

US Patent & Trademark Office

Patent Public Search | Text View

United States Patent	12391222
Kind Code	B2
Date of Patent	August 19, 2025
Inventor(s)	LaHousse; Shane R. et al.

Handle assembly for trailer landing gear

Abstract

A trailer landing gear system and handle assembly including a handle having an engagement bracket portion including a plurality of grooves or a plurality of notches. The handle assembly also includes a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket including a through-bore arranged to receive a shift shaft of a trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft and can maintain a constant connection with the shift shaft. The handle assembly further includes a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis wherein the plurality of grooves or the plurality of notches are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction.

Inventors:	LaHousse; Shane R. (Ann Arbor, MI), Ambrosi; Justin (Livonia, MI), Domanski; Christopher (Brighton, MI)
Applicant:	Alkon Corporation (Fremont, OH)
Family ID:	1000008768232
Assignee:	Alkon Corporation (Fremont, OH)
Appl. No.:	18/563096
Filed (or PCT Filed):	May 21, 2021
PCT No.:	PCT/US2021/033614
PCT Pub. No.:	WO2022/245367
PCT Pub. Date:	November 24, 2022

Prior Publication Data

Document Identifier	Publication Date
----------------------------	-------------------------

Publication Classification

Int. Cl.: B60S9/02 (20060101); G05G1/08 (20060101)

U.S. Cl.:

CPC B60S9/02 (20130101); G05G1/085 (20130101);

Field of Classification Search

CPC: G05G (1/085); B60S (9/08); A01K (89/009); B25G (1/007); Y10T (74/20756); Y10T (74/20762); Y10T (74/2075); Y10T (74/20744)

References Cited

U.S. PATENT DOCUMENTS

Patent No.	Issued Date	Patentee Name	U.S. Cl.	CPC
2460216	12/1948	Dalton	403/57	F16D 3/2052
3436987	12/1968	Baxter	74/547	G05G 1/085
3771385	12/1972	Benoit et al.	N/A	N/A
5538225	12/1995	VanDenberg	N/A	N/A
5904342	12/1998	Laarman	254/419	B60S 9/08
6099016	12/1999	Peveler	254/419	B60S 9/08
9393936	12/2015	Grote	N/A	N/A
2003/0150291	12/2002	Grenier	74/545	G05G 1/04
2006/0156857	12/2005	Turner	74/545	G05G 1/085
2007/0257243	12/2006	Cofer	254/419	G05G 1/085
2008/0164683	12/2007	VanDenberg	N/A	N/A
2016/0264107	12/2015	Riedl	N/A	B60S 9/08
2017/0001603	12/2016	Chen	N/A	B25B 23/0078

FOREIGN PATENT DOCUMENTS

Patent No.	Application Date	Country	CPC
0844208	12/1997	EP	N/A
2635205	12/1989	FR	N/A

OTHER PUBLICATIONS

USPTO Machine Translation (retrieved from FIT database) of FR 2635205 A1, Feb. 9, 1990. (Year: 2024). cited by examiner

International Search Report and the Written Opinion of the International Searching Authority, PCT Application No. PCT/US2021/033614, pp. 1-16, dated Sep. 27, 2021. cited by applicant

YouTube video clip entitled “Cranking Trailer Landing Gear,” uploaded on Oct. 12, 2018 by Midwestern Insurance Alliance. Retrieved from Internet: <https://www.youtube.com/watch?v=t6onRzaon4M&ab_channel=MidwesternInsuranceAlliance>. cited by applicant

“Correct Position of Landing Gear Crank Handle on Dropped Semi Trailers” NKBJ InfoNet, LLC, 2010, Retrieved from Internet Archive: <https://web.archive.org/web/20100623145158/https://truck-drivers-money-saving-tips.com/landing-gear.html>. cited by applicant

Landing Gear Catalog, 2018, Retrieved from the Internet: <
<https://www.stoughtontrailers.com/Portals/0/documents/parts/new-products-special/LANDING%20GEAR%20Mini%20Catalog.pdf?ver=2019-08-08-102513-690>>. cited by applicant

Primary Examiner: Yabut; Daniel D

Attorney, Agent or Firm: Bond, Schoeneck & King, PLLC

Background/Summary

CROSS-REFERENCE TO RELATED APPLICATIONS

(1) The present application is a United States National Stage Application pursuant to 35 U.S.C. § 371 of International Patent Application No. PCT/US2021/033614, filed May 21, 2021, and entitled, “Handle Assembly for Trailer Landing Gear,” the entire disclosure of which is hereby incorporated by reference in its entirety.

FIELD OF THE DISCLOSURE

(2) The present disclosure is directed generally to landing gear assemblies, specifically to handle assemblies for trailer landing gear systems.

BACKGROUND

(3) Trailers for transporting goods are configured to be removably connectable with a tractor, which typically includes a power source, e.g., a gas-powered engine, which propels the combined tractor-trailer to its destination. The tractor and the trailer typically include a component or components for creating a releasable connection between the tractor and the trailer. A trailer can also include one or more pairs of rear wheels, where each pair of rear wheels is non-rotatably connected via an axle. Notably, the trailer may include retractable or telescoping landing gear, which can be positioned at the front of the trailer proximate the component or components which establish the releasable connection with the tractor. When a tractor-trailer is transporting goods, the axles of the tractor and the connection with the tractor keep the trailer level and stable and the landing gear is retracted. However, once the tractor-trailer reaches its destination and the operator of the tractor disconnects the tractor from the trailer, the landing gear is expanded and, while in the expanded state, is used to keep the trailer substantially level.

(4) Generally, landing gear systems are manually operated, i.e., actuated between the retracted state and the expanded state, via a manual hand crank. Typically the manual hand crank is a separable component which is stored separately from and beneath the trailer landing gear or within the cabin of the tractor with the operator during transit.

SUMMARY OF THE DISCLOSURE

(5) The present disclosure is related to an improved handle assembly and a trailer landing gear system with an improved handle assembly. The handle assembly includes a handle with a grip portion and an engagement bracket portion, where the engagement bracket portion includes a plurality of grooves or a plurality of notches. The handle assembly also includes a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket including a through-bore arranged to receive a shift shaft of a trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft. The handle assembly further includes a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis wherein the plurality of grooves are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction. The present trailer landing gear system and handle assembly provide a

pivotable handle assembly which is continuously connected to the shift shaft of the trailer landing gear system such that the handle assembly is always located proximate the shift shaft and is ready to be pivoted into an engaged position quickly and efficiently. Additionally, the handle assembly can be pivoted away and stowed such that there is no interference between the stowed handle and the rotating shift shaft during transportation of a tractor trailer.

(6) In one example, a handle assembly is provided, the handle assembly including a handle including a first end and a second end, the first end having a grip portion and the second end arranged proximate to an engagement bracket portion, the engagement bracket portion including a plurality of grooves or a plurality of notches, a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket including a through-bore arranged to receive a shift shaft of a trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft, and a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis, wherein, the plurality of grooves or the plurality of notches are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction.

(7) In an aspect, in a first state, the plurality of grooves or the plurality of notches are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in the first rotational direction generates the rotational motion of the shift shaft in the first rotational direction; and, in a second state, the handle is configured to pivot about the pivot bracket to a stowed state.

(8) In an aspect, in at least the second state, the handle is configured to pivot about the pivot bracket, while the pivot bracket remains arranged about the shift shaft.

