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Gate hinge

Abstract

Gate hinges include an anchor shaft defining a shaft axis that extends between a first end and a second end. A first support arm is arranged at a position closer to the first end than the second end and extends in a direction normal to the shaft axis from the anchor shaft and a second support arm is arranged at the same axial position as the first support arm along the anchor shaft and extends in a direction opposite the first support arm. The anchor shaft includes a first thread and a second, self-tapping thread. The first thread is arranged along the anchor shaft for an axial length between the first and second support arms and the second thread and the second thread extends axially from the first thread to a tip of the anchor shaft at the second end.

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Background/Summary

BACKGROUND

(1) The subject matter disclosed herein generally relates to gate hinges and, more particularly, to gate hinges for supporting swinging gates and the like with improved installation thereof.

(2) Gates, and in particular gates used with fencing to provide access to a field or enclosure are well-known, it being typically desired to have the gate level to preserve the swinging function of the gate (e.g., avoid dragging the gate on the ground). Two hinges (e.g., upper and lower hinges) are typically used to support the gate on a support post and enable the gate to swing relative to the support post. Conventionally, a hinge is provided with a gate or other swinging structure and enables adjustment of the orientation of the gate in at least two different gate positions (e.g., open & closed). Gate hinges are designed to ensure that the gate remains level in the closed position and is able to be opened from the closed position. Some gate hinges are designed to allow for the gate to be raised or lowered at an end opposite the hinge during swinging. The hinges and/or the support posts may move out of alignment over time, such as due to listing in soil, loosening of fasteners or engagement between a hinge and a support post, or the like. Accordingly, improved gate hinges are desirable to increase operational life and ease of use.

SUMMARY

(3) According to some embodiments, a gate hinge includes an anchor shaft defining a shaft axis that extends between a first end and a second end, a first support arm arranged at a position closer to the first end than the second end, wherein the first support arm extends in a direction normal to the shaft axis from the anchor shaft, and a second support arm arranged at a same axial position as the first support arm along the anchor shaft and extends in a direction opposite the first support arm. The anchor shaft includes a first thread and a second thread, wherein the second thread is formed on the anchor shaft and extends to the second end of the anchor shaft, wherein the first thread is formed along the anchor shaft for at least a portion of an axial length between the first and second support arms and the second thread, and the second thread extends axially from the first thread to a tip of the anchor shaft, and wherein the second thread comprises a self-tapping thread.

(4) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the first thread has a thread pitch that is greater than a thread pitch of the second thread.

(5) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the anchor shaft comprises an intermediate portion extending from a junction between the first and second support arms and the anchor shaft to an end portion.

(6) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the first thread is arranged on the intermediate portion and the second thread is arranged on the end portion.

(7) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the intermediate portion comprises an unthreaded section and the first thread, wherein the unthreaded section is arranged between the junction and the first thread.

(8) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the end portion comprises a tapering section that ends at the tip.

(9) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the tapering portion includes at least a portion of the second thread.

(10) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include a seat at a base of each of the first support arm and the second support arm, wherein the base is defined where the respective support arm joins the anchor

shaft.
(11) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that each seat is integrally formed with the material of the respective support arm and the anchor shaft.
(12) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that each seat is a separate element installed to the respective support arm.
(13) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include a pin hole arranged at a distal end of each of the first support arm and the second support arm.
(14) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the anchor shaft continuously tapers from a base of the first and second support arms to the tip.
(15) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that first end comprises a tool-engagement feature and the second end comprises a post-engagement feature.
(16) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the tool-engagement feature comprises a tool head.
(17) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the tool-engagement feature comprises a recess formed in the first end.
(18) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the post-engagement feature comprises the second thread, and wherein the second thread is a self-tapping thread.
(19) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the anchor shaft comprises a section of uniform diameter and a section that tapers to the tip.
(20) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the anchor shaft is formed from chromium vanadium steel.
(21) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include a tool head at the first end, wherein the tool head extends axially in a direction away from the first and second support arms and opposite the tip.
(22) In addition to one or more of the features described herein, or as an alternative, further embodiments of the gate hinge may include that the first thread and the second thread have equal axial lengths along the anchor shaft.
(23) The foregoing features and elements may be combined in various combinations without exclusivity, unless expressly indicated otherwise. These features and elements as well as the operation thereof will become more apparent in light of the following description and the accompanying drawings. It should be understood, however, that the following description and drawings are intended to be illustrative and explanatory in nature and non-limiting.

