detail.

5 [035] In the fourth embodiment, one or more projections P1 are provided on the outer surface 118 of the brake drum wall 114b as shown in Figure 14. Also, one or more slots S1 are provided on the wall 112b of the annular opening 112. The one or more projections P1 provided on the outer surface 118 of the brake drum wall 114b are adapted to fit into one or more slots S2 of the annular opening 112. For detachably assembling the brake drum 114
10 in the annular opening 112, the projections P1 of the brake drum wall fit into the slots S1 of the annular opening 112.

[036] Although not shown in the Figures, in one non-limiting example, one or more slots S1 are provided on the outer surface 118 of the brake drum wall 114b. Also, one or more projections P1 are provided on the wall 112b of the annular opening 112. The one or more
15 projections P1 on the wall 112b of the annular opening 112 are adapted to fit into one or more slots S1 provided on the outer surface 118 of the brake drum wall 114b. For detachably assembling the brake drum 114 in the annular opening 112, the one or more projections P1 provided on the wall 112b of the annular opening 112 fit into the slots S1 provided on the outer surface 118 of the brake drum wall 114b.

20 [037] In one non-limiting example, in the fourth embodiment, the base 112a of the annular opening 112 may also comprise one or more mounting holes which are adapted to align with one or more mounting holes B4 on the brake drum base 114a and are fastened with one or more fasteners such as, not being limited to, screw, bolts, nuts and the likes.

[038] Figure 15 illustrates a perspective view of a prime mover assembly 102, in accordance with a fifth embodiment of the present invention. Figure 16a illustrates a schematic view of the wheel assembly 100 of the vehicle, in accordance with the fifth embodiment of the present invention. Figure 16b illustrates sectional view of Figure 16a cut
5 along line C-C, in accordance with the fifth embodiment of the present invention.

[039] In the fifth embodiment, the components of the prime mover assembly 102 such as stationary member 102a, rotating member 102b and the second members (left side cover 110 and right side cover 111) are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. Similarly, the components of the brake
10 assembly 104 such as brake drum 114 and the brake panel assembly 116 are same as discussed in the first embodiment and have not been reproduced herein for the sake of brevity. However, the construction of the brake drum 114, annular opening 112 and attachment of the brake drum 114 to the annular opening 112 is different from the first embodiment, second embodiment, third embodiment and fourth embodiment and has been
15 discussed in detail.

[040] In the fifth embodiment of the present invention, the base 112a of the annular opening 112 comprises one or more bosses 128 having one or more mounting holes H5 and the brake drum base 114a also comprises one or more mounting holes. For detachably assembling the brake drum 114 in the annular opening 112, the one or more
20 mounting holes H5 of the one or more bosses 128 are aligned with the one or more mounting holes of the brake drum base 114 and fastened with one or more fasteners F5. It is to be understood that, in the fifth embodiment of the present invention, a longitudinal axis of the one or more fasteners F5 is parallel to a rotational axis R-R of the wheel assembly 100.

[041] Figure 17 illustrates a perspective view of the wheel assembly 100 for the vehicle, in accordance with different embodiments of the present invention.

[042] The brake drum 114 is detachably received in the annular opening 112 of one of the left side cover 110 and the right side cover of the prime mover assembly 102. The inner surface 120 of the brake drum wall 114b of the brake drum 114 is lined with a brake liner. The second enclosure 114c defined by the brake drum base 114a and brake drum wall 114b receives the brake panel assembly 116 which has already been discussed in the preceding paragraphs.

[043] As shown in the present invention, the detachable brake drum 114 lined with the brake liner is an external part of the prime mover assembly 102. In other words, the brake liner is not in-built with left side cover 110 or right side cover 111 of the prime mover assembly 100. The brake drum 114 is attached with the prime mover assembly 102 by means of fasteners F1, F2, F3, F5 or any other joints such as, not being limited to, projections/slots S1, P1 and the likes. The brake drum 114 is assembled in the annular opening 112 of the prime mover assembly 102 and assembled with fasteners F1, F2, F3, F5 which gives the zero relative motion of the brake drum 114 with respect to the prime mover assembly 102. Upon application of the brake by the rider of the vehicle, the brake shoes come in contact with the brake liner and press against the brake drum 114 from inside which inhibit the motion of brake drum 114 with wheel assembly 100. It is to be understood that a washer may be used with fasteners while detachably attaching the brake drum 114 to the annular opening 112. The presence of washer increases the tightening torque and hence the clamping force without damaging the brake drum 114 or the prime mover assembly 102. It is to be understood that there is no relative motion present between brake drum 114 and prime mover assembly 102.

[044] The assembly of brake drum 114 can be done before the assembly of the tyre 108 or after assembly of tyre 108 depending upon the feasibility of the manufacturer. In one non-limiting example, the diameter of the annular opening 112 ranges from 100 millimetres to 220 millimetres and an outer diameter of the brake drum ranges from 100 millimetres to 220 millimetres.

[045] The brake drum 114 is made of first material and the brake liner is made of second material. The first material is elected from a group comprising aluminium, cast iron, steel etc. The second material is selected from a group comprising aluminium, cast iron, steel etc. In one non-limiting example, the first material and the second material are same. In another non-limiting example, the first material and the second material are different.

[046] The claimed features of the present invention as discussed above are not routine, conventional, or well understood in the art, as the claimed features/steps enable the following solutions to technical problems in conventional technologies. Specifically, the technical problem of brake liner being in-built with one of the side covers of the prime mover assembly has been solved by the present invention.

[047] In the present invention, the brake assembly is detachably attached to the prime mover assembly. More specifically, unlike the prior art, the brake liner is provided on the inner surface of the brake drum, which is detachably attached to the prime mover assembly. As already stated, frequent application of brakes requires frequent replacement of the brake liner. The detachable feature of the brake assembly allows frequent service of the brake assembly/replacement of the brake liner which increase ease of serviceability. Ease in serviceability improves braking performance, durability and performance of the brake assembly. Also, as the prime mover assembly does not have to be handled every time the brake assembly is serviced, the life of the prime mover assembly increases and

allows the manufacturer to claim for high warranty. Also, sealant compromise which occurs by changing the side covers of the prime mover assembly in uncontrolled conditions is avoided as in the present invention, the side cover is not in-built with the brake liner and does not have to be handled while replacing the brake liner of the brake assembly.

5 [048] The present invention can be applied to the existing layout of the wheel assembly with minimum modification to the prime mover assembly and/or brake assembly. The present invention is, therefore, simple as well cost effective solution for detachably attaching the brake assembly to the prime mover assembly of the wheel assembly.

10 [049] The present invention discloses an annular opening in the one of the left side cover and the right side cover of the prime mover assembly. This results in decrease in overall weight of the vehicle.

[050] In the present invention, owing to detachable nature of the brake assembly, independent assessment of the prime mover assembly and brake assembly is possible, in case of any failures.