(9) In an aspect, the engagement bracket portion includes a longitudinal member arranged to telescopingly engage with the second end of the handle, and wherein the longitudinal member includes a first plurality of adjustment apertures that are configured to align with a second plurality of adjustment apertures on the second end of the handle.

(10) In an aspect, the handle includes the plurality of grooves and each of the plurality of grooves includes a translational groove portion and an expanded groove portion, the expanded groove portion arranged to engage with the pin.

(11) In an aspect, the handle includes the plurality of grooves and the pin includes a first end and a second end, the first end arranged to engage with a first groove of the plurality of grooves and the second end arranged to engage with a second groove of the plurality of grooves, and the engagement bracket portion of the handle further includes a first arm and a second arm, the first arm including the first groove and the second arm including the second groove; and wherein the first arm has a first end and a second end and wherein the first groove is stepped or sloped between the first end and the second end of the first arm.

(12) In an aspect, the second arm has a first end and a second end and wherein the second groove is stepped or sloped between the first end and the second end of the second arm.

(13) In an aspect, the engagement bracket portion of the handle further includes a spring pin arranged between the first arm and the second arm.

(14) In an aspect, the handle includes the plurality of notches arranged to engage with the pin, and wherein the pin includes a first end and a second end, the first end arranged to engage with a first notch of the plurality of notches and the second end arranged to engage with a second notch of the plurality of notches.

(15) In an aspect, the pin further includes a first pin shroud proximate the first end of the pin and a second pin shroud proximate the second end of the pin where the first pin shroud is configured to engage with the first notch of the plurality of notches and the second pin shroud is configured to engage with the second notch of the plurality of notches.

(16) In an aspect, the pin includes a threaded bolt, the threaded bolt having a threaded end and a non-threaded end, and wherein the first pin shroud includes a first pin shroud through-bore arranged to receive the non-threaded end of the threaded bolt, and wherein the second pin shroud

includes a second pin shroud through-bore arranged to receive the threaded end of the threaded bolt.

(17) In another example, a trailer landing gear system is provided, the trailer landing gear system including a first landing gear leg rotationally engaged with a cross-shaft of a landing gear assembly, a shift shaft connected to the first landing gear leg, and a handle assembly. The handle assembly includes a handle having a first end and a second end, the first end having a grip portion and the second end arranged proximate to an engagement bracket portion, the engagement bracket portion including a plurality of grooves or a plurality of notches, a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket including a through-bore arranged to receive the shift shaft of the trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft, a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis, wherein, the plurality of grooves or the plurality of notches are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction.

(18) In an aspect, in a first state, the plurality of grooves or the plurality of notches are arranged to engage with the pin and such that rotation of the handle about the imaginary rotational axis in the first rotational direction generates the rotational motion of the shift shaft in the first rotational direction; and, in a second state, the handle is configured to pivot about the pivot bracket to a stowed state.

(19) In an aspect, in at least the second state, the handle is configured to pivot about the pivot bracket, while the pivot bracket remains arranged about the shift shaft.

(20) In an aspect, the plurality of grooves each include a translational groove portion and an expanded groove portion, the expanded groove portion arranged to engage with the pin.

(21) In an aspect, the pin includes a first end and a second end, the first end arranged to engage with a first groove of the plurality of grooves and the second end arranged to engage with a second groove of the plurality of grooves; wherein the engagement bracket portion of the handle further includes a first arm and a second arm, the first arm including the first groove and the second arm including the second groove; and wherein the first arm has a first end and a second end and wherein the first groove is stepped or sloped between the first end and the second end of the first arm.

(22) In an aspect, the second arm has a first end and a second end and wherein the second groove is stepped or sloped between the first end and the second end of the second arm.

(23) In an aspect, the handle includes the plurality of notches arranged to engage with the pin, and wherein the pin includes a first end and a second end, the first end arranged to engage with a first notch of the plurality of notches and the second end arranged to engage with a second notch of the plurality of notches.

(24) In an aspect, the pin further includes a first pin shroud proximate the first end of the pin and a second pin shroud proximate the second end of the pin where the first pin shroud is configured to engage with the first notch of the plurality of notches and the second pin shroud is configured to engage with the second notch of the plurality of notches.

(25) In an aspect, the pin includes a threaded bolt, the threaded bolt having a threaded end and a non-threaded end, and wherein the first pin shroud includes a first pin shroud through-bore arranged to receive the non-threaded end of the threaded bolt, and wherein the second pin shroud includes a second pin shroud through-bore arranged to receive the threaded end of the threaded bolt.

(26) These and other aspects of the various embodiments will be apparent from and elucidated with reference to the embodiment(s) described hereinafter.

Description

BRIEF DESCRIPTION OF THE DRAWINGS

- (1) In the drawings, like reference characters generally refer to the same parts throughout the different views. Also, the drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the various embodiments.
- (2) FIG. 1 is a perspective view of a trailer landing gear system according to the present disclosure.
- (3) FIG. 2 is a perspective view of a handle assembly according to the present disclosure.
- (4) FIG. 3 is a side elevational view of a handle assembly according to the present disclosure.
- (5) FIG. 4 is a perspective view of an engagement bracket portion of a handle according to the present disclosure.
- (6) FIG. 5 is a side perspective view of an engagement bracket portion of a handle according to the present disclosure.
- (7) FIG. 6A is a top plan view of a handle assembly according to the present disclosure.
- (8) FIG. 6B is a top plan view of a portion of a handle assembly according to the present disclosure.
- (9) FIG. 7 is a perspective view of a portion of a handle assembly according to the present disclosure.
- (10) FIG. 8 is a perspective view of a handle assembly in a stowed state according to the present disclosure.
- (11) FIG. 9 is a perspective view of a handle assembly according to the present disclosure.
- (12) FIG. 10 is an exploded perspective view of a handle assembly according to the present disclosure.
- (13) FIG. 11A is a top plan view of an engagement bracket portion of a handle assembly according to the present disclosure.
- (14) FIG. 11B is a bottom plan view of an engagement bracket portion of a handle assembly according to the present disclosure.
- (15) FIG. 12A is a cross-sectional exploded view of a pin taken generally down the center of the pin according to the present disclosure.
- (16) FIG. 12B is a cross-sectional assembled view of a pin taken generally down the center of the pin according to the present disclosure.
- (17) FIG. 13 is a perspective view of a handle assembly in a stowed state according to the present disclosure.
- (18) FIG. 14 is a perspective view of a handle assembly according to the present disclosure.
- (19) FIG. 15 is a perspective view of a handle assembly according to the present disclosure.
- (20) FIG. 16 is a perspective view of a handle assembly according to the present disclosure.

DETAILED DESCRIPTION OF EMBODIMENTS

(21) The present disclosure is related to an improved handle assembly and a trailer landing gear system with an improved handle assembly. The handle assembly includes a handle with a grip portion and an engagement bracket portion, where the engagement bracket portion includes a plurality of grooves or a plurality of notches. The handle assembly also includes a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket including a through-bore arranged to receive a shift shaft of a trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft. The handle assembly further includes a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis wherein the plurality of grooves are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction. The present trailer landing gear system and handle assembly provide a pivotable handle assembly which is continuously connected to the shift shaft of the trailer landing gear system such that the handle assembly is always located proximate the shift shaft and is ready to be pivoted into an engaged position quickly and efficiently. Additionally, the handle assembly

can be pivoted away and stowed such that there is no interference between the stowed handle and the rotating shift shaft during transportation of a tractor trailer.

