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Hinge

Abstract

A hinge includes a stainless steel pin rotatably connecting a glass filled nylon base section and a glass filled nylon rotating section by extending through a first lateral aperture of the glass filled nylon base section, a second lateral aperture of the glass filled nylon rotating section, and a third lateral aperture of the glass filled nylon base section. The glass filled nylon base section includes a right portion and a left portion fixed by a cross bar.

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Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS (1) The present application claims the benefit of U.S. Provisional Patent Application No. 63/402,788 filed Aug. 31, 2022, the entirety of which is incorporated herein by reference.

BACKGROUND

(1) The present disclosure generally relates to a hinge. Typically, a hinge is a mechanical device that rotatably connects two objects. A door hinge is one specific application of a hinge. Generally, a door hinge connects a door to the door frame, whereby the door is capable of rotating about an axis defined by the hinge that is perpendicular to the ground. The components and the structure of a hinge can be modified to fit various applications.

SUMMARY

(2) The present disclosure provides a new and innovative system, methods and apparatus for a hinge. In an example, a hinge includes a stainless steel pin rotatably connecting a glass filled nylon base section and a glass filled nylon rotating section by extending through a first lateral aperture of the glass filled nylon base section, a second lateral aperture of the glass filled nylon rotating section, and a third lateral aperture of the glass filled nylon base section. The glass filled nylon base section includes a right portion and a left portion fixed by a cross bar.

(3) In another example, the stainless steel pin defines a first axis, and the right portion and the left portion define a first plane. Further, the right portion comprises a fourth aperture and the left portion comprises a fifth aperture. Additionally, a third axis defined by the fourth aperture is parallel to a fourth axis defined by the fifth aperture. The third axis and the fourth axis are substantially perpendicular to the first axis.

(4) Additional features and advantages of the disclosed method and apparatus are described in, and will be apparent from, the following Detailed Description and the Figures. The features and advantages described herein are not all-inclusive and, in particular, many additional features and advantages will be apparent to one of ordinary skill in the art in view of the figures and description. Moreover, it should be noted that the language used in the specification has been principally

selected for readability and instructional purposes, and not to limit the scope of the inventive subject matter.

Description

BRIEF DESCRIPTION OF THE FIGURES

(1) FIGS. **1**A-**1**B are a hinge, according to various examples of the present disclosure;

(2) FIGS. **2**A-**2**C are a hinge, according to various examples of the present disclosure, applied to a rear door in the closed position;

(3) FIGS. **3**A-**3**B are a hinge, according to various examples of the present disclosure; and

(4) FIGS. **4**A-B are a hinge, according to various examples of the present disclosure, applied to a side door in the closed position.

(5) FIGS. **5**A-C are a hinge, according to various examples of the present disclosure.

DETAILED DESCRIPTION OF EXAMPLE EMBODIMENTS

(6) FIGS. **1**A and **1**B illustrate perspective views of a hinge, according to various examples of the present disclosure. The hinge **100** includes a stainless steel pin **102**, a glass filled nylon base section **104**, and a glass filled nylon rotating section **106**. The stainless steel pin **102** defines a first axis **108**. The glass filled nylon base section **104** includes a right portion **110** and a left portion **112** fixed by a cross bar **114**. The right portion **110** and the left portion **112** define a first plane. The right portion **110** includes a first lateral aperture **116** and a fourth aperture **118** defining a third axis **120**. The glass filled nylon rotating section **106** includes a second lateral aperture **123**. The left portion **112** includes a third lateral aperture **124** and a fifth aperture **126** defining a fourth axis **136**. A plurality of bolts **130** engage the fourth aperture **118** and the fifth aperture **126** to connect the glass filled nylon base section **104** to an anchor surface. The plurality of bolts **130** may be any number of bolts. In an example, as shown in FIG. **1**B, the plurality of bolts **130** are hex head bolts. Thus, during installation the hex head of the plurality of bolts **130** engage a respective hexagonal, complementary aperture **170**. When the plurality of bolts **130** engage their respective apertures **170**, the plurality of bolts **130** cannot be rotated, which allows a user to securely fasten a nut, for example, on the end of each bolt **130** without having to manually secure the bolt **130** from the opposite side. In FIG. **1**A, the stainless steel pin **102** rotatably connects the glass filled nylon base section **104** and the glass filled nylon rotating section **106**. Namely, the stainless steel pin **102** extends through the first lateral aperture **116**, the second lateral aperture **123**, and the third lateral aperture **124** such that the glass filled nylon rotating section **106** rotates about the first axis **108**.