List of Reference Numerals

- 100-wheel assembly
- 102- prime mover assembly
- 5 102a-stationary member
- 102b-rotating member
- 104- brake assembly
- 106-first member/rim
- 108-tyre
- 10 110- left side cover
- 111-right side cover
- 112- annular opening
- 112a- base of the annular opening
- 112b- wall of the annular opening
- 15 112c- first enclosure
- 114-brake drum
- 114a- brake drum base
- 114b- brake drum wall
- 114c- second enclosure
- 20 114b1- first end of the brake drum wall
- 114b2- second end of the brake drum wall
- 116- brake panel assembly
- 118- outer surface of the brake drum wall
- 120- inner surface of the brake drum wall
- 25 122- embossed portion
- 124- first flange

126- second flange

128-bosses

H1- mounting holes of the embossed portion

H2- mounting holes on the first flange

5 H5-mounting holes on the flanges

B1-mounting holes on the brake drum base

B2- mounting holes of the brake drum wall

B3- mounting holes on the second flange

B4- mounting holes on the brake drum base

10 P1- projections

S1- slots

F1- fasteners

F2- fasteners

F3- fasteners

15 F5- fasteners

R-R rotational axis of the wheel assembly

CLAIMS:

1. A wheel assembly (100) for a vehicle, the wheel assembly (100) comprising:
a prime mover assembly (102), the prime mover assembly having a stationary
5 member (102a) and a rotating member (102b), the rotating member (102b) being
attached to a first member (106) of the wheel assembly (100); a pair of left (110) and
right second members (111), one of the left second member (110) and the right second
member (111) being configured to have an annular opening (112), the annular opening
(112) being configured to receive a portion of a brake assembly (104) to detachably
10 attach with one of the left second member (110) and right second member (111).
2. The wheel assembly (100) as claimed in claim 1, wherein the first member (101) being
a rim of the wheel assembly (100), the left second member (110) being a left side cover
and the right second member (111) being a right side cover.
- 15 3. The wheel assembly (100) as claimed in claim 2, the annular opening (112) being
surrounded by a first flange (124), the first flange (124) extending in a laterally outward
direction of the wheel assembly (100).
- 20 4. The wheel assembly (100) as claimed in claim 1, wherein the annular opening (112)
comprises a base (112a) and a wall (112b), the wall (112b) extending from a periphery
of the base (112a) to define a first enclosure (112c) dimensioned to receive a brake
drum (114) of the brake assembly (104).
- 25 5. The wheel assembly (100) as claimed in claim 4, wherein the brake drum (106)
comprises a brake drum base (114a) and a brake drum wall (114b), the brake drum
wall (114b) extending from the periphery of the brake drum base (114a) to define a

second enclosure (114c), the second enclosure (114c) adapted for receiving a brake panel assembly (116).

6. The wheel assembly (100) as claimed in claim 5, wherein the brake drum wall (114b) comprises an outer surface (118) and an inner surface (120), the inner surface (120) facing the brake panel assembly (116) and lined with the brake liner.
7. The wheel assembly (100) as claimed in claim 6, wherein the base (112a) of the annular opening (112) comprises one or more mounting holes adapted for being aligned with one or more mounting holes of the brake drum base (114a) and fastened with one or more fasteners.
8. The wheel assembly (100) as claimed in claim 6, wherein the base (112a) of the annular opening (112) comprises one or more bosses (128) adapted for receiving the brake drum base (114a) and fastened with one or more fasteners (F5).
9. The wheel assembly (100) as claimed in claim 6, wherein the base (112a) of the annular opening (112) comprises a star-shaped embossed portion (122) adapted for receiving the brake drum base (114a) and fastened with one or more fasteners (F1).
10. The wheel assembly (100) as claimed in claim 7, claim 8 or claim 9, wherein a longitudinal axis of the one or more fasteners (F1, F5) being parallel to rotational axis (R-R) of the wheel assembly (100).
11. The wheel assembly (100) as claimed in claim 6, wherein the wall (112b) of the annular opening (112) comprises one or more slots (S1) or one or more projections (P1) and the outer surface (118) of the brake drum wall (114b) comprises one or more

projections (P1) or one or more slots (S1) adapted to fit into the one or more slots (S1) or one or more projections (P1) of the wall (112b) of the annular opening (112).

12. The wheel assembly (100) as claimed in claim 6, wherein the brake drum wall (114b) extends between a first end (114b1) and a second end (114b2), the first end (114b1) being integrally connected with the brake drum base (114a) and the second end (114b2) having a second flange (126) extending outwardly in a direction perpendicular to rotational axis (R-R) of the wheel assembly (100), the second flange (126) being adapted to detachably attach with a portion of one of the left second member (110) and the right second member (111) outside the annular opening (112) with one or more fasteners (F3).

13. The wheel assembly (100) as claimed in claim 12, wherein a longitudinal axis of the one or more fasteners (F3) being parallel to rotational axis (R-R) of the wheel assembly (100).

14. The wheel assembly (100) as claimed in claim 3 and claim 6, wherein the first flange (124) of the annular opening (112) comprises one or more mounting holes (B3) adapted for being aligned with one or more mounting holes (H3) on the brake drum wall (114b) and fastened with one or more fasteners (F3).

15. The wheel assembly (100) as claimed in claim 14, wherein an axis of the one or more fasteners (F3) being perpendicular to rotational axis (R-R) of the wheel assembly (100).

16. The wheel (100) as claimed in claim 6, wherein the brake drum (106) being made of a first material and brake liner being made of a second material.

17. The wheel assembly (100) as claimed in claim 16, wherein the first material and the second material being different.

5 18. The wheel assembly (100) as claimed in claim 16, wherein the first material and second material being same.

