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### TAILGATE HINGE ASSEMBLY

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#### Abstract

A hinge assembly configured to couple either a motorized tailgate or a non-motorized tailgate to a side wall of a bed of a vehicle. The hinge assembly includes a hinge bracket configured to be fixed to the side wall, and an elongated hinge key having a proximate end attached to the hinge bracket and a distal end including a keyed surface, wherein the elongated hinge key is configured to be fixed to a first cup that is configured to be attached to the motorized tailgate and configured to be received within a second cup that is configured to be attached to the non-motorized tailgate such that the second cup can rotate about the elongated hinge key.

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#### Background/Summary

## FIELD

[0001] The present disclosure relates to a tailgate hinge assembly.

## BACKGROUND

[0002] This section provides background information related to the present disclosure which is not necessarily prior art.

[0003] Tailgates are pivotal components of various vehicles, especially trucks and utility vehicles, providing access to a cargo area. Tailgate hinge assemblies have been designed with a specific focus on either powered or unpowered (manually operated) tailgates. Powered tailgates, equipped with motors or hydraulic systems, allow for automatic opening and closing with minimal physical effort. These systems generally require specialized hinge assemblies that can accommodate the additional stresses and operational demands of motorized movement. Conversely, unpowered tailgates rely on manual operation and are typically paired with hinge assemblies that are simpler in design, but require physical force for operation.

[0004] One challenge has been the development of a versatile hinge assembly capable of efficient operation in both powered and unpowered tailgates. Such versatility is desirable for greater manufacturing efficiency, as the same hinge assembly can be used across different tailgate designs, e.g. powered and unpowered.

## SUMMARY

[0005] This section provides a general summary of the disclosure, and is not a comprehensive disclosure of its full scope or all of its features.

[0006] According to a first aspect of the present disclosure, there is provided a hinge assembly configured to couple either a motorized tailgate or a non-motorized tailgate to a side wall of a bed of a vehicle, the hinge assembly including a hinge bracket configured to be fixed to the side wall, an elongated hinge key having a proximate end attached to the hinge bracket and a distal end including a keyed surface, wherein the elongated hinge key is configured to be fixed to a first cup that is configured to be attached to the motorized tailgate and configured to be received within a second cup that is configured to be attached to the non-motorized tailgate such that the second cup can rotate about the elongated hinge key.

[0007] According to the first aspect, the distal end includes a threaded aperture configured for receipt of a threaded pin that fixes the hinge key to the first cup and prevents the first cup from rotating relative to the hinge key.

[0008] According to the first aspect, the first cup has a through-hole configured to be aligned with the threaded aperture and configured for receipt of the threaded pin.

[0009] According to the first aspect, the keyed surface includes a profile that is configured to mate with an interior surface of the first cup that has a profile that corresponds to the profile of the keyed surface to prevent the first cup from rotating relative to the hinge key.

[0010] According to the first aspect, the first cup is fixed to the hinge key such that when the motorized tailgate is moved from a closed position to an open position, the motorized tailgate moves relative to the first cup.

[0011] According to the first aspect, second cup includes a smooth interior surface that terminates at a bumper that extends radially inward from the interior surface and is configured to be abutted by the keyed surface of the hinge key, the second cup being configured to rotate relative to the hinge key until keyed surface of the hinge key abuts the bumper.

[0012] According to the first aspect, the second cup is fixed to the non-motorized tailgate and is configured to rotate about the hinge key as the non-motorized tailgate is moved from a closed position to an open position.

[0013] According to a second aspect of the present disclosure, a vehicle including a vehicle body having a bed defined by a pair of side walls, either a motorized tailgate or a non-motorized tailgate positioned between the pair of sidewalls and pivotably coupled to at least one sidewall of the pair

of sidewalls by a hinge assembly, the hinge assembly including a hinge bracket configured to be fixed to the one side wall, and an elongated hinge key having a proximate end attached to the hinge bracket and a distal end including a keyed surface, wherein the elongated hinge key is configured to be fixed to a first cup that is configured to be attached to the motorized tailgate and configured to be received within a second cup that is configured to be attached to the non-motorized tailgate such that the second cup can rotate about the elongated hinge key.

[0014] According to the second aspect, the distal end includes a threaded aperture configured for receipt of a threaded pin that fixes the hinge key to the first cup and prevents the first cup from rotating relative to the hinge key.

[0015] According to the second aspect, the first cup has a through-hole configured to be aligned with the threaded aperture and configured for receipt of the threaded pin.

[0016] According to the second aspect, the keyed surface includes a profile that is configured to mate with an interior surface of the first cup that has a profile that corresponds to the profile of the keyed surface to prevent the first cup from rotating relative to the hinge key.

[0017] According to the second aspect, the first cup is fixed to the hinge key such that when the motorized tailgate is moved from a closed position to an open position, the motorized tailgate moves relative to the first cup.

[0018] According to the second aspect, the second cup includes a smooth interior surface that terminates at a bumper that extends radially inward from the interior surface and is configured to be abutted by the keyed surface of the hinge key, the second cup being configured to rotate relative to the hinge key until keyed surface of the hinge key abuts the bumper.

[0019] According to the second aspect, the second cup is fixed to the non-motorized tailgate and is configured to rotate about the hinge key as the non-motorized tailgate is moved from a closed position to an open position.

[0020] Further areas of applicability will become apparent from the description provided herein. The description and specific examples in this summary are intended for purposes of illustration only and are not intended to limit the scope of the present disclosure.

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## Description

### DRAWINGS

[0021] The drawings described herein are for illustrative purposes only of selected embodiments and not all possible implementations, and are not intended to limit the scope of the present disclosure.