Description

BRIEF DESCRIPTION OF THE DRAWINGS
(1) The subject matter is particularly pointed out and distinctly claimed at the conclusion of the specification. The foregoing and other features, and advantages of the present disclosure are apparent from the following detailed description taken in conjunction with the accompanying drawings in which:

(2) FIG. **1**A is a schematic illustration of a gate system, shown in a closed state, that may incorporate embodiments of the present disclosure;
(3) FIG. **1**B is a schematic illustration of the gate system of FIG. **1**A, shown in an open state;
(4) FIG. **2** is a schematic illustration of a gate hinge in accordance with an embodiment of the present disclosure;
(5) FIG. **3** is a schematic illustration of a gate hinge in accordance with another embodiment of the present disclosure;
(6) FIG. **4** is a schematic illustration of a gate supported on a post using a gate hinge in accordance with an embodiment of the present disclosure; and
(7) FIG. **5** is a schematic illustration of a gate hinge in accordance with another embodiment of the present disclosure.

DETAILED DESCRIPTION

(8) Referring to FIGS. **1**A-**1**B, schematic illustrations of a gate system **100** that may incorporate embodiments of the present disclosure are shown. The gate system **100** includes a gate **102** that is hingedly supported on a first post **104** at a first end **106** and has a free second end **108** that may selectively attach to a second post **110**. The first post **104** and the second post **110** may be part of a fence **112** Although shown in FIGS. **1**A-**1**B as a fence **112**, it will be appreciated that the gate system **100** may be incorporated into other structures, such as at the opening of a building (e.g., barn or the like) or other type of wall. Further, in some configurations, the gate system **100** may be provided independent from the fence **112** or other similar structures, and thus may be a free-standing gate.
(9) The gate **102** of the gate system **100** is supported on the first post **104** by a first hinge **114** and a second hinge **116**. The hinges **114**, **116** of the gate system **100** may be substantially the same or may be configured with different features or functionality, depending on the specific configuration of the gate system **100**, as will be appreciated by those of skill in the art. The gate **102** is rotationally supported on the first post **104** and can be moved or swung from a first position (e.g., closed position) indicated by line **118** in FIG. **1**B and a second position (e.g., open position) indicated by line **120** in FIG. **1**B. The gate **102** may be swung through an angle **122**, illustrated in FIG. **1**B, between the first position **118** and the second position **120**. At the second end **108** of the gate **102**, a securing mechanism **124** may optionally be provided to secure the gate **102** in the closed position **118** (e.g., as shown in FIG. **1**A).
(10) The hinges **114**, **116** may be securely attached to the first post **104** by various mechanisms, as will be appreciated by those of skill in the art. In some configurations, the hinges **114**, **116** are engaged with the first post **104** through a threaded connection between a portion of the respective hinge **114**, **116** and the first post **104**. In some configurations, and in accordance with some embodiments of the present disclosure, the hinges **114**, **116** may threadedly screw into the material of the first post **104**.
(11) For example, in accordance with some non-limiting embodiments of the present disclosure, easy install self-tapping gate hinges are provided. The gate hinges may include a dual-sided gate hinge body having two support arms. In accordance with some embodiments, gate hinges of the present disclosure may have an anchor shaft or body and the two support arms extend therefrom in a substantially “t” or “T” shape. The anchor shaft or body may include features for engaging and securing to a support post, such as a threaded feature, a self-tapping feature, or the like. The support arms of the gate hinge provide a shaft or structure on to which a portion of the gate may be placed. With the gate installed over one of the support arm, a locking pin (e.g., cotter pin) may be passed through a locking aperture of the gate hinge support arm and a locking aperture of the gate to provide a secured connection therebetween (e.g., to prevent the gate from dislodging from the gate hinge). For example, each hinge support arm may include a single hole approximately ¼ inch from a top side of the respective support arm. These holes are for the locking pin to pass through an prevent the gate from being inadvertently knocked off the hinge.