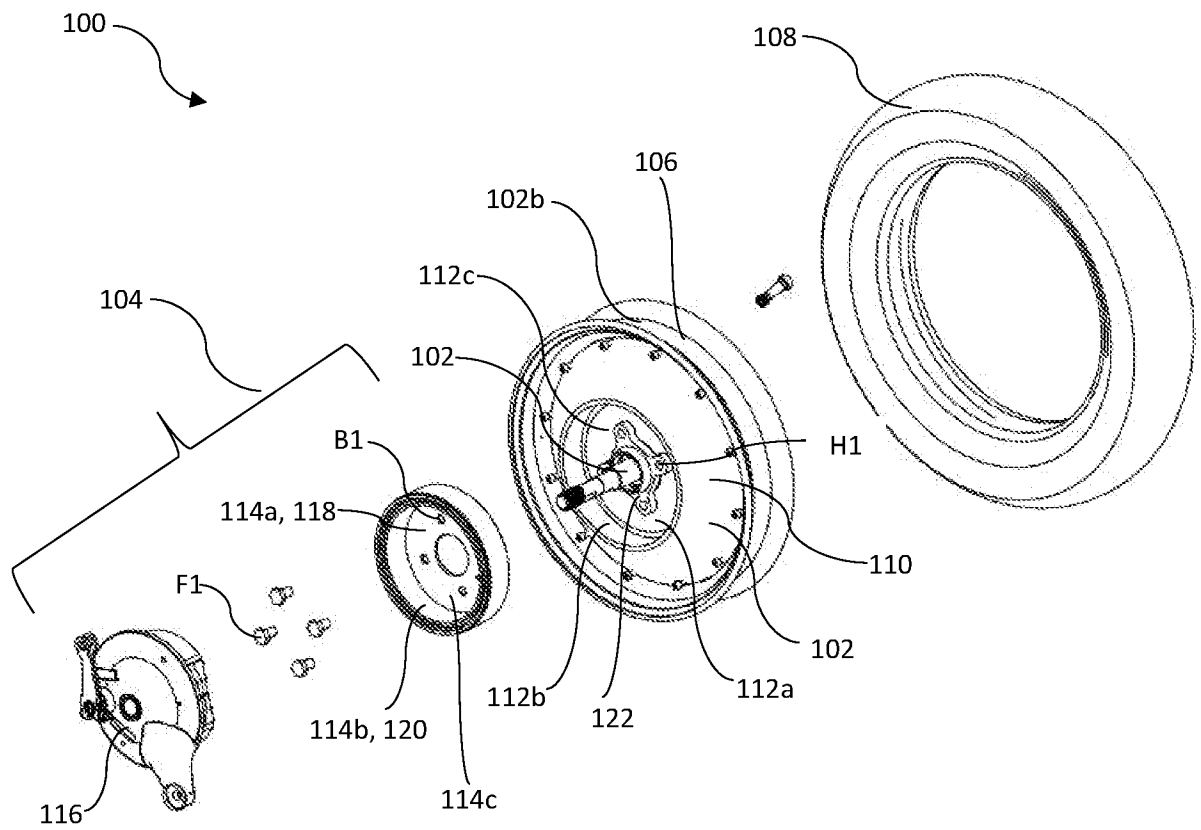


Figure 1

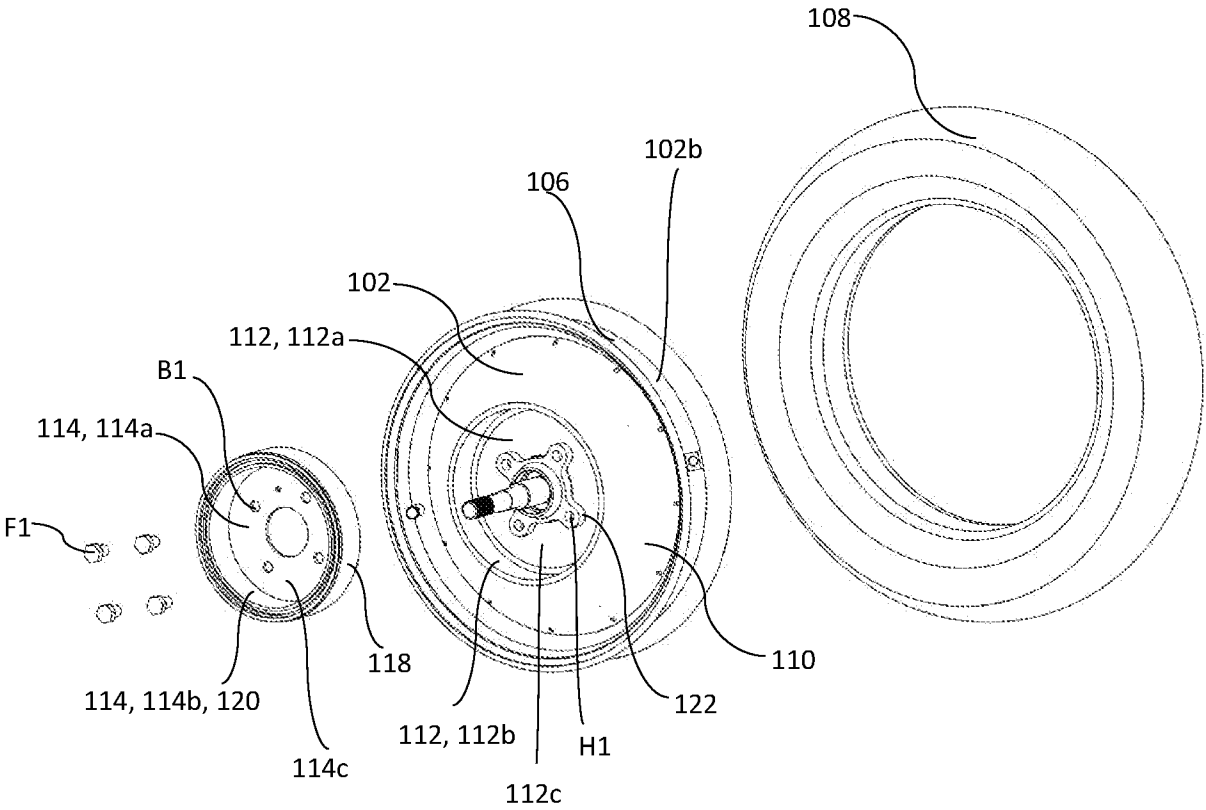


Figure 2

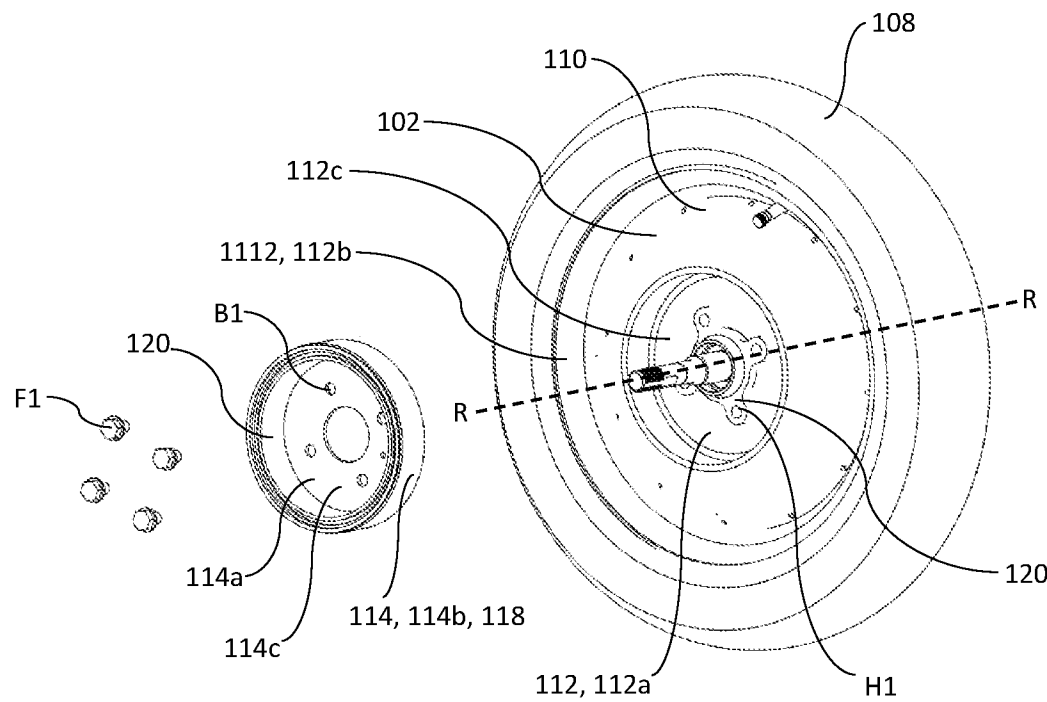


Figure 3

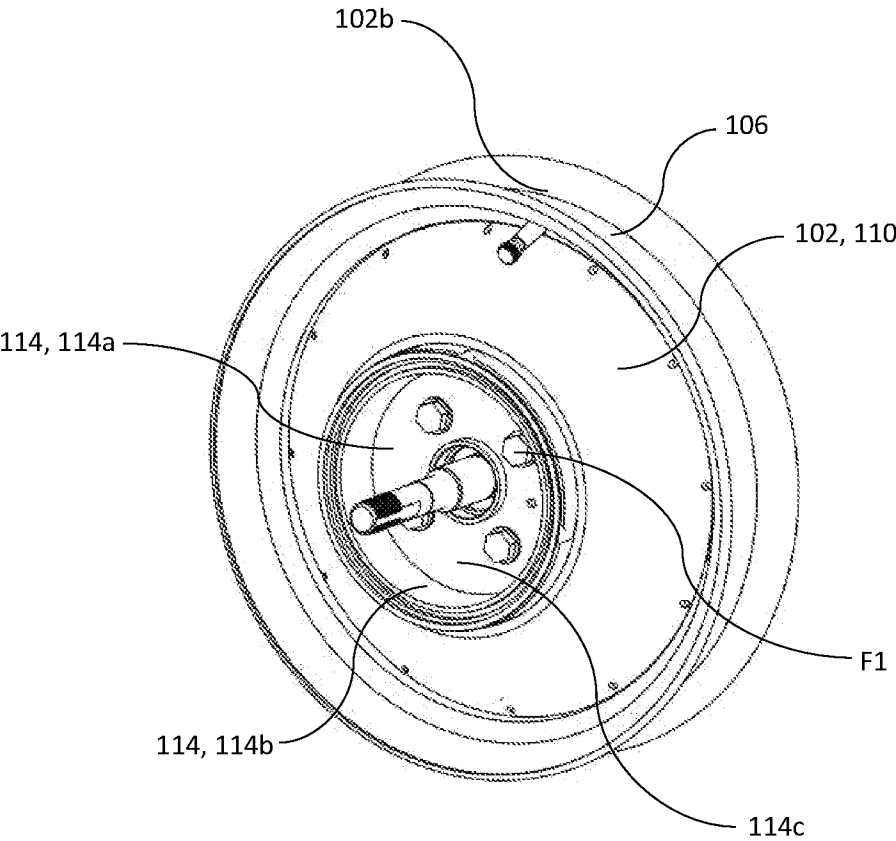


Figure 4

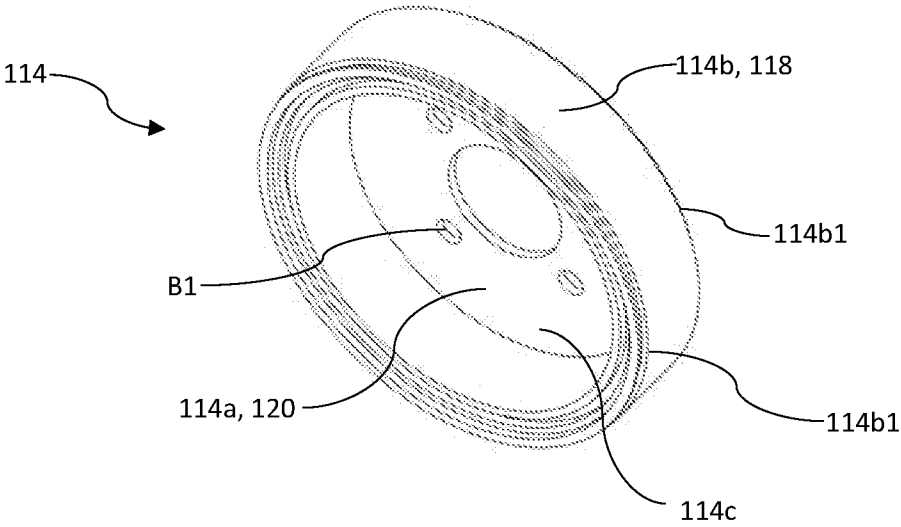


Figure 5

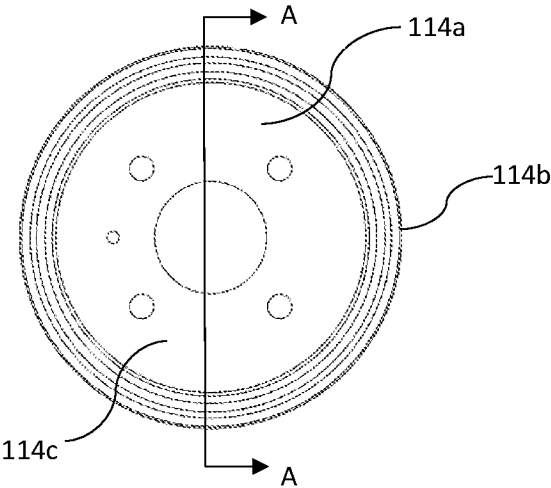


Figure 6a

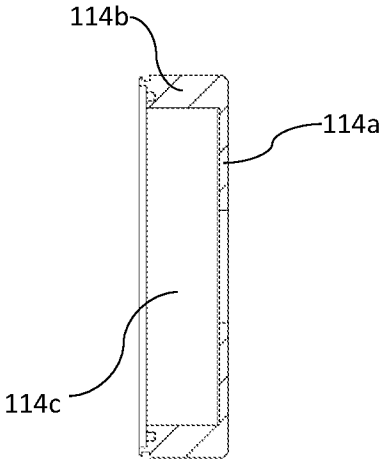


Figure 6b

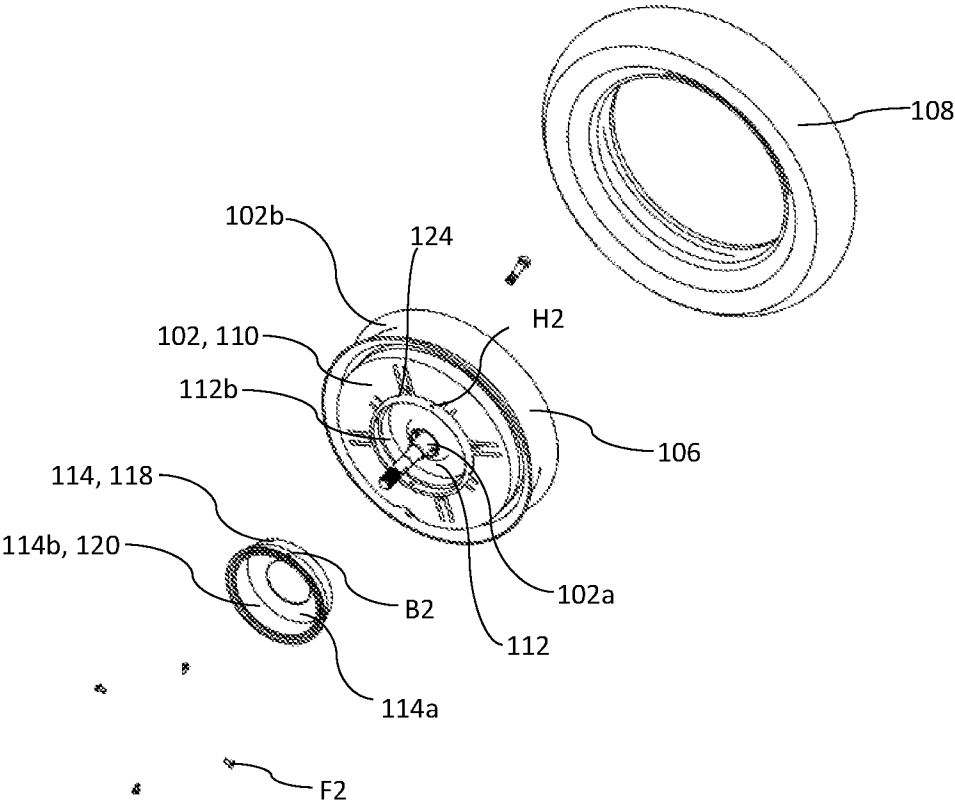


Figure 7