(22) Transitioning now to the figures, FIG. 1 illustrates a perspective view of trailer landing gear system **100** according to the present disclosure. It should be appreciated that, although not illustrated for clarity, during operation of trailer landing gear system **100**, a trailer may be provided, where trailer landing gear system **100** is fixedly secured to the underside of the trailer so that it may stabilize the front portion of the trailer when disassembled from a tractor or semi-truck. Generally, trailer landing gear system **100** includes a first leg assembly **102**, a second leg assembly **104**, and a cross-shaft **106**.

(23) First leg assembly **102** includes a first leg housing **108** and a first leg **110**. First leg housing **108** includes a substantially hollow longitudinal member arranged to telescopingly engage with first leg **110**. First leg **110** is intended to fit within and slidingly engage with first leg housing **108** such that, when retracted a substantial portion of first leg **110** is arranged within first leg housing **108** and when expanded a substantial portion of first leg **110** is arranged outside of first leg housing **108**. Although not illustrated, one or more gears may be arranged between first leg **110** and cross-shaft **106** such that torque or rotational forces of cross-shaft **106** can be transferred 90 degrees to first leg **110** when operating trailer landing gear assembly **100** from the retracted state to the expanded state.

(24) Similarly, second leg assembly **104** includes a second leg housing **112** and a second leg **114**. Second leg housing **112** includes a substantially hollow longitudinal member arranged to telescopingly engage with second leg **114**. Second leg **114** is intended to fit within and slidingly engage with second leg housing **112** such that, when in the retracted state a substantial portion of second leg **114** is arranged within second leg housing **112** and when in an expanded state a substantial portion of second leg **114** is arranged outside of second leg housing **112**. Although not illustrated, one or more gears may be arranged between second leg **114** and cross-shaft **106** such that torque or rotational forces of cross-shaft **106** can be transferred 90 degrees to second leg **114** when operating trailer landing gear system **100** from the retracted state to the expanded state. The terminal ends of each leg may include a foot, as illustrated, to disperse the weight of the trailer when in the expanded state as well as provide a level surface upon which the legs may stand.

(25) As will be discussed below, trailer landing gear system **100** can include a handle assembly **200** arranged to provide a manual means of rotating a shift shaft **116**, which in turn (via one or more gears of the first and second leg assemblies and the cross-shaft **106**), lowers or raises the legs of the trailer landing gear system **100**. As illustrated, the shift shaft **116** includes a proximate end **118** and a distal end **120** (shown in FIG. 2), where the proximate end is arranged to receive handle assembly **200** and the distal end **120** is arranged to engage with the one or more gears of one of the leg assemblies described above. In the examples provided below, it should be appreciated that shift shaft **116** can include a hole, aperture, or through-bore through and within proximate end **118** to receive pin **206** (discussed below).

(26) The following description should be read in view of FIGS. 2-8. FIGS. 2-3 illustrate a front perspective view and a side elevational view, respectively, of an improved handle assembly **200** according to the present disclosure. As shown, handle assembly **200** includes a handle **202**, a pivot bracket **204** and a pin **206**.

(27) As shown, handle **202** has a first end **208** and a second end **210**. Handle **202** includes a grip portion **212** proximate the first end **208** and an integral engagement bracket portion **214** proximate the second end **210**. It should be appreciated that engagement bracket portion **214** can be integrally formed as a part of handle **202**, or may be a separable portion arranged to engage or secure to the handle **202** as shown in FIG. 2 and in the examples illustrated in FIGS. 9-10. Between first end **208** and second end **210**, handle **202** can include a plurality of bends and straight portions substantially forming a crank handle shape to aid in generating rotational torque through a rotational cranking motion about imaginary rotational axis RA. Grip portion **212** is intended to be a portion of handle

202 proximate the first end **208** where a user or operator of a trailer landing gear system, e.g., trailer landing gear system **100**, can grab handle **202** and generate a rotational motion of shift shaft **120** about imaginary rotational axis RA to extend or retract the legs of the system. Grip portion **212** can be an integral or separable component configured to rotate independently of the rotation of handle **202** about imaginary rotational axis RA (hereinafter “rotational axis RA”) such that the user's or operator's hand can remain in substantially the same orientation with respect to their body while rotating the handle **202** about rotational axis RA. Alternatively, grip portion **212** may be a rotationally fixed component and the user can relax their grip around grip portion **212** while cranking the handle **202** in a first rotational direction RD1 or a second rotational direction RD2 (discussed below). It should be appreciated that handle **202** and the other components discussed herein can be made from steel, iron, cast-iron, or any other material with sufficient hardness, strength, or overall durability to withstand the rotational loads required to crank or actuate the legs of trailer landing gear system **100** discussed above.

(28) FIG. 4 is a perspective view of engagement bracket portion **214** shown without pivot bracket **204** or pin **206** for clarity. As shown, engagement bracket portion **214** is arranged proximate to second end **210** of handle **202**. As described above, engagement bracket portion **214** can be integrally formed with the rest of handle **202** or may be formed separately and non-rotatably secured to the second end **210** of handle **202**, e.g., by welding, threading, etc. Engagement bracket portion **214** includes two arms, e.g., first arm **216** and second arm **218**. First arm **216** and second arm **218** extend away from second end **210** of handle **202** and are substantially parallel with rotational axis RA as shown. First arm **216** includes a first end **220** and a second end **222**, where the first end **220** is the end of first arm **216** that is closest to the rest of handle **202** while second end **222** is the end of first arm **216** that is farthest from the rest of handle **202**. First arm **216** also includes a step or slope feature between first end **220** and second end **222**. The step or slope feature is configured such that the lower portion of the stepped or sloped arm is proximate first end **220** and handle **202** while the higher portion of the stepped or sloped arm is proximate second end **222**. Similarly, second arm **218** includes a first end **224** and a second end **226**, where the first end **224** is the end of second arm **218** that is closest to the rest of handle **202** while second end **226** is the end of second arm **218** that is farthest from the rest of handle **202**. Second arm **218** also includes a step or slope feature between first end **224** and second end **226**. The step or slope feature is configured such that the upper portion of the stepped or sloped arm is proximate first end **224** while the lower portion of the stepped or sloped arm is proximate second end **226**. Additionally, the upper portion of first arm **216** includes a hole, aperture, or through-bore configured to receive a connector **246** (discussed below), e.g., a rivet or bolt, to pivotably secure first arm **216** with tab **244A** of first planar portion **238** of pivot bracket **204** (discussed below). Similarly, the lower portion of second arm **218** includes a hole, aperture, or through-bore configured to receive a connector **246** (discussed below), e.g., a rivet or bolt, to pivotably secure second arm **218** with tab **244B** of first planar portion **238** of pivot bracket **204** (discussed below).

(29) Additionally, engagement bracket portion **214** includes a plurality of grooves **228A-228B** (collectively referred to herein as “plurality of grooves **228**” or “grooves **228**”). For example, first arm **216** includes a first groove **228A** arranged between first end **220** and second end **222** of first arm **216**, and second arm **218** includes a second groove **228B** arranged between first end **224** and second end **226** of second arm **218**. Each groove, e.g., first groove **228A** and second groove **228B**, are configured such that they are disposed through and within each arm, i.e., first arm **216** and second arm **218**, respectively, such that each groove **228** also includes a stepped or sloped feature corresponding with the stepped or slope feature of each arm as discussed above. Additionally, as illustrated in FIGS. 4-6B, each groove **228** is arranged substantially in the center of engagement bracket portion **214**, e.g., in line or substantially aligned with rotational axis RA such that there is an equal amount of engagement bracket portion **214** on either side of each groove **228**.