(7) The glass filled nylon rotating section **106** of the hinge **100**, as depicted in FIG. **1**A, is in the closed position. In the closed position, the glass filled nylon rotating section **106** is located between the right portion **110** and the left portion **112** of the glass filled nylon base section **104**. The glass filled nylon rotating section **106** has a sixth aperture **134** and a seventh aperture **132**. Further, in the closed position, the sixth aperture **134** defines a fifth axis **138**, which is parallel to the fourth axis **136** and the third axis **120**. To transition to the open position, the glass filled nylon rotating section **106** rotates about the first axis **108** defined by the stainless steel pin **102**. Further, the stainless steel pin **102**, the glass filled nylon base section **104**, and the glass filled nylon rotating section **106** may be resistant to corrosion. In an example, hinges can be made from various materials, one of which is aluminum. Overtime, when exposed to the elements in an outdoor environment, aluminum may corrode, thereby preventing a hinge from properly rotating. In contrast, FIG. **1** depicts a hinge **100** including a glass filled nylon base section **104** and a glass filled nylon rotating section **106** connected by a stainless steel pin **102**. Glass filled nylon and stainless steel may prevent the hinge **100** from corroding over time, which may increase the lifetime of the hinge.

(8) FIG. **2**A is a rear door hinge and a side door hinge, according to various examples of the present disclosure, applied to a vehicle canopy in the closed position. The rear door hinges **272** allows a

user to rotate the rear door **240** to an open position. The side door hinges **274** allow a user to rotate the side door **260** to an opened position. In an example embodiment, the vehicle canopy **278** may include mechanical components that fix the rear door **240** and the side door **260** in the open position. FIG. **2**B is an exploded view of a hinge from FIG. **2**A (e.g., rear door hinge), according to various examples of the present disclosure, applied to a rear door in the closed position. To effectively show the hinge **200** in the closed position, the rear door **240** (shown in FIG. **2**A) is transparent in FIG. **2**B. The hinge **200** includes the stainless steel pin **202**, the glass filled nylon base section **204**, and the glass filled nylon rotating section **206**. As depicted in FIG. **2**B, the glass filled nylon base section **204** abuts and is mounted to an anchor surface **250**. In an example, the anchor surface **250** can be a frame of the vehicle canopy **278**. In FIG. **2**B, a first button head bolt **242** and a second button head bolt **244** extend through the glass filled nylon rotating section **206** and through a rear door **240** to engage a first nyloc nut **246** and a second nyloc nut **248**, respectively. Therefore, the first button head bolt **242** and the second button head bolt **244** connect the glass filled nylon rotating section **206** to the rear door **240**. In an example, a user rotates the rear door **240**, which rotates the glass filled nylon rotating section **206** about the stainless steel pin **202**.

(9) The hinge **200** may be used in various applications. In an example, the hinge **200** may rotatably connect a door or panel to a number of anchor surfaces. Some examples may include the use of the hinge **200** to connect a panel to a vehicle frame, a door to a door frame, or a gate to a fence. Further, the hinge **200** may be used on any suitable material or combination of materials. Examples may include various metals, wood, glass, plastic, or composite.

(10) Before using the hinge **200**, a user may be required to manually install the hinge **200** for their desired application. In an example, the user may use the hinge **200** to secure a rear door **240** to the anchor surface **250**. In FIG. **2**B, the anchor surface **250** is the frame of a vehicle canopy **278**. The anchor surface **250** includes a lip portion **280** and a roof portion **282**. However, in a number of applications, a user may have limited space for installing a typical hinge. For example, as shown in FIG. **2**A, the entire anchor surface **250** and the rear door **240** are not completely coplanar. Instead, the anchor surface **250** is substantially coplanar for a small length, for example, 1 to 2 inches with the lip portion **280**. After the lip portion **280**, the anchor surface **250** is angled. In FIG. **2**A, the rear door **240** and the roof portion **282** of the anchor surface **250** may define an angle that is closer to 90 degrees, and less than 135 degrees. Thus, when installing a typical hinge on the rear door **240** and the anchor surface **250**, a user would be constrained in the amount of overhead space available. For example, a user at an interior side of the vehicle canopy **278** may need to secure the plurality of bolts that extend through rear door **240**, through the hinge **272** with a nut between the roof portion **282** and the hinge **272** causing space constraints. Further, a space constrained environment in the installation process may cause assembly issues or increase assembly costs.