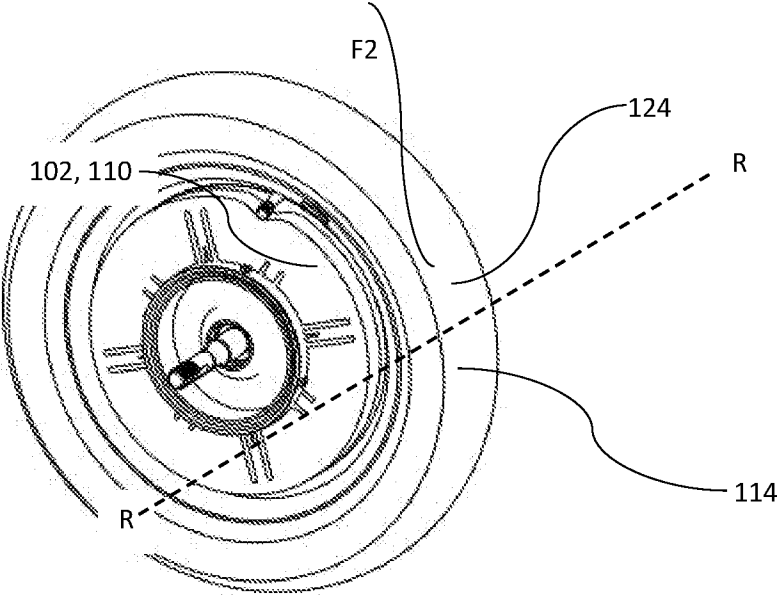


Figure 8

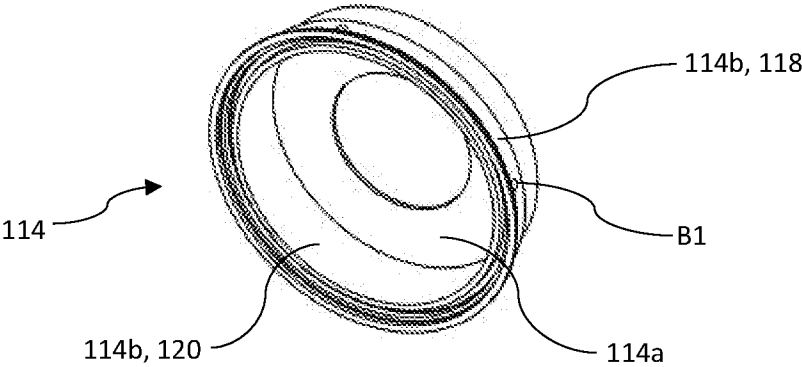


Figure 9

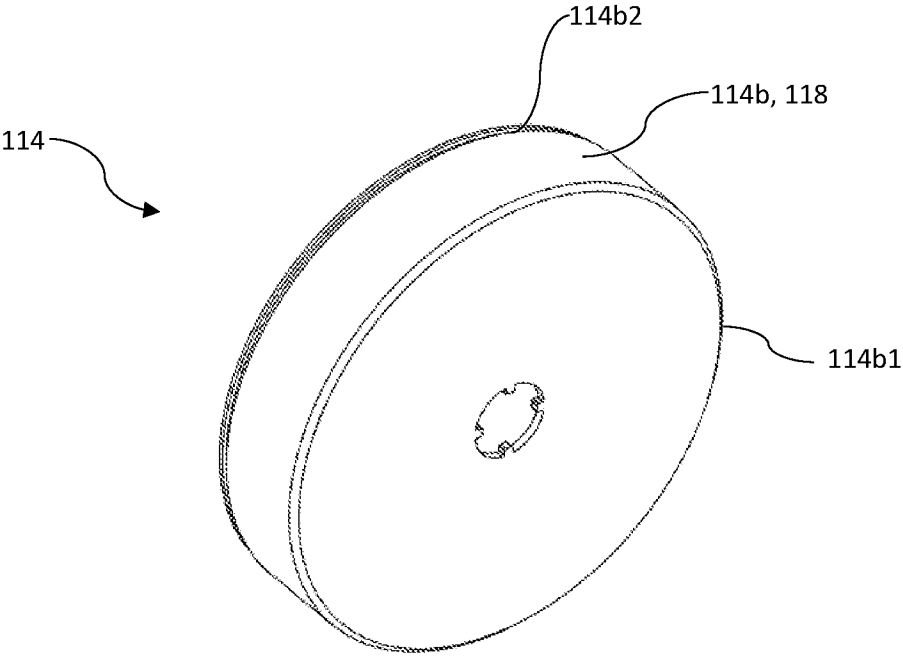


Figure 10

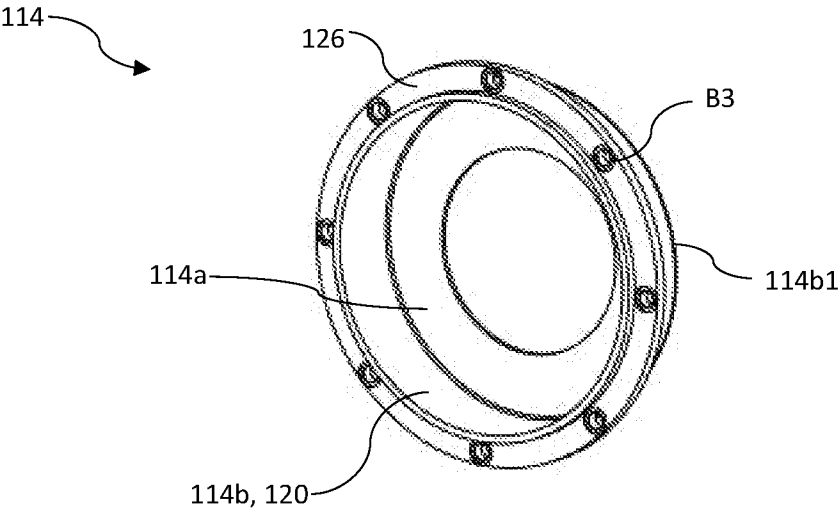


Figure 11

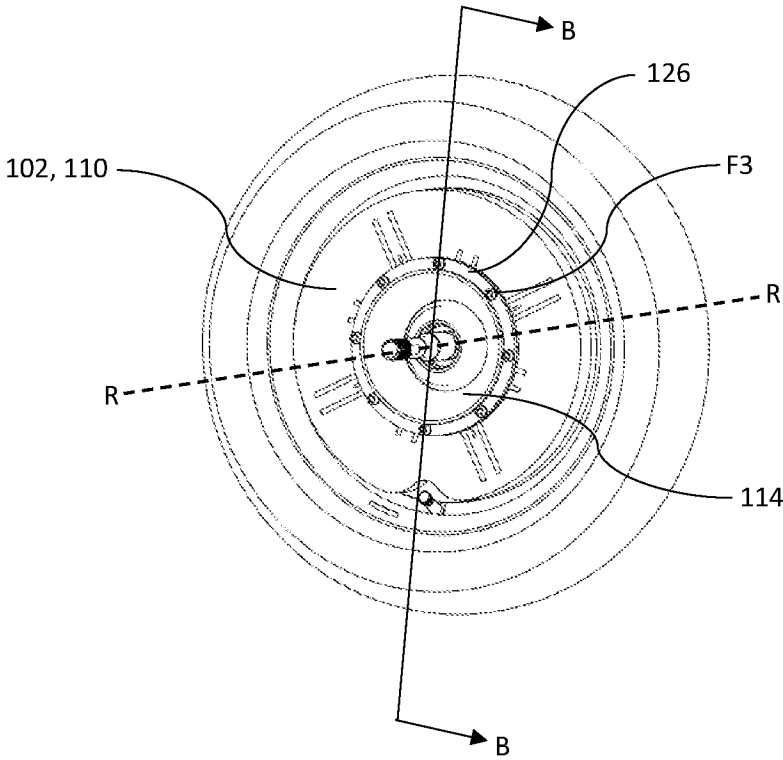


Figure 12a

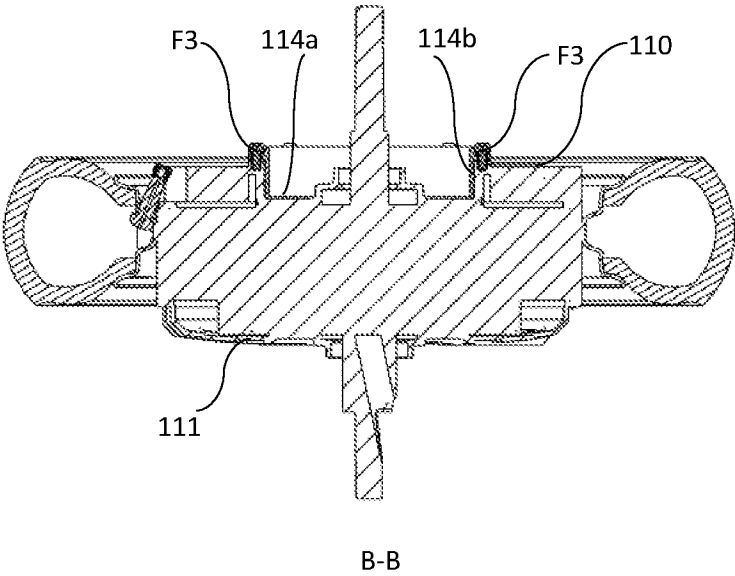


Figure 12b

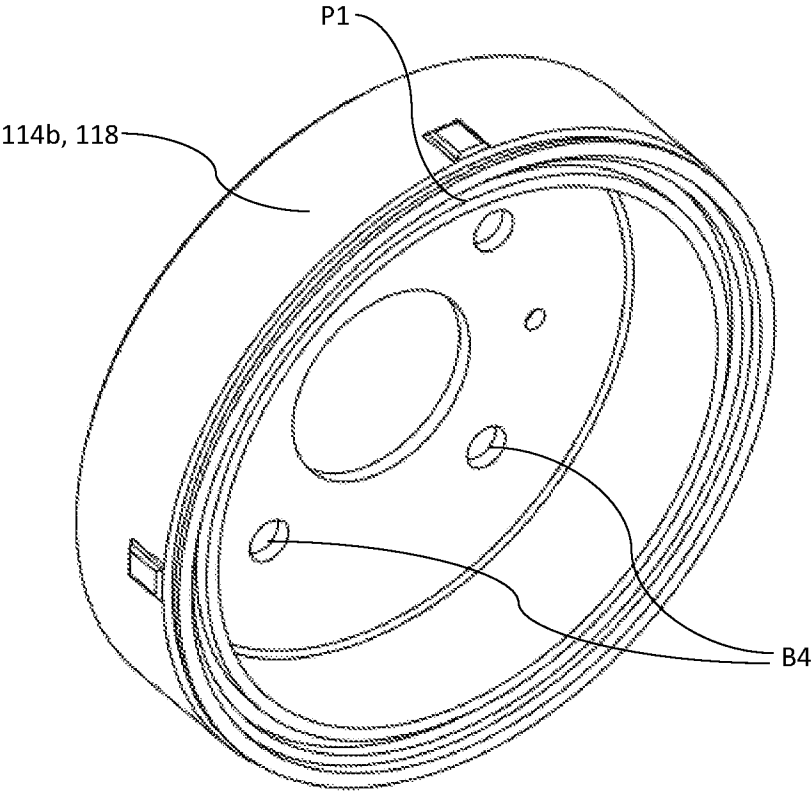


Figure 13

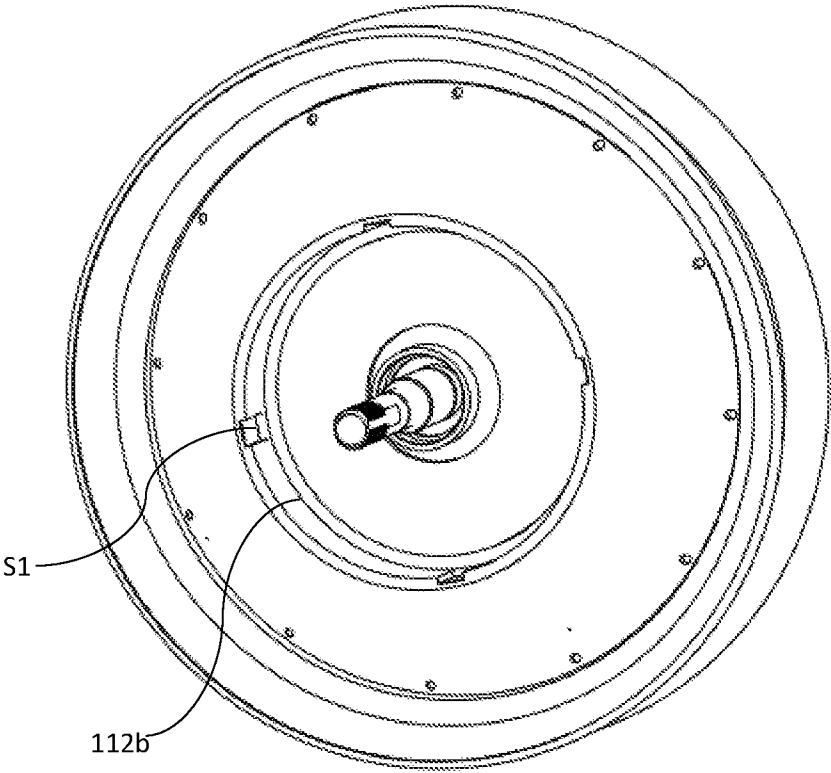


Figure 14