(12) As noted, the gate hinge may have an anchor shaft or body from which the support arms extend. At one end of the anchor shaft is a post-engagement end and at the opposite end is a tool-engagement end. The post-engagement end may include threading of the like for installing the gate hinge to a support post. The tool-engagement end may include features to engage with a tool or the like for installing the gate hinge to the support post, uninstalling the gate hinge from the support post, and/or adjusting the gate hinge after installation. In accordance with some embodiments, a center of the tool-engagement end (along an axis there through) may include a recess, depression, slot, hole or the like. The recess can provide access for a driver tool to be used to set, screw, and/or unscrew the anchor shaft into the support post. In some embodiments, at a junction between the support arms and the anchor shaft, a seat may be provided for receiving and supporting a portion of the gate, such as a bracket or sleeve.

(13) Referring now to FIG. **2**, a schematic illustration of a gate hinge **200** in accordance with an embodiment of the present disclosure is shown. The gate hinge **200** may be used in the gate system **100** of FIGS. **1**A-**1**B and may be used for the hinges **114**, **116** illustrated therein. The gate hinge **200** is configured to be installed into a support post or the like and includes features for biting into and securing to material of the support post (e.g., a wooden post or the like). The gate hinge **200** includes an anchor shaft **202**, a first support arm **204**, and a second support arm **206**. The anchor shaft **202** may be a solid body structure (e.g., not hollow) and extends in an axial direction between a tool-engagement end **208** and a post-engagement end **210** and defines a shaft axis **212**. The first support arm **204** extends in a direction normal to the shaft axis **212** and at a position closer to the tool-engagement end **208** than the post-engagement end **210**. The second support arm **206** extends in a direction normal to the shaft axis **212** form a position along the shaft axis **212** that is axial the same as the first support arm **204** and opposite therefrom. As a result, the gate hinge **200** has a substantially “t” or “T” shape, as shown.

(14) The tool-engagement end **208** of the gate hinge **200** includes a tool head **218**. The tool head **218** is a structure for receiving and engaging with a tool for installation, removal, and/or adjustment of the gate hinge **200** with respect to a support post or the like. In this illustrative configuration, the tool head **218** extends away from the junction with the support arms **204**, **206**. The tool head **218**, as shown, may be a hex-type bolt head that may be engaged with a ratchet tool, a wrench, or the like. In this configuration, the tool head **218** is a positive structure of material at the tool-engagement end **208**. In other embodiments, the tool head **218** may be arranged as a recess, depression, or hole at the tool-engagement end **208** for receiving a tool therein (e.g., a screwdriver, hex key, etc.). When the tool-engagement end **208** is engaged by an appropriate tool, the gate hinge **200** may be rotated about the shaft axis **212**.