(30) As illustrated in FIGS. 5-6B, each groove **228** includes a translational portion **230A-230B**

(collectively referred to herein as “translational portion 230”) and an expanded portion 232A-232B (collectively referred to herein as “expanded portion 232”). For example, the translational portion 230A of first groove 228A, shown in FIG. 6B, includes the portion of first groove 228A that begins proximate second end 222 of first arm 216 and continues until it reaches the expanded portion 232A, located proximate first end 220 of first arm 216. Translational portion 230A includes a portion of groove 228A that is substantially longitudinal with a substantially uniform width, i.e., a first width W1 sufficient to receive and slidably engage with first end 248 of pin 206 (discussed below). Similarly, translational portion 230B of second groove 228B, includes the portion of second groove 228B that begins proximate second end 226 of second arm 218 and continues until it reaches the expanded portion 232B, located proximate first end 224 of second arm 218. Translational portion 230B includes a portion of groove 228B that is substantially longitudinal with a substantially uniform width, i.e., first width W1 sufficient to receive and slidably engage with second end 250 of pin 206 (discussed below).

(31) Each expanded portion 232 of each respective arm is intended to include a portion of each groove 228 that has a greater width than the width of the respective translational portion 230 of each groove 228. For example, first expanded portion 232A of first groove 228A has a larger width, i.e., a second width W2, than the width W1 of translational portion 230A. In some examples, second width W2 is at least two times the first width W1, e.g., at least two times the width of the first end 248 of pin 206 (discussed below). Likewise, although not shown, second expanded portion 232B of second groove 228B has a larger width than the first width W1 of translational portion 230B, i.e., a second width W2. In some examples, second width W2 is at least two times the first width W1, e.g., at least two times the width of the second end 250 of pin 206 (discussed below). As will be discussed below in detail, each side of each expanded portion 232 is arranged to receive and slidably engage with an end of pin 206 to rotatably engage shift shaft 116 with handle 202 such that manual rotation of handle 202 about rotational axis RA results in rotation of shift shaft 116 about rotational axis RA. In some examples, as illustrated in FIG. 6B, each expanded portion 232 includes a left engagement area LEA and a right engagement area REA. Each engagement area is configured to slidably engage with and disengage with the respective ends of pin 206 (as will be discussed below). It should be appreciated that the area of the left and right engagement areas can be selected such that the length and width of each area are larger than, or slightly larger than, the diameter of the respective ends of pin 206 (discussed below).

(32) As illustrated in FIGS. 3-4, 6A-6B, and 8, engagement bracket portion 214 also includes a spring pin 234. As shown in FIG. 4, spring pin 234 is intended to be a unitary fastener used to join or connect both arms of engagement bracket portion 214, i.e., join first arm 216 and second arm 218. In some examples, spring pin 234 includes a spring that expands upon insertion within corresponding apertures or through-bores arranged within and through each arm of engagement bracket portion 214. As shown in FIGS. 4-6B, spring pin 234 is configured off center within engagement bracket portion 214, e.g., to the left or right of the center of engagement bracket portion 214 or left and right of the rotational axis RA. As will be discussed below in detail, spring pin 234 is provided to prevent pivoting of handle 202 in one of the two potential pivoting/rotational directions when disengaging and stowing the handle 202, i.e., within the transition to the stowed state ST1 (discussed below). It should be appreciated that spring pin 234 is but one example of a mechanism that can be employed to prevent this unwanted pivoting/rotation of handle 202, and other mechanisms may be utilized. For example, a bolt, solid pin, solid wall, or other obstructive object or component may be provided to one side of the engagement bracket portion 214 such that pivoting or rotation of handle 202 in a limited number of directions is possible.

(33) Additionally, as illustrated in FIG. 8, engagement bracket portion 214 also includes a through-bore or recess 236. Through-bore or recess 236 is arranged within engagement bracket portion 214 proximate the transition between engagement bracket portion 214 and the rest of handle 202 and between first arm 216 and second arm 218. Through-bore or recess 236 is intended to be circular in

shape and be sized such that the diameter of the through-bore or recess **236** of engagement bracket portion **214** is less than the diameter of shift shaft **116** such that when handle assembly **200** is translated from second state ST2 (shown in FIG. 3) to third state ST3 (shown in FIGS. 5-6B and discussed below) shift shaft **116** fits within through-bore or recess **236** and maintains alignment between shift shaft **116** and handle **202** of handle assembly **200**.

(34) As discussed above, handle assembly **200** also includes pivot bracket **204**. As shown in FIGS. 2-3, 5, and 7-8, pivot bracket **204** includes a first planer portion **238**, a second planer portion **240**, and a through-bore **242**. First planer portion **238** is configured such that during operation, the planar surface of first planar portion **238** is located within a substantially vertical plane, i.e., a plane arranged orthogonally to the ground beneath handle assembly **200** and substantially parallel with rotational axis RA when at rest as shown. First planar portion **238** also includes a plurality of tabs **244A-244B** (collectively referred to herein as “plurality of tabs **244**” or “tabs **244**”) at opposite sides of the first planar portion **238**. Each tab **244** includes an inward bend, i.e., bent toward shift shaft **116** with respect to first planar portion **238**, such that the planar surfaces of each tab of plurality of tabs **244** are substantially parallel with the planar surfaces of first arm **216** and second arm **218** of engagement bracket portion **214**. Each tab **244** includes a hole, aperture, or through-bore configured to receive a connector **246**, e.g., a rivet or bolt, and align and pivotably secure pivot bracket **204** to engagement bracket portion **214**, via the holes, apertures, or through-bores in each arm as discussed above. In other words, a connector **246** is configured through a hole, aperture, or through-bore of first tab **244A** as well as through a hole, aperture, or through-bore on the upper portion of first arm **216**, such that pivot bracket **204** and engagement bracket portion **214** of handle **202** can pivot or rotate with respect to each other about the connector **246**. Similarly, another connector **246** is configured to go through a hole, aperture, or through-bore of second tab **244B** as well as go through the hole, aperture, or through-bore on the lower portion of second arm **218**, such that pivot bracket **204** and engagement bracket portion **214** of handle **202** can pivot or rotate with respect to each other about the connector **246**.

(35) Pivot bracket **204** also includes a second planar portion **240**. Second planar portion **240** is intended to be integral with first planar portion **238** and arranged such that rotational axis RA is orthogonal to and passes through the planar surface of second planar portion **240**. Thus, second planar portion **240** is substantially orthogonal to the planar surface of first planar portion **238**. Second planar portion **240** includes a through-bore **242** (shown in FIGS. 7-8). Through-bore **242** is substantially centered on the planar surface of second planar portion **240** and arranged to slide over and be positioned radially about shift shaft **116**. Through-bore **242** is configured such that, at all times following installation of handle assembly **200**, e.g., at least during operation of trailer landing gear system **100**, second planar portion **240** is arranged about shift shaft **116**. In other words, shift shaft **116** is configured to slidably engage with through-bore **242**. Although second planar portion **240** is configured to slidably engage with shift shaft **116** and slidably translate forward and backward along rotational axis RA at various positions during the state transitions discussed below, the second planar portion **240** remains engaged about shift shaft **116** at all times after installation. It should be appreciated that the shape and diameter of through-bore **242** can be configured such that it substantially complements or mirrors the cross-sectional shape of shift shaft **116** and has a diameter that is greater than the diameter of shift shaft **116** such that second planar portion **240** of pivot bracket **204** can slidably engage with shift shaft **116**.

