ABSTRACT
The present invention presents a wheelchair racing glove. The glove includes a main body having a top surface with a gripping structure, padded segments, fastener, and nesting cavity; and a bottom surface having a force transfer member and frictional support member. The gripping structure is formed with ergonomic features that fit a user’s hand, which is held in the glove by the fastener. The padded segments reduce vibrational forces acting on the user’s hand, and the nesting cavity provides a protective cover and additional grip for a user’s thumb. The nesting cavity may also have ventilation holes to promote airflow to a user’s thumb. The force transfer member and frictional support member both function to reduce impact forces as well as promote force transfer efficiency between a user’s hand and a wheelchair wheel. A patterned internal support system further provides structural integrity, weight reduction, force absorption, and efficient force transfer.
FIG. 2
WHEELCHAIR RACING GLOVE

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This invention claims priority from the previously filed provisional application, U.S. Pat. No. 62/659,021, filed Apr. 17, 2018; the contents of which are herein incorporated by reference.

BACKGROUND OF THE INVENTION

[0002] In competitive wheelchair racing, it is known in the art that racing wheelchairs typically have a set of wheels configured with a propulsion rail structure attached to an outer wheel surface of the wheelchair such that a user grips the propulsion rail and applies torque to it. Force is transferred from the rail to the wheel surface and then to the wheels; thereby propelling the wheelchair forward. High speeds combined with the typically metallic propulsion rails of wheelchair requires the use of specialized gloves for gripping the rails and propelling the user.

[0003] Wheelchair racing gloves known in the art are configured to cover the entirety of the user’s hands, binding fingers together separately from a thumb, in a mitt-like harness. Manufactured from suede, foam, or rubber; such racing gloves also include a strap designed to extend around the thumb and fasten the fingers to a back side of the user’s hand, binding the hand in a fist-like configuration. This allows the user to grip the propulsion rings of the wheels using a “pinching” motion between a thumb and index finger and apply the torque needed to propel the wheelchair and user forward.

[0004] Such gloves known in the art and the aforementioned need of the user to execute a “pinching” motion produces an array of disadvantages. Beyond discomfort if bound for extended periods of time, attempts to put on the gloves typically require another person to assist with a second glove; since the user cannot fasten the second glove while their hand is bound inside a first glove. Additionally, wheelchair racing gloves known in the art are typically manufactured with padding that may absorb an inordinate amount of force exerted by the user, thereby decreasing energy transfer efficiency to the wheels, potentially tiring and slowing the user, and putting them at a disadvantage. When combined with the need to carry out the fine function of “pinching” the propulsion rail, the user may be susceptible to hand cramps, further decreasing racing performance. Additionally, the entirely enclosed structure of typical wheelchair racing gloves can quickly form unhygienic internal conditions due to accumulation of the user’s sweat. This may result in odors, chaffing, blister formation, and general discomfort of the user’s hands during and after use.

[0005] Wheelchair racing gloves known in the art have not been manufactured from largely rigid materials, resulting in a loss of force transfer from user to wheel. A rigid structure would disallow force absorption and promote transfer efficiency, allowing a user to propel a chair faster with less effort. Further, glove rigidity would eliminate a need for the user to affect the aforementioned “pinching” motion in order to grip and transfer force to the propulsion rail and wheel, conserving the user’s energy and reducing potential injury from hand cramps. Additionally, non-binding and open-air glove structures would promote extended hygiene maintenance of a user’s hand, as well as a greater ease of securing or releasing the glove to or from a user’s hand without additional assistance.

SUMMARY OF THE INVENTION

[0006] The present invention related to a rigid wheelchair racing glove. The glove comprises a main body having a top surface and a bottom surface, the top surface having an ergonomic gripping structure configured to allow comfortable handling of the glove and a cavity disposed therein for a user to insert and rest a thumb inside during handling and use. The thumb cavity of the gripping structure also comprises a plurality of ventilation holes disposed through the surface, promoting airflow to the user’s thumb. The gripping structure also has an elongated member extending from an end and configured to allow coupling and retention of a fastener.