(15) As shown, the first support arm **204** includes a respective pin hole **214** at a distal end thereof. Similarly, the second support arm **206** includes a respective pin hole **216** at a distal end thereof. The distal ends of the support arms **204**, **206** are ends of the support arms **204**, **206** and a base of the respective the support arms **204**, **206** is defined at the joining or junction with the anchor shaft **202**. The pin holes **214**, **216** are provided to receive a locking pin (e.g., cotter pin) when a portion a portion of a gate is arranged over the respective support arm **204**, **206**. When the gate is installed on the respective support arm **204**, **206**, a hole or aperture in the structure of the gate may align with the respective pin hole **214**, **216** and thus the two structures may be secured together. Each support arm **204**, **206** may be substantially the same, and extend a length **220** from the anchor shaft **202**. The length **220** may be, for example, and without limitation, between 1 and 5 inches, or, in some embodiments, between 1.5 and 2 inches in length. The pin holes **214**, **216** may be arranged generally centrally on the respective support arms **204**, **206**. The support arms **204**, **206** may be cylindrical in shape and have an axis therethrough that is normal to the shaft axis **212**. In one non-limiting embodiment, the support arms **204**, **206** may have a diameter of ⅝ inch, and the respective pin holes **214**, **216** may be ⅛-inch holes.

(16) As shown, an optional seat **224**, **226** may be arranged at a base or junction between the

respective support arms **204**, **206** and the anchor shaft **202**. That is, the base of the support arms **204**, **206** is defined where the support arms **204**, **206** extend outward from the anchor shaft **202**. The seats **224**, **226** may be integrally formed with the material of the gate hinge **200** (e.g., may be welds or the like) or may be separate structures installed to the base of each support arm **204**, **206**. In some embodiments, the seats **224**, **226** may be formed of a material different from the rest of the gate hinge **200**, such as from a plastic, rubber, metal, or the like. The seats **224**, **226** may provide a surface or structure to which a portion of a gate may rest and contact when installed to the gate hinge **200**. The seats **224**, **226** may be arranged to extend along an axial length of the respective support arms **204**, **206** a distance that is greater than a length or extent of the tool head **218** in the same direction. That is, the seats **224**, **226** may provide a contact surface for a portion of a received gate and the length and/or position of the seats may be set to prevent the tool head **218** from interfering with operation (e.g., opening and closing) of a gate supported on the gate hinge **200**.

(17) As shown, the anchor shaft **202** of the gate hinge **200** may be defined as having an intermediate portion **228** and an end portion **230**. The intermediate portion **228** may have a substantially uniform diameter that extends from the base of the support arms **204**, **206** toward the post-engagement end **210**. The end portion **230** extends from the intermediate portion **228** to a tip **232** at an end of the gate hinge **200** at the post-engagement end **210** thereof.

(18) The intermediate portion **228** includes a first thread **234**. The first thread **234** has an axial length **236**. That is, the first thread **234** may extend for an axial distance along the anchor shaft **202** for the axial length **236**. In accordance with some embodiments, the axial length **236** of the first thread **234** may be a length less than an axial length of the intermediate portion **228**, and thus the intermediate portion **228** may include a threaded portion defined by the first thread **234** and an unthreaded portion that is between the first thread **234** and the base of the support arms **204**, **206**. In other embodiments, the axial length **236** of the first thread **234** may be equal to a full axial length of the intermediate portion **228** (i.e., extend from the base of the support arms **204**, **206** to the end portion **230**).

(19) The end portion **230** extends from the intermediate portion **228** to the tip **232**. The end portion **230** includes a second thread **238** that extends to the tip **232**. The end portion **230** may be defined in two sections, with a first section **240** having a uniform size (e.g., diameter) along the axial length thereof and a second section **242** that tapers from an end of the first section **240** to the tip **232**. The second thread **238** may be provided on both the first section **240** and the second section **242** and extend to the tip **232**.

(20) In accordance with some embodiments of the present disclosure, the first thread **234** and the second thread **238** may be configured with different properties. For example, the first thread **234** may have a relatively coarse threading (e.g., ⅛-inch thread pitch) and the second thread **238** may have a relatively fine threading (e.g., 1/16-inch thread pitch). That is, the first thread **234** may have a thread spacing or thread pitch that is greater than a thread spacing or thread pitch of the second thread **238**. Stated another way, in accordance with some embodiments, the first thread **234** may have fewer threads per inch than the second thread **238**. Thread pitch is the distance between corresponding points on adjacent threads along an axis of the threaded body.