(36) Handle assembly **200** further includes a pin **206**. Pin **206** is a substantially solid longitudinal member arranged to sit within and engage with the hole, aperture, or through-bore in the proximate end **118** of shift shaft **116**. As shown in FIG. 3, pin **206** includes a first end **248** and a second end **250**. First end **248** of pin **206** is arranged to slidably engage and disengage with first groove **228A** of plurality of grooves **228** of first arm **216** of engagement bracket portion **214**. Second end **250** of pin **206** is arranged to slidably engage and disengage with second groove **228B** of plurality of grooves **228** of second arm **218** of engagement bracket portion **214**. Pin **206** is secured within the

hole, aperture, or through-bore at the proximate end **118** of shift shaft **116** via a plurality of retaining devices **252A-252B** (collectively referred to herein as “retaining devices **252**”), e.g., retaining rings, clamps, detents, etc. As shown in FIGS. **5**, **6B**, and **7-8**, a first retaining device **252A** is positioned outside of the hole, aperture, or through-bore of the shift shaft **116** and about the outer circumferential surface of the first end **248** of pin **206**. Also, a second retaining device **252B** is positioned outside of the hole, aperture, or through-bore of the shift shaft **116** and about the outer circumferential surface of the second end **250** of pin **206**. Thus, the two retaining devices **252A-252B** are arranged about pin **206** and on either side of shift shaft **116** and are configured to prevent pin **206** from sliding out of the hole, aperture, or through-bore of the shift shaft **116**. It should be appreciated that first end **248** and second end **250** of pin **206** can both include a recessed circumferential groove arranged to receive first retaining device **252A** and second retaining device **252B**, respectively, to prevent the retention devices from sliding with respect to pin **206**.

(37) During operation of trailer landing gear system **100**, it is desirable (at least in certain circumstances) to allow the operator to manually raise or lower the legs of the trailer landing gear system **100** using handle assembly **200**. As shown in FIG. **8**, while driving or transporting the trailer (not shown), the handle assembly **200** is arranged in a first state ST1 (hereinafter “first state ST1” or “stowed state ST1”), i.e., a state where handle **202** has been pivoted out of alignment with shift shaft **116** and has been stowed or otherwise affixed to a portion of the trailer or trailer landing gear system **100**. It should be appreciated that, as described above, even during stowed state ST1 pivot bracket **204** remains disposed about shift shaft **116** via sliding engagement with through-bore **242**.

(38) When the tractor operator desires to manually raise or lower the legs of trailer landing gear system **100**, the operator can pivot handle **202** about connectors **246**, i.e., about the connectors arranged to pivotably secure first arm **216** and second arm **218** of engagement bracket portion **214** with the respective tabs **244** of the first planar portion **238** of pivot bracket **204**. By pivoting handle **202** to be in alignment with shift shaft **116**, handle assembly **200** has been transitioned from the first, stowed state ST1 to a second state ST2. Second state ST2 (shown in FIGS. **2-3**) represents the state of handle assembly **200** where handle **202** is substantially aligned with or inline with shift shaft **116** and/or rotational axis RA, and where engagement bracket portion **214** is not engaged or slidably engaged with pin **206**. From the second state ST2, i.e., in an inline and disengaged position, the tractor operator can transition handle assembly **200** to a third state ST3 (shown in FIGS. **5-6B**) by sliding handle **202** in a first direction DR1 along rotational axis RA such that first end **248** and second end **250** of pin **206** slidably engages with the inside of first groove **228A** and second groove **228B**, respectively, of engagement bracket portion **214**. During the transition from the second state ST2 (shown in FIGS. **2-3**) to the third state ST3 (shown in FIGS. **5-6B**), the first end **248** of pin **206** slidably engages with translational groove portion **230A** until it stops within expanded groove portion **232A** when first end **248** of pin **206** contacts the back of expanded groove portion **232A**. Simultaneously, second end **250** of pin **206** slidably engages with translational groove portion **230B** until it stops within expanded groove portion **232B** when second end **250** contacts the back of expanded groove portion **232B**.

(39) From the third state ST3 (shown in FIGS. **5-6B**), the tractor operator can rotate handle **202** in a first rotational direction RD1 (e.g., clockwise) to secure first end **248** of pin **206** within the right engagement area REA of first expanded groove portion **232A** of first groove **228A**, and secure second end **250** of pin **206** within the left engagement area LEA of second expanded groove portion **232B** of second groove **228B**. In this fourth and final state ST4 (shown in FIG. **7**), i.e., where first end **248** of pin **206** is secured within the right engagement area REA of expanded groove portion **232A** of first groove **228A** and second end **250** of pin **206** is secured within the left engagement area LEA of expanded groove portion **232B**, the operator can continue to rotate or crank handle **202** in the first rotational direction RD1 about rotational axis RA, which will transfer rotational torque from the handle **202** to each leg of the trailer landing gear system **100**, via cross-

shaft **106** and/or the one or more gears within each leg to, e.g., raise the legs of the trailer landing gear system **100**.

(40) Alternatively, and although not shown, from the third state ST3 (shown in FIGS. 5-6B), the tractor operator can rotate handle **202** in a second rotational direction RD2 (e.g., counter-clockwise) to secure first end **248** of pin **206** within the left engagement area LEA of first expanded groove portion **232A** of first groove **228A**, and secure second end **250** of pin **206** within the right engagement area REA of second expanded groove portion **232B** of second groove **228B**. In this fourth and final state ST4 (not shown), i.e., where first end **248** of pin **206** is secured within the left engagement area LEA of expanded groove portion **232A** of first groove **228A** and second end **250** of pin **206** is secured within the right engagement area REA of expanded groove portion **232B**, the operator can continue to rotate or crank handle **202** in the second rotational direction RD2 about rotational axis RA, which will transfer rotational torque from the handle **202** to each leg of the trailer landing gear system **100**, via cross-shaft **106** and/or the one or more gears within each leg to, e.g., raise the legs of the trailer landing gear system **100**.

(41) When the operator is satisfied with the current position of the legs of the trailer landing gear system **100**, the operator can proceed through each state recited above in the reverse order so that the handle assembly **200** is placed in the stowed state, i.e., ST1 (shown in FIG. 8). For example, from the fourth state ST4 (shown in FIG. 7) the operator can rotate handle **202** such that first end **248** and second end **250** of pin **206** are disengaged with the right engagement area and left engagement areas of expanded groove portions **232A** and **232B** to transition handle assembly to the third state ST3 (shown in FIGS. 5-6B). From the third state ST3, the operator can pull handle **202** in second direction DR2, opposite first direction DR1, such that pin **206** slidably disengages from grooves **228A** and **228B**, placing handle assembly **200** in second state ST2 (shown in FIGS. 2-3). From the second state ST2, the operator can pivot handle **202** about connectors **246** and out of alignment with shift shaft **116**, to the stowed state ST1 (shown in FIG. 8), where handle **202** can be clamped or otherwise secured to a portion of the trailer landing gear system **100** and/or the trailer (not shown) for safe and secure storage during transportation. When transitioning handle assembly **200** from the second state ST2 (shown in FIGS. 2-3) to the stowed state ST1 (shown in FIG. 8), the presence of spring pin **234** prevents pivoting of engagement bracket portion **214** (and by extension prevents pivoting of handle **202**) in one direction, e.g., prevents the operator from pivoting handle **202** away from the appropriate storage location for the handle **202** on the trailer (not shown) or the trailer landing gear system **100**.