[0007] At another end, the gripping structure also has at least one depression, also configured to couple and retain a fastener. The fastener, once fastened to the glove, is designed to allow a user to fasten the glove to their hand during handling and use. The top surface of the glove may also have at least one padded segment disposed thereupon, facilitating further comfort and ergonomics for the user during use.

[0008] The bottom surface of the main body of the wheelchair racing glove may also comprise at least one force transfer member configured to absorb impact forces while also maintaining transfer efficiency of forces between the user’s hand and a wheelchair propulsion rail. The at least one force transfer member may extend from the bottom surface of the main body to form an angled channel with the bottom surface. Dimensioned to accept the propulsion rail of a wheelchair wheel, the channel promotes grip between the wheelchair racing glove and the wheel, increasing force transfer and force transfer efficiency through structural characteristics rather than a user’s finger gripping pressure.

[0009] The wheelchair racing glove may further comprise at least one frictional support member coupled to the at least one force transfer member and the bottom surface of the main body, made of dense padding or another material of limited compressibility and configured to promote impact force absorption. The at least one frictional support member may also be manufactured of a material having enhanced surface friction capabilities, thereby further increasing force transfer efficiency by reducing slippage between the at least one transfer member and bottom surface and the propulsion rail of the wheelchair wheel. Force transfer efficiency may also be accomplished by coating the at least one force transfer member in another material having enhanced frictional capabilities similar to or the same as the at least one frictional support member.

[0010] Moreover, the main body of the glove may also comprise an internal structure patterned with mesh, grid structures, or lattices. The internal structure is further configured to reduce overall weight of the glove, as well as promote impact absorption and force transfer efficiency in a similar fashion as the force transfer member. The main body being manufactured from an impact resistant thermoplastic such as poly(lactic acid) (PLA), acrylonitrile butadiene styrene (ABS), or polyvinyl alcohol (PVA). The wheelchair racing glove may be manufactured through three-dimensional printing techniques known in the art.
BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 illustrates a perspective view of the wheelchair racing glove.
[0012] FIG. 2 is a perspective view of the top surface of the wheelchair racing glove.
[0013] FIG. 3 is a perspective view of the bottom surface of the wheelchair racing glove.
[0014] FIG. 4 is a cross-sectional view of the wheelchair racing glove.
[0015] FIG. 5 illustrates a perspective view of another configuration of the wheelchair racing glove.
[0016] FIG. 6 illustrates a perspective view of another configuration of the wheelchair racing glove.
[0017] FIG. 7 illustrates a perspective view of another configuration of the wheelchair racing glove.

DETAILED DESCRIPTION OF THE INVENTION

[0018] The foregoing features and advantages of the present invention are apparent from the subsequent detailed description of representative embodiments, read in conjunction with the attached drawings. The detailed description and drawings are illustrative of the invention rather than limiting, with the scope of the invention being defined by the appended claims and equivalents thereof.

[0019] The present invention relates to an improved wheelchair racing glove with a rigid main body and a force transfer member configured to simultaneously absorb impact forces while promoting lateral force transfer efficiency between a user’s hand and a propulsion rail of a racing wheelchair.

[0020] FIG. 1 depicts the wheelchair racing glove 100, comprising a main body 101 having a top surface 102 and a bottom surface 103. The top surface 102 further comprises a gripping structure 104 extending from a first end of the top surface 102 to a second end of the top surface 102. The gripping structure 104 comprises a partially arced structure spanning the top surface 102 of the glove 100, configured to couple a hand of a user.

[0021] The gripping structure 104 may further comprise ergonomic surface features such as grooves or indents, configured to nest a user’s fingers and promote gripping functions while the glove is in use. At least one end of the gripping structure 104 further comprises at least one depression 106, configured to couple and retain a fastener 107 thereto. The fastener 107 extends from a first end of the gripping structure 104 to a second end of the gripping structure 104 and is configured to couple and retain a user’s hand to the glove during use. The fastener 107 may be composed of elastic, cloth, rubber, hook-and-loops, or another fastening method known in the art.