(21) In some configurations, the second thread **238** may define a self-tapping thread. A self-tapping thread (or screw) is a structure that can tap its own hole as it is driven into a material, such as a support post or the like (e.g., first post **104** shown in FIGS. **1**A-**1**B). The self-tapping thread is a type of thread-cutting arrangement intended to produce a thread in relatively soft material or sheet materials. In other embodiments, the second thread **238** may define the structure of a self-drilling screw or a thread rolling screw. The relatively fine threading of the second thread **238** is selected to perform a self-tapping function and start the threading of the gate hinge **200** into a post or other structure. Once the threading is started and the gate hinge **200** enters the post or other structure, the relatively coarser first thread **234** provides threaded engagement with the material to hold and secure the gate hinge **200** in the post or other structure. The increase in thread size or spacing of the

first thread **234** relative to the second thread **238** may be set to ensure that the anchor shaft **202** is held securely in the post or structure and does not disengage from the post or structure (e.g., slide out).

(22) During installation, a user may place the tip **232** into contact with a surface of a support post or the like. The user can then drive the gate hinge **200** into the material of the support post. The second thread **238** will bite into the material of the support post. A user may use a tool to engage with the tool head **218** and rotate the gate hinge **200** about the shaft axis **212**. The second thread **238** will enter into the material of the support post first, followed by the first thread **234** which may be rotationally driven by a tool engaged with the tool head **218**. When fully installed, one of the support arms **204**, **206** will be oriented upward and parallel with a direction of the support post. The other of the support arms **204**, **206** will be oriented 180 degrees opposite the upward facing support arm **204**, **206**. In some embodiments, a portion **244** of the intermediate portion **228** may be unthreaded (e.g., unthreaded section) and may provide for a gap between the supports arms **204**, **206** and the material of the support post, such that the support arms **204**, **206** do not contact the support post. The resulting gap allows for a portion of a gate (e.g., sleeve or bracket) to fit over the upward facing support arm **204**, **206** without contacting the support post.

(23) In one non-limiting example of a gate hinge in accordance with the present disclosure, the gate hinge **200** may have a length **220** of the support arms **204**, **206** of about 2 inches with a diameter of about ⅝ inch. In some embodiments, the anchor shaft **202** may have a diameter of about ⅝ inch for the length of the anchor shaft **202** from the tool head **218** to the beginning of the tapering second section **242** of the end portion **230**. In other embodiments, the anchor shaft **202** may have a variable diameter, with the intermediate portion **228** having a diameter of ⅝ inch at a maximum and ⅜ inch at a minimum, with a narrowing tapering extending in a direction from the tool-engagement end **208** toward the post-engagement end **210**. In some non-limiting embodiments, the combined axial length of the first thread **234** and the first section **240** of the end portion **230** may be about 3 inches. In such a configuration, the axial length **236** of the first thread **234** along the anchor shaft **202** may be 1 inch and the axial length of the first section **240** of the end portion **230** may be about 2 inches. Furthermore, in some embodiments, the axial length of the end portion **230** may be about 3 inches, and in such configurations, the first section **240** and the second section **242** may each be about 1.5 inches. The tapering portion of the second section **242** may taper from a diameter of about ⅜ inch at the first portion **240** and taper to about 1/16 inch at the tip **232**.

(24) In accordance with non-limiting embodiments of the present disclosure, the gates hinges described herein may be formed from a variety of materials. For example, and without limitation, the gate hinges may be made from various metals and/or composite materials. In accordance with a non-limiting embodiment, the entirety of the gate hinge may be made from chromium vanadium steel, which can provide for high torque resistance. Such high torque resistance can withstand the resistance and high torques produced by high impact torque tools and the like. Other high torque resistant materials may be used, such as steel, steel alloys, iron, and the like. Further, in some embodiments, depending on the specific application, the gate hinges may be formed from high strength composite materials or the like.