(42) The following description should be read in view of FIGS. 9-16. FIGS. 9-10 illustrate a front perspective view and a front-perspective exploded view, respectively, of an alternative improved handle assembly **200** according to the present disclosure. In this alternative embodiment, engagement portion **214** is a separable component from the rest of handle **202** and includes a longitudinal member **254** integrally formed on and is secured to engagement portion **214** proximate the first end **220** of first arm **216** and first end **224** of second arm **218**. It should be appreciated that, although illustrated as an integral component, longitudinal member **254** may also be a separable component from engagement portion **214**, e.g., longitudinal member **254** may be rotatably or otherwise fixedly secured to engagement portion **214**. Longitudinal member **254** is configured to slidably or telescopically engage with second end **210** of handle **202** such that different handle lengths may be set by the operator of the trailer landing gear system **100**. To that end, second end **210** of handle **202** can be a cylindrical portion of handle **202** and can be hollow so as to receive at least a portion of the length of longitudinal member **254**. In one example, as illustrated in FIG. 9, second end **210** of handle **202** is a hollow cylindrical member with a first diameter and longitudinal member **254** is a hollow cylindrical member of a second diameter, where the second diameter is smaller than the first diameter such that the longitudinal member **254** is configured to telescopically and slidably engage with and within the inner circumferential surface of second end **210** of handle **202**. It should be appreciated that the diameter of the longitudinal member **254** can be larger than

the diameter of the second end **210** of handle **202** such that longitudinal member **254** is configured to telescopingly and slidingly engage with, over, and about the outer circumferential surface of second end **210** of handle **202**. Furthermore, it should be appreciated that second end **210** of handle **202** and longitudinal member **254** do not need to be cylindrical members and may take any complementary shape to one another that would allow for telescoping or sliding engagement between the two members, e.g., rather than each member having a circular cross-section each member can have an oval cross-section, a square cross-section, an octagonal cross-section, a hexagonal cross-section, etc.

(43) Additionally, second end **210** of handle **202** is configured to engage with longitudinal member **254** along a plurality of discrete positions such that the length of handle assembly **200** is adjustable to each of the discrete positions. For example, as shown in FIGS. **9-10**, longitudinal member **254** of engagement portion **214** includes a first plurality of adjustment apertures **256** arranged in line along rotational axis RA, and second end **210** of handle **202** includes a second plurality of adjustment apertures **258** arranged in line along rotational axis RA. In some examples, the first plurality of adjustment apertures **256** include a first plurality of paired apertures, for example, a first aperture of the pair can be positioned on one side of longitudinal member **254** while the other aperture of the pair can be positioned on the opposing side of longitudinal member **254** substantially forming a through-bore between each of the paired first adjustment apertures **256** where the through-bore is arranged along an axis substantially orthogonal to the rotational axis RA. Similarly, the second plurality of adjustment apertures **258** include a second plurality of paired apertures, for example, a first aperture of the pair can be positioned on one side of handle **202** while the other aperture of the pair can be positioned on the opposing side of **202** substantially forming a through-bore between each of the paired second adjustment apertures **258** where the through-bore is arranged along an axis substantially orthogonal to the rotational axis RA. As will be discussed below, prior to operation of handle assembly **200**, the operator of the trailer landing gear system **100** can adjust the overall length of handle assembly **200**, by sliding or telescoping handle **202** with respect to longitudinal member **254** until handle **202** is at a desired position. At the desired position, the operator can align a pair of first adjustment apertures **256** and a pair of second adjustment apertures **258**. Once aligned, the operator can lock the handle **202** in the desired length position by sliding at least one adjustment fastener **260** through the pair of first adjustment apertures **256** and the pair of second adjustment apertures **258** such that the handle **202** is prevented from sliding or shifting along rotational axis RA with respect to longitudinal member **254** of engagement portion **214**. Although illustrated as a combination of a threaded hex bolt and nut, it should be appreciated that adjustment fastener **260** can be any fastener capable of securing longitudinal member **254** to second end **210** of handle **202**, e.g., a pin, bolt, screw, capped rod, etc.

(44) As shown in FIGS. **11A-11B**, in one example, rather than a plurality of grooves **228**, engagement portion **214** includes a plurality of notches **262** for pin **206** to engage with. FIGS. **11A** and **11B** illustrate a top plan view and a bottom plan view, respectively, of engagement portion **214** of handle assembly **200** according to the present disclosure. As shown in FIG. **11A**, first arm **216** includes a plurality of notches **262A-262B**. As shown, first notch **262A** is positioned on first arm **216** of engagement bracket portion **214** and proximate first end **220** of first arm **216**, i.e., proximate longitudinal member **252**. Similarly, second notch **262B** is positioned on the opposing side of first arm **216** with respect to first notch **262A** and proximate first end **220** of first arm **216**. As shown in FIG. **11B**, second arm **218** includes a plurality of notches **262C-262D**. As shown, third notch **262C** is positioned on second arm **218** of engagement bracket portion **214** and proximate first end **224** of second arm **218**, i.e., proximate longitudinal member **252**. Similarly, fourth notch **262D** is positioned on the opposing side of second arm **218** with respect to third notch **262C** and proximate first end **224** of second arm **218**. Each notch of the plurality of notches **262A-262D** (collectively referred to herein as “notches **262**” or “plurality of notches **262**”) is intended to be a semi-circular cut-out with a radius greater than or equal to the radius of the first end **248** and second end **250** of

pin **206** and/or a radius greater than or equal to the radius of first pin shroud **266** and second pin shroud **268** (discussed below). As will be discussed below, during operation the first end **248** of pin **206** is configured to rest within and engage with either first notch **262A** or second notch **262B**, while second end **250** of pin **206** is configured to rest within and engage with either third notch **262C** or fourth notch **262D**.

(45) Additionally, as an alternative arrangement to the description and illustrations of pin **206** as shown in FIGS. **3** and **5-7** and described above, in other examples, as shown in FIGS. **12A-12B** pin **206** can include a threaded bolt **264**, a first pin shroud **266**, and a second pin shroud **268**. Threaded bolt **264** is a substantially longitudinal member configured to pass through the hole, aperture, or through-bore in the proximate end **118** of shift shaft **116**. In some examples, threaded bolt **264** includes a non-threaded end **270** and a threaded end **272**. As shown in FIGS. **12A** and **12B**, which illustrate an exploded view and an assembled view, respectively, of pin **206** according to the present disclosure, first pin shroud **266** includes a through-bore **274** and a cupped end where the through-bore **274** of the first pin shroud **266** is configured to receive and slidingly engage with the non-threaded end **270** of threaded bolt **264**. Additionally, the cupped end of first pin shroud **266** has a radius that is configured to mirror the radius of and mate with the outer circumferential surface of the shift shaft **116**. Similarly, second pin shroud **268** includes a through-bore **276** and a cupped end where the through-bore **276** of the second pin shroud **268** is configured to receive and slidingly engage with the threaded end **272** of threaded bolt **264**. To that end, and although not illustrated, the inner surface of the through-bore **276** of the second pin shroud **268** can have a complementary threading to the threading on the threaded end **272** of threaded bolt **264**. Additionally, the cupped end of second pin shroud **268** has a radius that is configured to mirror the radius of and mate with the outer circumferential surface of the shift shaft **116**. Thus, during assembly, the first pin shroud **266** and the second pin shroud **268** are positioned such that the cupped end of first pin shroud **266** and the cupped end of second pin shroud **268** mate with the outer circumferential surface of shift shaft **116** and where each pin shroud is on opposing sides of the shift shaft **116**. The operator of the trailer landing gear system **100** can then slide the threaded bolt **264** through the through-bore **274** of first pin shroud **266**, through the hole, through-bore, or aperture in the proximate end **118** of shift shaft **116**, and rotate the threaded bolt **264** to engage the threads of the threaded end **272** of threaded bolt **264** with the threading in the through-bore **276** of second pin shroud **268**. As the threaded bolt **264** is rotated into the threading of the second pin shroud **268**, the head of the threaded bolt **264** contacts the bottom flange of a well **278** within first pin shroud **266** pulling the first pin shroud **266** and the second pin shroud **268** together securing them about the shift shaft **116**.