[0022] The second end of the gripping structure 104 may have, disposed upon a surface, a surface depression 108 similar to the at least one depression 106 of the first end, configured to couple and retain the fastener 107. In some embodiments of the invention, at least one of the ends of the gripping structure 104 may have a retention member 109 extending therefrom, configured to retain an end of the fastener 107. In some embodiments of the invention, at least one of the depressions 106, 108 of the gripping structure 104 may further comprise a hole disposed through the gripping structure 104, configured to allow the fastener 107 to be threaded therethrough and retained to the structure 104.

[0023] The top surface 102 of the wheelchair racing glove 100, as shown in FIG. 2, further comprises a depression disposed partially into the surface, forming a nesting cavity 110. The nesting cavity 110 is configured such that a user may insert a thumb into the cavity 110 during use, thereby protecting the thumb and providing an additional gripping surface for the user. In some embodiments the nesting cavity 110 may have a plurality of ventilation holes 111 disposed through the top surface 102 of the glove 100 into an interior of the cavity 110 to facilitate airflow between the cavity 110 and an external environment. The ventilation holes 111 may be dimensioned to facilitate airflow and promote comfort and hygiene of the user’s thumb during and after use of the glove 100.

[0024] In some embodiments of the invention, the main body 101 of the wheelchair racing glove may further comprise at least one padded segment 112 disposed upon the top surface 102 thereof. The at least one padded segment 112 is configured to reduce vibrational and impact forces transferring to a user’s hand, thereby facilitating comfort and ergonomics. In some embodiments, the at least one padded segment 112 may comprise raised structures coupled to the top surface 102 of the main body 101. In other embodiments the at least one padded segment 112 may comprise inlays of materials including but not limited to foam, gel, rubber, or other vibrational and impact-resistant materials known in the art.

[0025] FIG. 3 depicts the bottom surface 103 of the wheelchair racing glove 100, comprising at least one force transfer member 113 configured to absorb impact forces while promoting friction and lateral force transfer efficiency between the glove and the wheelchair propulsion rail. In some embodiments of the invention, the force transfer member may extend from the bottom surface 103 of the wheelchair racing glove to form an angled channel with the bottom surface. The angled channel is configured to accept and couple the wheelchair propulsion rail, thereby providing sufficient friction between the glove and the rail to efficiently transfer force from the user to the wheel.

[0026] A person of ordinary skill in the art will appreciate that the angled channel may be configured to couple varying propulsion rail diameters and cross-sections, the angle formed by the channel being classified as, but not limited to, acute, right, obtuse, straight, and reflex angles.

[0027] In some embodiments of the invention, the force transfer member and the bottom surface may comprise a continuous structure such that the angled channel is visually absent, forming an obtuse, straight, or reflex angle.

[0028] The force transfer member 113 may further comprise surface features having enhanced frictional capabilities and configured to reduce slipping between a surface of the transfer member 113 and the wheelchair propulsion rail. In other embodiments, the force transfer member 113 may comprise a molded structure, the surface features comprising a portion of the member itself.

[0029] The bottom surface of the wheelchair racing glove may further comprise an at least one frictional support member coupled thereto. The frictional support member may comprise a force absorption material having limited compressibility, including but not limited to a dense padding, foam, or plastic; configured to absorb an impact force, such as that of a user driving the glove 100 down upon an edge of a wheelchair propulsion rail. The frictional support member also comprises surface features with enhanced
frictional capabilities, configured to reduce slippage between a surface of the force transfer member 113 and the wheelchair propulsion rail.

[0030] In some embodiments of the invention, the frictional support member may comprise a chemical coating, including but not limited to rubber, resin, vinyl, or other anti-slip material known in the art. In other embodiments, the frictional support member may comprise a covering, such as cloth or leather, coupled to both the force transfer member 113 and the bottom surface 103 of the glove 100 and configured to enclose each.

[0031] The main body 101 of the wheelchair racing glove 100 may further comprise a internal support system 116, shown in FIG. 4, arranged in at least one pattern of, including but not limited to, geometric shapes, mesh, grid structures, or lattices. The internal support system 116 is further configured to maintain structural rigidity and reduce the overall weight of the glove 100 while further promoting impact absorption and force transfer efficiency during use of the glove 100.