(25) Referring now to FIG. **3**, a schematic illustration of a gate hinge **300** in accordance with an embodiment of the present disclosure is shown. The gate hinge **300** may be used in the gate system **100** of FIGS. **1**A-**1**B and may be used for the hinges **114**, **116** illustrated therein. The gate hinge **300** is configured similarly to that shown and described above with respect to FIG. **2**, and thus similar features may not be shown or described for simplicity and ease of explanation. The gate hinge **300** includes an anchor shaft **302**, a first support arm **304**, and a second support arm **306**. The anchor shaft **302** extends in an axial direction between a tool-engagement end **308** and a post-engagement end **310**. The anchor shaft **302** includes a first thread **312** and a second thread **314**, similar to that shown and described above. That is, the first thread **312** may have a relatively coarse threading and the second thread **314** may be a self-tapping thread.

(26) In this illustration, the gate hinge **300** includes a tool head **316** at the tool-engagement end **308**. Rather than the positive feature of FIG. **2**, the gate hinge **300** includes a tool head **316** having a recess **318** that is configured to receive a tool. The recess **318** may be sized and shaped to receive a screwdriver head, a hex key, or the like. It will be appreciated that in some embodiments, the tool head may have both positive (e.g., as shown in FIG. **2**) and negative (e.g., as shown in FIG. **3**) features, such that multiple different tools may be useable with the gate hinge.

(27) Referring now to FIG. **4**, a schematic illustration of a portion of a gate system **400** in accordance with an embodiment of the present disclosure is shown. The gate system **400** includes a gate **402** that is hingedly supported on a post **404**, similar to that shown in FIGS. **1**A-**1**B. The gate **402** is rotationally mounted or supported on the post **404** by a first gate hinge **406***a* and a second gate hinge **406***b*. The gate hinges **406***a*, **406***b* may be similar to the above-described embodiments, having a dual-threaded configuration (e.g., coarse threads and self-tapping threads) on respective anchor shafts **408***a*, **408***b*. The gate hinges **406***a*, **406***b* include respective first support arms **410***a*, **410***b* and respective second support arms **412***a*, **412***b* extending in opposite directions from the respective anchor shaft **408***a*, **408***b*.

(28) As shown, the gate **402** includes a first gate mount **414***a* and a second gate mount **414***b*. The first gate mount **414***a* and the second gate mount **414***b* have different geometric and structural configurations, but both configurations are able to be used with the gate hinges **406***a*, **406***b*, and other gate hinges as shown and described herein. The first gate mount **414***a* may be a substantially linear extension or structure that extends from the gate **402** toward the post **404**. The first gate mount **414***a* may have a central through hole or aperture that may be fit over the first support arm **410***a* of the first gate hinge **406***a* and may be supported thereon. The second gate hinge **414***b* has a tubular configuration or sleeve-like structure that fits over the first support arm **410***b* of the second gate hinge **406***b*.

(29) A portion of the first gate mount **414***a* may fit over the first support arm **410***a* of the first gate hinge **406***a* such that an end of the first support arm **410***a* of the first gate hinge **406***a* extends through or above the first gate mount **414***a*. In this configuration, the first gate mount **414***a* rests on a first seat **416***a* of the first gate hinge **406***a* such that during operation (e.g., rotation) of the gate **402**, a tool end or tool head of the first gate hinge **406***a* does not interfere with the rotation thereof. In this configuration, the first support arm **410***a* includes a respective first pin hole **418***a* for receiving a pin, such as a locking pin or cotter pin.