(46) Thus, in an alternative operation of trailer landing gear system **100**, it is desirable (at least in certain circumstances) to allow the operator to manually raise or lower the legs of the trailer landing gear system **100** using handle assembly **200**. As shown in FIG. **13**, which illustrates a front perspective view of handle assembly **200**, while driving or transporting the trailer (not shown), the handle assembly **200** is arranged in a first state ST1 (hereinafter “first state ST1” or “stowed state ST1”), i.e., a state where handle **202** has been pivoted out of alignment with shift shaft **116** and has been stowed or otherwise affixed to a portion of the trailer or trailer landing gear system **100**. It should be appreciated that, as described above, even during stowed state ST1 pivot bracket **204** remains disposed about shift shaft **116** via sliding engagement with through-bore **242** (shown in FIG. **7**). Prior to raising or lowering the legs of the trailer landing gear system **100**, the operator may desire to adjust or change the operating length of handle **202** with respect to the rest of the trailer landing gear system **100**. For example, the trailer (not shown) may require a longer handle **202** such that rotation of the handle during operation can clear (i.e., not contact during rotation), the body of the trailer. To that end, the use may, using the handle assembly **200** of the present disclosure, telescopingly slide handle **202** about or with respect to the longitudinal member **254** of engagement bracket portion **214** until the handle **202** is in the desired operating length. Once set to the desired length, the operator can align first adjustment apertures **256** and second adjustment

apertures **258** and lock the handle **202** in the desired length position by sliding at least one adjustment fastener **260** through the first adjustment apertures **256** and second adjustment apertures **258** such that the handle **202** is prevented from sliding or shifting along rotational axis RA with respect to longitudinal member **254** of engagement portion **214**.

(47) When the tractor operator desires to manually raise or lower the legs of trailer landing gear system **100**, the operator can pivot handle **202** about connectors **246**, i.e., about the connectors arranged to pivotably secure first arm **216** and second arm **218** of engagement bracket portion **214** with the respective tabs **244** of the first planar portion **238** of pivot bracket **204**. By pivoting handle **202** to be in alignment with shift shaft **116**, handle assembly **200** has been transitioned from the first, stowed state ST1 to a second state ST2. Second state ST2, shown by a partial magnified view of handle assembly **200** in FIG. **14**, represents the state of handle assembly **200** where handle **202** is substantially aligned with or in line with shift shaft **116** and/or rotational axis RA, and where engagement bracket portion **214** is not engaged or slidably engaged with pin **206**. From the second state ST2, i.e., in an in line and disengaged position, the tractor operator can transition handle assembly **200** to a third state ST3 (shown in FIG. **15**) by rotating handle **202** substantially 90 degrees in a rotational direction (e.g., first rotational direction, i.e., clockwise) and sliding handle **202** in a first direction DR1 along rotational axis RA until first pin shroud **266** and second pin shroud **268** are substantially aligned with first notch **262A** and fourth notch **262D** (shown in FIG. **11B**).

(48) From the third state ST3 (shown in FIG. **15**), the tractor operator can then rotate handle **202** in a second rotational direction RD2 (e.g., counter-clockwise) to engage first pin shroud **266** and first notch **262A** and engage second pin shroud **268** with fourth notch **262D**. In this fourth state ST4 (shown in FIG. **16**), i.e., where both pin shrouds are engaged with respective notches of engagement bracket portion **214**, the operator can continue to rotate or crank handle **202** in the second rotational direction RD2 about rotational axis RA, which will transfer rotational torque from the handle **202** to each leg of the trailer landing gear system **100**, via cross-shaft **106** and/or the one or more gears within each leg to, e.g., raise or lower the legs of the trailer landing gear system **100**.

(49) Alternatively, and although not shown, from the second state ST2 (shown in FIG. **14**), the tractor operator can rotate handle **202** in a second rotational direction RD2 (e.g., counter-clockwise) while translating the handle along first direction DR1 until both pin shrouds are aligned with the notches of engagement bracket portion **214**. Then from this alternative third state ST3, the operator can rotate handle **202** in the first rotational direction RD1 (e.g., clockwise) to engage first pin shroud **266** with second notch **262B** and engage second pin shroud **268** with third notch **262C**. Once in this alternative fourth state ST4, the operator can continue to rotate or crank handle **202** in the first rotational direction RD1 about rotational axis RA, which will transfer rotational torque from the handle **202** to each leg of the trailer landing gear system **100**, via cross-shaft **106** and/or the one or more gears within each leg to, e.g., raise or lower the legs of the trailer landing gear system **100**.

(50) When the operator is satisfied with the current position of the legs of the trailer landing gear system **100**, the operator can proceed through each state recited above in the reverse order so that the handle assembly **200** is placed in the stowed state, i.e., ST1 (shown in FIG. **13**). For example, from the fourth state ST4 (shown in FIG. **16**) the operator can rotate handle **202** such that first pin shroud **266** and second pin shroud **268** of pin **206** are disengaged with the notches of the engagement bracket portion **214** to transition handle assembly to the third state ST3 (shown in FIG. **15**). From the third state ST3, the operator can pull handle **202** in second direction DR2, opposite first direction DR1, such that pin **206** is no longer aligned with the plurality of notches of the engagement bracket portion **214**, placing handle assembly **200** in second state ST2 (shown in FIG. **14**). From the second state ST2, the operator can pivot handle **202** about connectors **246** and out of alignment with shift shaft **116**, to the stowed state ST1 (shown in FIG. **13**), where handle **202** can

be clamped or otherwise secured to a portion of the trailer landing gear system **100** and/or the trailer (not shown) for safe and secure storage during transportation.

(51) Thus the present trailer landing gear system **100** and handle assembly **200** provide a pivotable handle **202** which is continuously connected to the shift shaft **116** via through-bore **242** of second planar portion **240** of pivot bracket **204** such that the handle **202** is always located proximate the shift shaft **116** and is ready to be pivoted into an engaged position (e.g., second state ST2, third state ST3, and fourth state ST4) quickly and efficiently. Additionally, the handle **202** can be pivoted away and stowed (e.g., in stowed state ST1) such that there is no interference between the stowed handle **202** and the rotating shift shaft **116** during transportation of a tractor trailer.

(52) All definitions, as defined and used herein, should be understood to control over dictionary definitions, definitions in documents incorporated by reference, and/or ordinary meanings of the defined terms.

(53) The indefinite articles “a” and “an,” as used herein in the specification and in the claims, unless clearly indicated to the contrary, should be understood to mean “at least one.”