(11) As shown in FIGS. **2**B and **2**C, by using the first button head bolt **242** and the second button head bolt **244**, a user may assemble the hinge **200** from one side. For example, a user may partially assembly the hinge **200** with the stainless steel pin **202**, the glass filled nylon base section **204**, and the glass filled nylon rotating section **206**. First, a user may extend the first button head bolt **242** and the second button head bolt **244** through the glass filled nylon rotating section **206**. Then, a user may advantageously secure the hinge **200** to the rear door **240** by locking the first button head bolt **242** and the second button head bolt **244** into place with the first nyloc nut **246** and a second nyloc nut **248**, respectively. Thus, the hinge **200** will be secured to the rear door **240**. The hinge **200** and rear door **240** combination can then be attached to the anchor surface **250**. Namely, the bolts that extend through the glass filled nylon base section **204** may extend through the anchor surface **250**. The user then can complete the assembly process on a single side of the hinge **200** in the overhead space by securing the bolts **230** to the anchor surface **240** with a first and second nut (not illustrated). The following single side installation of the hinge **200** may be preferred over securing the hinge **200** from multiple sides in a space constrained environment where the rear door **240** extends, after a few inches (or less) of overhead space, away from the anchor surface **250**, not at

approximately 180 degrees, but rather, at closer to 90 degrees. Thus, the connection of the first button head bolt **242** and the second button head bolt **244** to the rear door **240** before the connection to the anchor surface **250** may provide an efficient assembly process by advantageously enabling final tightening or securing of the nuts (not illustrated) on bolts **230** and button head bolts **242**, **244** in constrained space all from one side of the hinge **200** without any manipulation of components on the other side of the hinge **200**.

(12) FIG. **3**A is a hinge, according to various examples of the present disclosure. The hinge **300** includes a stainless steel pin **302**, a glass filled nylon base section **304**, and a glass filled nylon rotating section **306** having a sixth aperture **334** and a seventh aperture **332**. The hinge **300** may share some of the same features as hinge **100** depicted in FIG. **1**, and for ease of understanding, like terminology (e.g., numbering, reference numerals) may be used herein across various Figures in the present application. For example, the hinge **300** may include the same stainless steel pin **302** and the glass filled nylon rotating section **306**. Further, the same stainless steel pin **302** may rotatably fix the glass filled nylon base section **304** and the glass filled nylon rotating as previously explained.

(13) The glass filled nylon rotating section **306** may further include a first portion **352** and a second portion **354**. The first portion **352** and the second portion **354** meet at an approximately 90 degree angle. In another example, the first portion **352** and the second portion **354** may meet at a number of angles for the specific application. Further, the first portion **352** defines a second plane and the second portion **354** defines a third plane. The hinge **300** may be used to rotatably connect an anchor surface to a side door.

(14) For example, in FIG. **4**A, an anchor surface may be a frame of a vehicle canopy and the side door **460** may be a side panel that rotates upward, thereby creating an open window on the vehicle canopy (e.g., as in FIG. **2**A). In the closed position, the hinge **400** can connect a side door **460** to a vehicle canopy frame where the connection point **466** of the side door **460** and the vehicle canopy frame **468** are not coplanar. Rather, the connection point **466** of the side door **460** and the vehicle canopy frame **468** would meet, if extended, at an acute angle. The hinge **400** includes the first portion **452** and the second portion **454** to accommodate the connection point **466** of the side door **460** and the vehicle canopy frame **468**. In an example, the glass filled nylon base section **404** abuts and mounts to the vehicle canopy frame **468** substantially perpendicular to the ground. The first portion **452** of the glass filled nylon rotating section **406** extends from the glass filled nylon base section **404**. The second portion **454** of the glass filled nylon rotating section **406** extends from the first portion **452** in an approximately 90 degree angle such that the first button head bolt **442** and the second button head bolt **444** may extend through the second portion **454** and engage the side door **460** at a non-coplanar angle with the anchor surface.

(15) In FIG. **4**A, a third axis, a fourth axis, and a fifth axis analogously correspond to the third axis **120**, the fourth axis **136**, and the fifth axis **138** in FIG. **1**A. The hinge **400** rotatably connects a side door **460** to an anchor surface **450**. In the close position, a plane of the first portion **454** and a plane of the second section are diagonal and non-perpendicular to a plane of the glass filled nylon base section **404**. Thus, the first portion **452**, the second portion **454**, and the glass filled nylon base section **404** do not share a plane in the closed position, and may not share any parallel planes. Further, the fifth axis **138** is not parallel to the third axis **120** or the fourth axis **136** in the closed position. To transition the hinge **400** to an opened position, a user may rotate that side door **460**, thereby rotating the glass filled nylon rotating section **406** in the direction of arrow labeled **462**.