(30) With respect to the second gate hinge **406***b*, an end of the second gate mount **414***b* is bent such that a portion of the second gate mount **414***b* may slide over and enclose the first support arm **410***b* of the second gate hinge **406***b*. As shown, the second gate mount **414***b* may rest on a respective second seat **416***b* of the first support arm **410***b* of the second gate hinge **406***b*. A locking pin, cotter pin, or the like may be installed through a first pin hole **418***b* of the second support arm **410***b* for use with a gate mount having a configuration similar to the first gate mount **414***a*. In the configuration of the second gate hinge **406***b*, the seat **416***b* may, optionally, be omitted from the second gate hinge **406***b* because the curved or bent structure of the second gate mount **414***b* will not interact with a tool head or tool end of the second gate hinge **406***b*.

(31) Referring now to FIG. **5**, a schematic illustration of a gate hinge **500** in accordance with an embodiment of the present disclosure is shown. The gate hinge **500** may be used in the gate system **100** of FIGS. **1**A-**1**B and may be used for the hinges **114**, **116** illustrated therein. The gate hinge **500** is configured similarly to that shown and described above with respect to FIGS. **2-3**, and thus similar features may not be shown or described for simplicity and ease of explanation. The gate hinge **500** includes an anchor shaft **502**, a first support arm **504**, and a second support arm **506**. The anchor shaft **502** extends in an axial direction between a tool-engagement end **508** and a post-engagement end **510**. The anchor shaft **502** includes a first thread **512** and a second thread **514**, similar to that shown and described above. That is, the first thread **512** may have a relatively coarse threading and the second thread **514** may be a self-tapping thread. In this configuration, the anchor

shaft **502** has a continuous taper or continuously tapers from a junction with the support arms **504**, **506** to a tip **516** of the post-engagement end **510**. That is, in this embodiment, the anchor shaft **502** does not include a substantially cylindrical portion, but rather is substantially conical for the axial length thereof. Further, in this embodiment, separate seat structures or elements are not provided, but rather seats **518** are defined at the intersection of the material of the support arms **504**, **506** with the anchor shaft **502**. Furthermore, in this embodiment, the tool-engagement end **508** does not extend axially from the anchor shaft **502** beyond the support arms **504**, **506**. In this configuration, the tool-engagement end **508** includes a recess **520** that is configured to receive a tool, similar to the configuration described with respect to FIG. **3**.

(32) In view of the above, it will be appreciated that the gate hinges described herein may incorporate various features to improve use of gates and mounting and supporting gates to a support post. The gate hinges described herein may include a dual-support arm configuration such that the gate hinge structure can balance forces applied thereto during installation and use. Furthermore, inclusion of a tool-engagement end improves installation operations by allowing for a tool to be used to fully install the gate hinge into a post or the like. Additionally, advantageously, by including a self-tapping feature in the threads of the gate hinge, installation may become easier to perform. It will further be appreciated that the structures, features, and aspects of the different illustrated embodiments may be combined with each other (e.g., between different embodiments) to form a gate hinge structure that is not explicitly shown and described but incorporates features from one or more of the disclosed configurations. For example, and without limitation, in some embodiments, the tool-engagement end **508** having the recess **520** shown in FIG. **5** may be implemented with the other features and structures of the embodiment shown in FIG. **2**. In such a configurations, the tool head **218** may be incorporated into the material of the region where the anchor shaft **202** ends at a top side that is level with a top surface of the support arms **204**, **206**. In such a configuration, the tool head **218** may be a recessed feature similar to that shown in FIG. **5**, and a portion of the anchor shaft **202** may not extend beyond such point. In some such configurations, the seats (e.g., seats **224**, **226**) may be omitted. Other combinations of features and structures may be interchanged or included without departing from the scope of the present disclosure.

(33) The use of the terms “a”, “an”, “the”, and similar references in the context of description (especially in the context of the following claims) are to be construed to cover both the singular and the plural, unless otherwise indicated herein or specifically contradicted by context. The modifier “about” used in connection with a quantity is inclusive of the stated value and has the meaning dictated by the context (e.g., it includes the degree of error associated with measurement of the particular quantity). All ranges disclosed herein are inclusive of the endpoints, and the endpoints are independently combinable with each other.