(54) The phrase “and/or,” as used herein in the specification and in the claims, should be understood to mean “either or both” of the elements so conjoined, i.e., elements that are conjunctively present in some cases and disjunctively present in other cases. Multiple elements listed with “and/or” should be construed in the same fashion, i.e., “one or more” of the elements so conjoined. Other elements may optionally be present other than the elements specifically identified by the “and/or” clause, whether related or unrelated to those elements specifically identified.

(55) As used herein in the specification and in the claims, “or” should be understood to have the same meaning as “and/or” as defined above. For example, when separating items in a list, “or” or “and/or” shall be interpreted as being inclusive, i.e., the inclusion of at least one, but also including more than one, of a number or list of elements, and, optionally, additional unlisted items. Only terms clearly indicated to the contrary, such as “only one of” or “exactly one of,” or, when used in the claims, “consisting of,” will refer to the inclusion of exactly one element of a number or list of elements. In general, the term “or” as used herein shall only be interpreted as indicating exclusive alternatives (i.e. “one or the other but not both”) when preceded by terms of exclusivity, such as “either,” “one of,” “only one of,” or “exactly one of.”

(56) As used herein in the specification and in the claims, the phrase “at least one,” in reference to a list of one or more elements, should be understood to mean at least one element selected from any one or more of the elements in the list of elements, but not necessarily including at least one of each and every element specifically listed within the list of elements and not excluding any combinations of elements in the list of elements. This definition also allows that elements may optionally be present other than the elements specifically identified within the list of elements to which the phrase “at least one” refers, whether related or unrelated to those elements specifically identified.

(57) It should also be understood that, unless clearly indicated to the contrary, in any methods claimed herein that include more than one step or act, the order of the steps or acts of the method is not necessarily limited to the order in which the steps or acts of the method are recited.

(58) In the claims, as well as in the specification above, all transitional phrases such as “comprising,” “including,” “carrying,” “having,” “containing,” “involving,” “holding,” “composed of,” and the like are to be understood to be open-ended, i.e., to mean including but not limited to. Only the transitional phrases “consisting of” and “consisting essentially of” shall be closed or semi-closed transitional phrases, respectively.

(59) While several inventive embodiments have been described and illustrated herein, those of ordinary skill in the art will readily envision a variety of other means and/or structures for performing the function and/or obtaining the results and/or one or more of the advantages described herein, and each of such variations and/or modifications is deemed to be within the scope of the inventive embodiments described herein. More generally, those skilled in the art will readily

appreciate that all parameters, dimensions, materials, and configurations described herein are meant to be exemplary and that the actual parameters, dimensions, materials, and/or configurations will depend upon the specific application or applications for which the inventive teachings is/are used. Those skilled in the art will recognize, or be able to ascertain using no more than routine experimentation, many equivalents to the specific inventive embodiments described herein. It is, therefore, to be understood that the foregoing embodiments are presented by way of example only and that, within the scope of the appended claims and equivalents thereto, inventive embodiments may be practiced otherwise than as specifically described and claimed. Inventive embodiments of the present disclosure are directed to each individual feature, system, article, material, kit, and/or method described herein. In addition, any combination of two or more such features, systems, articles, materials, kits, and/or methods, if such features, systems, articles, materials, kits, and/or methods are not mutually inconsistent, is included within the inventive scope of the present disclosure.

Claims

1. A handle assembly, comprising: a handle comprising a first end and a second end, the first end having a grip portion and the second end arranged proximate to an engagement bracket portion, the engagement bracket portion comprising a plurality of grooves; a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket comprising a through-bore arranged to receive a shift shaft of a trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft; and a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis; wherein the plurality of grooves are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction; wherein the handle comprises the plurality of grooves and the pin includes a first end and a second end, the first end arranged to engage with a first groove of the plurality of grooves and the second end arranged to engage with a second groove of the plurality of grooves; wherein the engagement bracket portion of the handle further comprises a first arm and a second arm, the first arm comprising the first groove and the second arm comprising the second groove; and wherein the first arm has a first end and a second end and wherein the first groove is stepped or sloped between the first end and the second end of the first arm.
2. The handle assembly of claim 1, wherein, in a first state, the plurality of grooves are arranged to engage with the pin such that the rotation of the handle about the imaginary rotational axis in the first rotational direction generates the rotational motion of the shift shaft in the first rotational direction; and, in a second state, the handle is configured to pivot about the pivot bracket to a stowed state.
3. The handle assembly of claim 2, wherein, in at least the second state, the handle is configured to pivot about the pivot bracket, while the pivot bracket remains arranged about the shift shaft.
4. The handle assembly of claim 1, wherein the engagement bracket portion includes a longitudinal member arranged to telescopingly engage with the second end of the handle, and wherein the longitudinal member includes a first plurality of adjustment apertures that are configured to align with a second plurality of adjustment apertures on the second end of the handle.
5. The handle assembly of claim 1, wherein the handle comprises the plurality of grooves and each of the plurality of grooves includes a translational groove portion and an expanded groove portion, the expanded groove portion arranged to engage with the pin.
6. The handle assembly of claim 1, wherein the second arm has a first end and a second end and wherein the second groove is stepped or sloped between the first end and the second end of the second arm.
7. The handle assembly of claim 1, wherein the engagement bracket portion of the handle further

comprises a spring pin arranged between the first arm and the second arm.

8. A trailer landing gear system, comprising: a first landing gear leg rotationally engaged with a cross-shaft of a landing gear assembly; a shift shaft connected to the first landing gear leg; and a handle assembly comprising: a handle comprising a first end and a second end, the first end having a grip portion and the second end arranged proximate to an engagement bracket portion, the engagement bracket portion comprising a plurality of grooves; a pivot bracket pivotably secured to the engagement bracket portion, the pivot bracket comprising a through-bore arranged to receive the shift shaft of the trailer landing gear assembly, such that the pivot bracket is arranged about the shift shaft; and a pin secured to a proximate end of the shift shaft, the shift shaft having an imaginary rotational axis; wherein the plurality of grooves are arranged to engage with the pin such that rotation of the handle about the imaginary rotational axis in a first rotational direction generates a rotational motion of the shift shaft in the first rotational direction; wherein the pin comprises a first end and a second end, the first end arranged to engage with a first groove of the plurality of grooves and the second end arranged to engage with a second groove of the plurality of grooves; wherein the engagement bracket portion of the handle further comprises a first arm and a second arm, the first arm comprising the first groove and the second arm comprising the second groove; and wherein the first arm has a first end and a second end and wherein the first groove is stepped or sloped between the first end and the second end of the first arm.

9. The trailer landing gear system of claim 8, wherein, in a first state, the plurality of grooves are arranged to engage with the pin such that the rotation of the handle about the imaginary rotational axis in the first rotational direction generates the rotational motion of the shift shaft in the first rotational direction; and, in a second state, the handle is configured to pivot about the pivot bracket to a stowed state.

10. The trailer landing gear system of claim 9, wherein, in at least the second state, the handle is configured to pivot about the pivot bracket, while the pivot bracket remains arranged about the shift shaft.

11. The trailer landing gear system of claim 8, wherein the plurality of grooves each include a translational groove portion and an expanded groove portion, the expanded groove portion arranged to engage with the pin.

12. The trailer landing gear system of claim 8, wherein the second arm has a first end and a second end and wherein the second groove is stepped or sloped between the first end and the second end of the second arm.