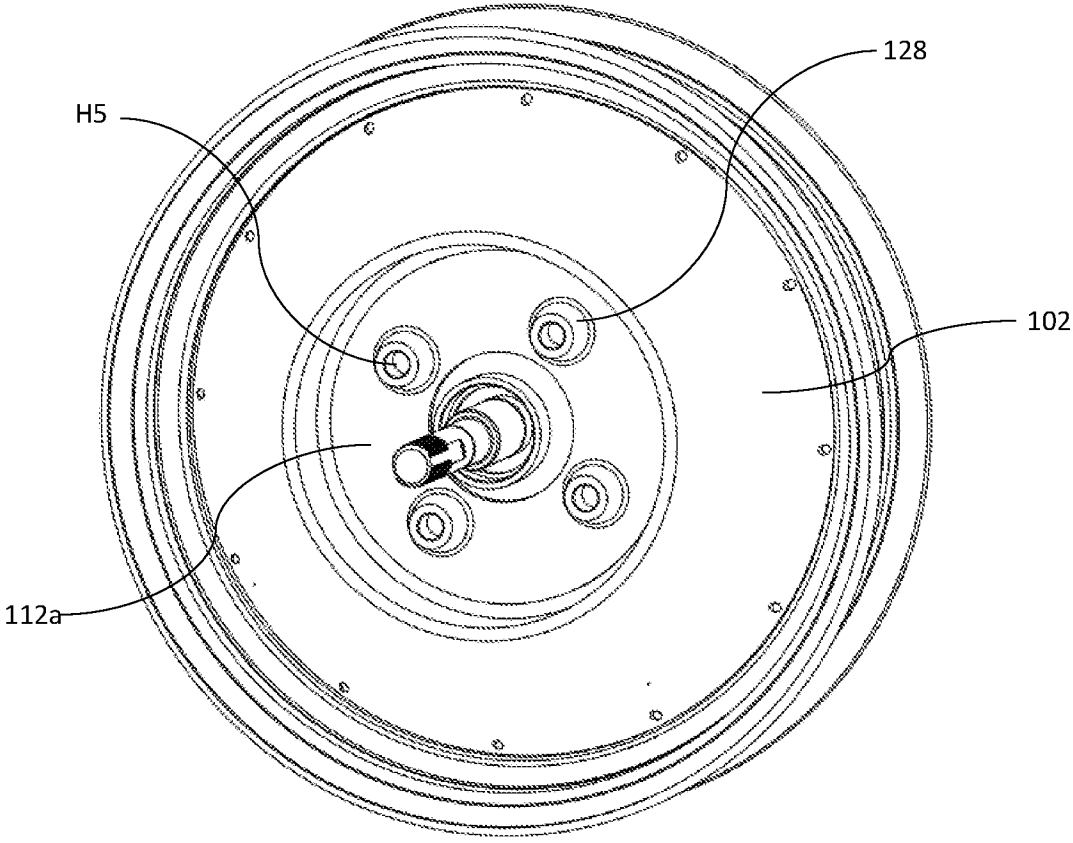


Figure 15

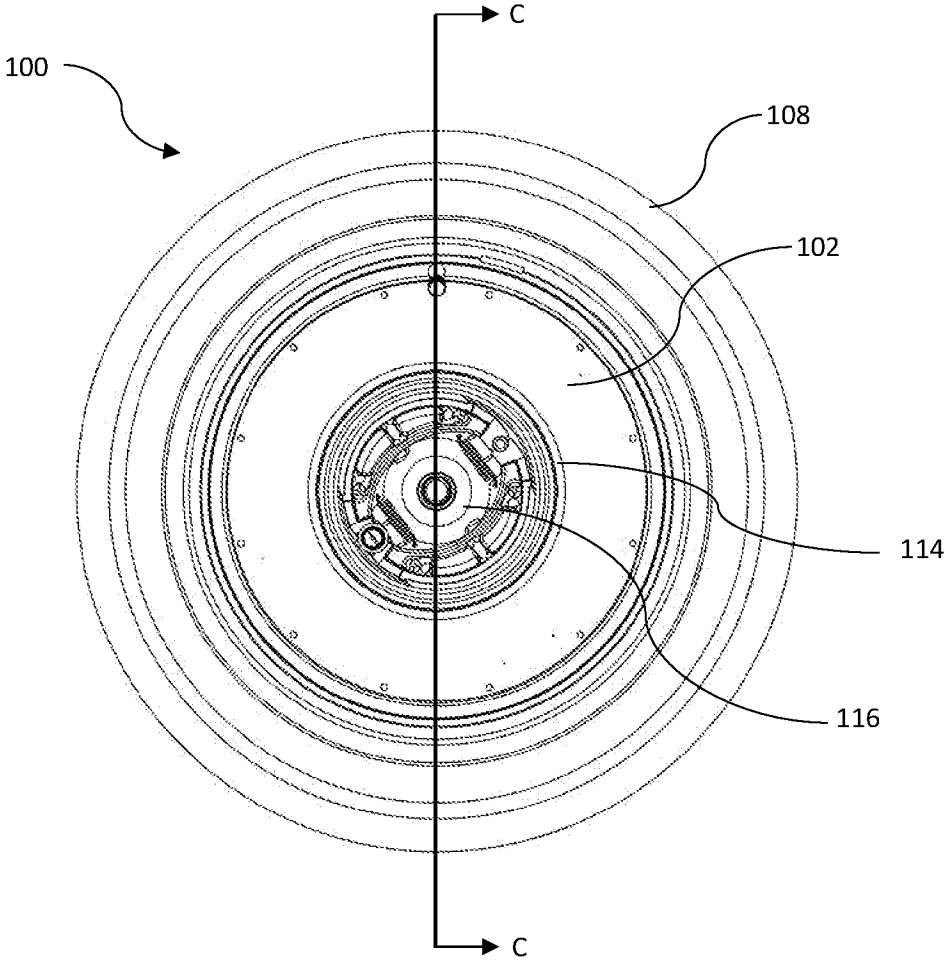


Figure 16a

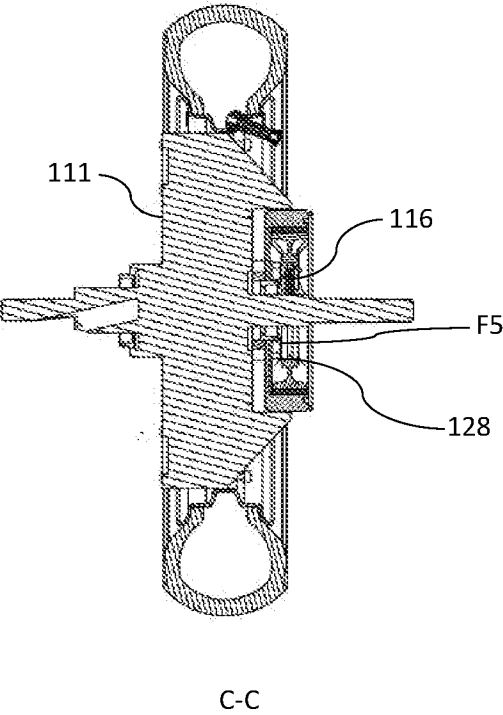


Figure 16b

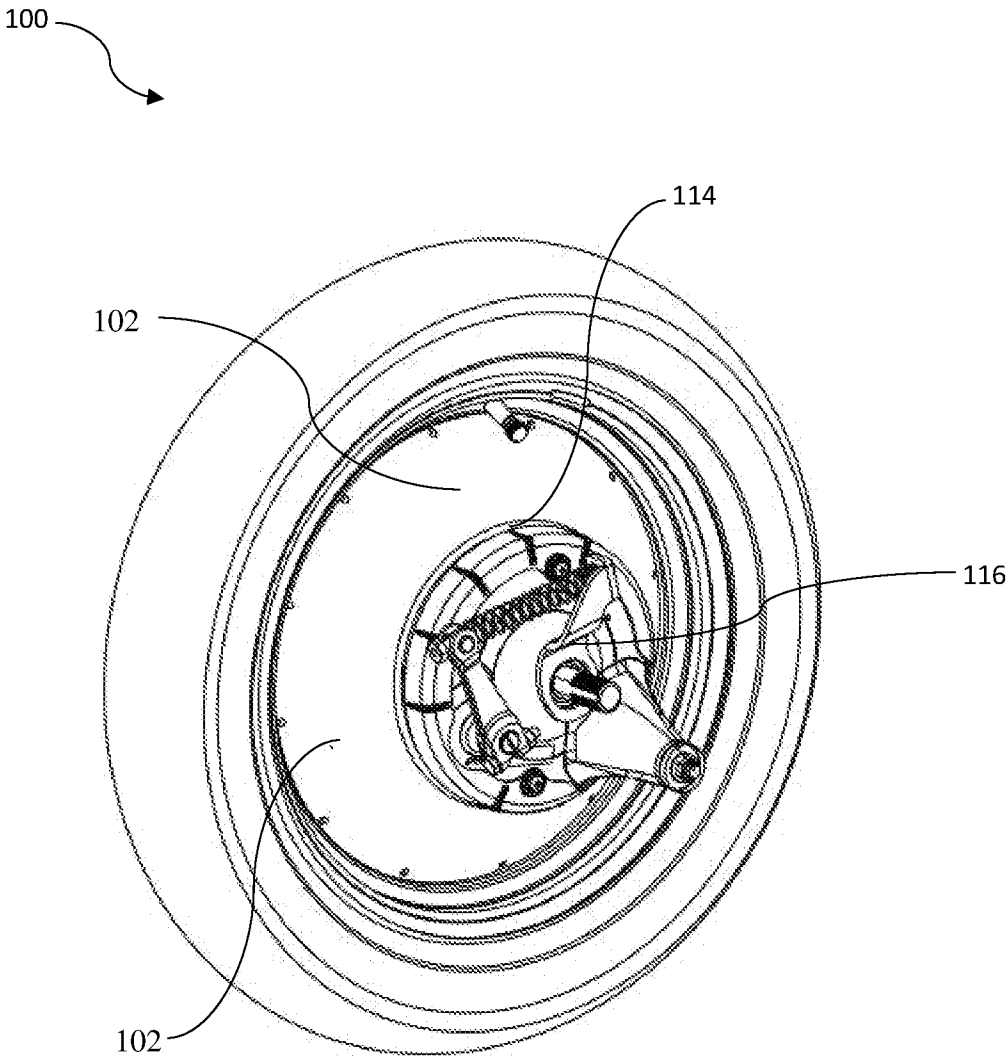


Figure 17

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IN2024/050312

A. CLASSIFICATION OF SUBJECT MATTER
F16D65/02, B60B27/00 Version=2024.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

F16D, B60B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic database consulted during the international search (name of database and, where practicable, search terms used)

PatSeer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO2008031080A2 [GM GLOBAL TECH OPERATIONS INC] 13 MARCH 2008 (13.03.2008) Abstract; Claim 1; Paragraph [0021-0028]	1-18
A	CN113119658A [ZHENGZHOU JINGTONG AUTO PARTS CO LTD] 16 JULY 2021 (16.07.2021) Paragraph [0011; 0024; 0027]; Claim 1	1-18

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:

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"D" document cited by the applicant in the international application

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19-07-2024

Date of mailing of the international search report

19-07-2024

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Plot No.32, Sector 14, Dwarka, New Delhi-110075
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Authorized officer

Md Khalik Khan

Telephone No. +91-1125300200

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IN2024/050312

Citation	Pub.Date	Family	Pub.Date
WO 2008031080 A2	13-03-2008	CN 101528492 A	09-09-2009
		CN 101535078 A	16-09-2009
		DE 112007002093 T5	02-07-2009
		US 2008061525 A1	13-03-2008
		US 2008210479 A1	04-09-2008
		WO 2008031081 A3	08-05-2008