[0032] A person of ordinary skill in the art will appreciate that the main body 101 may be manufactured from any impact-resistant thermoplastic, including but not limited to polylactic acid (PLA), acrylonitrile butadiene styrene (ABS), or polyvinyl alcohol (PVA). The wheelchair racing glove 100 may be manufactured through injection molding, thermforming, compression molding, or other technique known in the art. A person of ordinary skill in the art would further appreciate that the wheelchair racing glove 100 may be manufactured through three-dimensional printing techniques, including but not limited to stereolithography (SLA), fused deposition modeling (FDM), selective laser sintering (SLS), or selective laser melting (SLM).

[0033] While the invention has been described with respect to various embodiments, it will be understood that the invention is capable of further modifications. This application is intended to cover any variations, uses, or adaptations of the invention generally following the principles of the invention, and includes such departures from the present disclosure within the known and customary practice in the art to which the invention pertains.

What is claimed is:

1. A wheelchair racing glove, comprising:
   a. a main body having a top surface and a bottom surface;
   b. wherein the top surface further comprises a gripping structure;
   c. wherein the bottom surface further comprises a force transfer member

2. The wheelchair racing glove of claim 1, wherein the top surface further comprises a nesting cavity disposed therein and configured to accept a user's thumb.

3. The wheelchair racing glove of claim 2, wherein at least one ventilation hole is disposed through the main body, connecting and promoting airflow between an interior of the nesting cavity with an external environment.

4. The wheelchair racing glove of claim 1, wherein the top surface further comprises paddled segments disposed thereupon and configured to reduce vibrational and impact forces transferred between a user's hand and the main body of the glove.

5. The wheelchair racing glove of claim 1, wherein the gripping structure comprises ergonomic surface features configured to assist a user's grip.

6. The wheelchair racing glove of claim 1, wherein a fastener is coupled to an at least one end of the gripping structure, the fastener configured to couple and retain a user's hand.

7. The wheelchair racing glove of claim 1, wherein the main body has at least one depression disposed along a surface of the gripping structure, the depression configured to couple and retain a fastener.

8. The wheelchair racing glove of claim 7, wherein the at least one depression further comprises a hole disposed through the gripping structure and configured to accept the fastener threaded therethrough.

9. The wheelchair racing glove of claim 1, wherein the bottom surface of the main body further comprises a force transfer member coupled thereto and configured to absorb impact force and promote force transfer efficiency from a user's hand to a wheelchair wheel.

10. The wheelchair racing glove of claim 9, wherein the force transfer member extends from the bottom surface to an angled channel between the force transfer member and the bottom surface, the angled channel configured to accept and couple a wheelchair propulsion rail.

11. The wheelchair racing glove of claim 10, wherein the force transfer member and the bottom surface comprise a continuous structure.

12. The wheelchair racing glove of claim 9, wherein the force transfer member and bottom surface of the main body further comprises enhanced frictional surface features, configured to reduce slippage between the wheelchair racing glove and a wheelchair propulsion rail.

13. The wheelchair racing glove of claim 9, wherein the bottom surface comprises an at least one frictional support member coupled thereto, having surface features configured to promote friction between the force transfer member and the wheelchair propulsion rail.

14. The wheelchair racing glove of claim 13, wherein the at least one frictional support member comprises a force absorption material having limited compressibility, configured to absorb impact forces between the wheelchair racing glove and the wheelchair propulsion rail.

15. The wheelchair racing glove of claim 14, wherein the surface features of the at least one frictional support member further comprises an anti-slip chemical coating.

16. The wheelchair racing glove of claim 14, wherein the at least one frictional support member comprises an outer covering configured to couple, cover, and enclose the bottom surface of the wheelchair racing glove.

17. The wheelchair racing glove of claim 1, wherein the main body further comprises an internal support system having a continuous pattern.

18. The wheelchair racing glove of claim 17, wherein the continuous pattern of the internal support system is configured to promote impact absorption and force transfer efficiency between the wheelchair racing glove and a wheelchair propulsion rail.

19. The wheelchair racing glove of claim 18, wherein the continuous pattern of the internal support system is configured to maintain structural rigidity and reduce overall weight of the wheelchair racing glove.

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