(34) While the present disclosure has been described in detail in connection with only a limited number of embodiments, it should be readily understood that the present disclosure is not limited to such disclosed embodiments. Rather, the present disclosure can be modified to incorporate any number of variations, alterations, substitutions, combinations, sub-combinations, or equivalent arrangements not heretofore described, but which are commensurate with the scope of the present disclosure. Additionally, while various embodiments of the present disclosure have been described, it is to be understood that aspects of the present disclosure may include only some of the described embodiments.

(35) Accordingly, the present disclosure is not to be seen as limited by the foregoing description but is only limited by the scope of the appended claims.

Claims

1. A gate hinge comprising: an anchor shaft defining a shaft axis that extends between a first end and a second end; a first support arm arranged at a position closer to the first end than the second end, wherein the first support arm extends in a direction normal to the shaft axis from the anchor shaft, wherein the first support arm is configured to receive and support a portion of a gate; a second support arm arranged at a same axial position as the first support arm along the anchor shaft and extends in a direction opposite the first support arm, wherein the second support arm is configured to receive and support a portion of a gate; and a seat at a base of each of the first support arm and the second support arm, wherein the base is defined where the respective support arm joins the anchor shaft, wherein the anchor shaft comprises a first thread and a second thread, wherein the second thread is formed on the anchor shaft and extends to the second end of the anchor shaft, wherein the first thread is formed along the anchor shaft for at least a portion of an axial length between the first and second support arms and the second thread, and the second thread extends axially from the first thread to a tip of the anchor shaft, and wherein the second thread comprises a self-tapping thread.
2. The gate hinge of claim 1, wherein the first thread has a thread pitch that is greater than a thread pitch of the second thread.
3. The gate hinge of claim 1, wherein the anchor shaft comprises an intermediate portion and an end portion, wherein end portion is defined toward the second end of the anchor shaft and the intermediate portion extends from (i) a junction between the first and second support arms with the anchor shaft to (ii) the end portion.
4. The gate hinge of claim 3, wherein the first thread is arranged on the intermediate portion and the second thread is arranged on the end portion.
5. The gate hinge of claim 3, wherein the intermediate portion comprises an unthreaded section and the first thread, wherein the unthreaded section is arranged between the junction and the first thread.
6. The gate hinge of claim 3, wherein the end portion comprises a tapering section that ends at the tip.
7. The gate hinge of claim 6, wherein the tapering portion includes at least a portion of the second thread.
8. The gate hinge of claim 1, wherein each seat is integrally formed with the material of the respective support arm and the anchor shaft.
9. The gate hinge of claim 1, wherein each seat is a separate element installed to the respective support arm.
10. The gate hinge of claim 1, further comprising a pin hole arranged at a distal end of each of the first support arm and the second support arm.
11. The gate hinge of claim 1, wherein the anchor shaft continuously tapers from a base of the first and second support arms to the tip.
12. The gate hinge of claim 1, wherein the first end comprises a tool-engagement feature and the second end comprises a post-engagement feature.
13. The gate hinge of claim 12, wherein the tool-engagement feature comprises a tool head.
14. The gate hinge of claim 12, wherein the tool-engagement feature comprises a recess formed in the first end.
15. The gate hinge of claim 12, wherein the post-engagement feature comprises the second thread.
16. The gate hinge of claim 1, wherein the anchor shaft comprises a section of uniform diameter and a section that tapers to the tip.
17. The gate hinge of claim 1, wherein the anchor shaft is formed from chromium vanadium steel.
18. The gate hinge of claim 1, further comprising a tool head at the first end, wherein the tool head extends axially in a direction away from the first and second support arms and opposite the tip.

19. The gate hinge of claim 1, wherein the first thread and the second thread have equal axial lengths along the anchor shaft.