(16) In an example, the user may use the hinge **400** to secure a side door **460** to the anchor surface **450**. In FIG. **4**A, the anchor surface **450** is the frame of a vehicle canopy. To address space constraints, the hinge **400** may be installed from a single side. Namely, in FIG. **4**B, a user may first secure the hinge **400** to a side door **460**. To secure the hinge **400** to the side door **460**, a user may extend the first button head bolt **442** and the second button head bolt **444** through the glass filled nylon rotating section **406**. Then, a user may advantageously secure the hinge **400** to the side door

460 by locking the first button head bolt **442** and the second button head bolt **444** into place with the first nyloc nut **446** and a second nyloc nut **448**, respectively. Thus, the hinge **400** will be secured to the side door **460**. The hinge **400** and rear door **460** combination can then be attached, in FIG. **4**A, to the anchor surface **450** via the vehicle canopy frame **468**. The user then can complete the assembly process on a single side of the hinge **400** in the overhead space by securing the bolts **430** to the anchor surface **450** with a first nut **484**. Further, application of the first nut **484** would secure the hinge **400** to the anchor surface **450** because the complementary aperture of the hex head bolt prevents the bolt from rotating, allowing a user to tighten a first nut **484** without securing the opposite side of the bolt **430**. The installation process provided may be advantageously for assembly and, based on the one sides installation, wrenches and other tools (e.g., Allen wrench) may be suitable for use.

(17) FIG. **5**A is a perspective view of a hinge, according to various examples of the present disclosure. The hinge **500** includes a ridge **574**. The ridge **574** acts as a support structure and may improve the rigidity and structural integrity of the hinge **500**. The ridge **574** is also illustrated in FIG. **5**B and FIG. **5**C. Further, as shown in FIG. **5**C, the glass filled nylon base section **504** will contact the ridge **574**, thereby preventing over rotation beyond a desired closing position. The hinge **500** also includes a first notch **570** and a second notch **572**. As shown in FIG. **5**B, the first notch **570** and the second notch **572** are located on the first portion **552** of the hinge **500**. By providing the first notch **570** and the second notch **572**, the thickness of the first portion **552** can be increased while maintaining accessibility of the first button head bolt **542** and the second button head bolt **544**. Similar to the ridge **574**, the first notch **570** and the second notch **572** provides additional rigidity and structural integrity by increasing the thickness of the first portion **552** of the hinge **500**.

(18) Although the hinge has been described in certain specific aspects, many additional modifications and variations would be apparent to those skilled in the art. In particular, any of the various processes described above can be performed in alternative sequences and/or in parallel in order to achieve similar results in a manner that is more appropriate to the requirements of a specific application. It is therefore to be understood that the present disclosure can be practiced otherwise than specifically described without departing from the scope and spirit of the present embodiments. Thus, embodiments of the present disclosure should be considered in all respects as illustrative and not restrictive. It will be evident to the annotator skilled in the art to freely combine several or all of the embodiments discussed here as deemed suitable for a specific application of the invention. Throughout this disclosure, terms like “advantageous”, “exemplary” or “preferred” indicate elements or dimensions which are particularly suitable (but not essential) to the invention or an embodiment thereof, and may be modified wherever deemed suitable by the skilled annotator, except where expressly required. Accordingly, the scope of the invention should be determined not by the embodiments illustrated, but by the appended claims and their equivalents.

Claims

1. A hinge comprising: a stainless steel pin rotatably connecting a glass filled nylon base section and a glass filled nylon rotating section by extending through a first lateral aperture of the glass filled nylon base section, a second lateral aperture of the glass filled nylon rotating section, and a third lateral aperture of the glass filled nylon base section, wherein the glass filled nylon base section comprises a right portion and a left portion fixed by a cross bar, the right portion, the left portion, and the cross bar forming a first plane, wherein the rotating section comprises: a first portion and a second portion configured to meet at an approximately 90 degree angle, and a triangular support structure comprising a first edge contacting the first portion, a second edge contacting the second portion, and a third edge extending diagonally between the first portion and the second portion, the third edge configured to contact the cross bar of the glass filled nylon base

section when the hinge is in a closed position.

2. The hinge of claim 1, wherein the first portion defines a second plane and the second portion defines a third plane, and wherein the second plane and the third plane are diagonal to the first plane in the closed position.

3. The hinge of claim 1, wherein the rotating section comprises a bolt aperture located on the second portion.