[0022] FIG. 1 is a perspective view of a vehicle according to a principle of the present disclosure;

[0023] FIG. 2 is a partial perspective view of a tailgate and an example tailgate hinge assembly of the vehicle illustrated in FIG. 1;

[0024] FIG. 3A is an exploded view of the motorized configuration of the example tailgate hinge assembly according to a principle of the present disclosure.

[0025] FIG. 3B is an exploded view of the non-motorized configuration of the example tailgate hinge assembly according to a principle of the present disclosure.

[0026] FIG. 4A is a perspective view of the motorized configuration of the example tailgate hinge assembly in the tailgate closed position;

[0027] FIG. 4B is a perspective view of the motorized configuration of the example tailgate hinge assembly in the tailgate open position;

[0028] FIG. 5A is a perspective view of the non-motorized configuration of the example tailgate hinge assembly in the tailgate closed position;

[0029] FIG. 5B is a perspective view of the non-motorized configuration of the example tailgate hinge assembly in the tailgate open position; and

[0030] FIG. 6 is a cross section view of the example tailgate hinge assembly.

[0031] Corresponding reference numerals indicate corresponding parts throughout the several views of the drawings.

#### DETAILED DESCRIPTION

[0032] Example embodiments will now be described more fully with reference to the accompanying drawings. The example embodiments are provided so that this disclosure will be thorough, and will fully convey the scope to those who are skilled in the art. Numerous specific details are set forth such as examples of specific components, devices, and methods, to provide a thorough understanding of embodiments of the present disclosure. It will be apparent to those skilled in the art that specific details need not be employed, that example embodiments may be embodied in many different forms and that neither should be construed to limit the scope of the disclosure. In some example embodiments, well-known processes, well-known device structures, and well-known technologies are not described in detail.

[0033] The terminology used herein is for the purpose of describing particular example embodiments only and is not intended to be limiting. As used herein, the singular forms “a,” “an,” and “the” may be intended to include the plural forms as well, unless the context clearly indicates otherwise. The terms “comprises,” “comprising,” “including,” and “having,” are inclusive and therefore specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components, and/or groups thereof. The method steps, processes, and operations described herein are not to be construed as necessarily requiring their performance in the particular order discussed or illustrated, unless specifically identified as an order of performance. It is also to be understood that additional or alternative steps may be employed.

[0034] Although the terms first, second, third, etc. may be used herein to describe various elements, components, regions, layers and/or sections, these elements, components, regions, layers and/or sections should not be limited by these terms. These terms may be only used to distinguish one element, component, region, layer or section from another region, layer or section. Terms such as “first,” “second,” and other numerical terms when used herein do not imply a sequence or order unless clearly indicated by the context. Thus, a first element, component, region, layer, or section discussed below could be termed a second element, component, region, layer, or section departing from the teachings of the example embodiments.

[0035] FIG. 1 illustrates an example vehicle **10** according to the present disclosure. The vehicle **10** may be a pickup truck including a body **12** and a tailgate **14**. Tailgate **14** may be hollow and formed of an exterior panel **15**, a pair of side panels **16**, an interior panel **17** that faces a cargo bed **20** of vehicle **10**, and a bottom panel **18**. Cargo bed **20** may include a bed floor (not shown), a pair of side walls **22** and **24**, and a front wall panel **26**. The tailgate **14** may be pivotably coupled to the side walls **22** and **24** so that the tailgate **14** is allowed to pivot about a horizontal axis H between a horizontal open position (not shown) and a horizontal closed position (FIG. 1), as is known in the art.

[0036] FIG. 2 illustrates a portion of the tailgate **14** having an example tailgate hinge assembly **28** according to the present disclosure. The tailgate hinge assembly **28** may generally include a hinge bracket **30**, a hinge key **32**, and a cup **36**. The tailgate hinge assembly **28** illustrated in FIG. 2 is configured to be positioned between the tailgate **14** and the right side wall **24**. It should be understood, however, that the tailgate hinge assembly **28** may be positioned between the left side wall **22** and the tailgate **14** without departing from the scope of the present disclosure.

[0037] Tailgate **14** may further include an L-shaped bracket **42** located within the hollow interior **43** of tailgate **14** that includes a bottom leg **42a** that extends along bottom panel **18** and a side leg **42b** that extends alongside panel **16**. Bottom leg **42a** and side leg **42b** are connected at a joint **42c** such that a right angle is formed between bottom leg **42a** and side leg **42b**. Side leg **42b** is configured to be attached to the side panel **16** and the bottom leg **42a** is configured to be attached

to the bottom panel **18**. In a motorized configuration, the L-shaped bracket **42** may be configured to support a tailgate motor **44** at the bottom leg **42a**, which is attached to side leg **42b** by a rotatable shaft **46** that can rotate L-shaped bracket **42** and tailgate **14** relative to cup **36** and sidewall **22**. [0038] The hinge bracket **30** may be attached to the side wall **24** by, for example, fasteners **38**. The hinge bracket **30** may be a stamped member that includes a first planar region **30a** having a pair of apertures **31** configured for receipt of the fasteners **38** and a second planar region **30b** that defines a hinge key aperture **33** configured for receipt of hinge key **32**. Second planar region **30b** is recessed relative to first planar region **30a** and connected to first planar region **30a** by a sidewall **35** that extends in a direction towards the tailgate **14**. The hinge bracket **30** may be formed of a rigid material such as a metal (e.g., steel or aluminum).

[0039] As best shown in FIGS. 3A and 3B, the hinge key **32** is an elongated member having a proximate end **48** attached to hinge key aperture **33**, a distal end **50**, and a keyed surface **52** that extends between proximate end **48** and distal end **50**. The distal end **50** may include a threaded aperture **54** for receiving a pin **34** characterized by a head **56** and a threaded shank **58**.

[0040] The hinge key **32** may be a generally parallelepiped-shaped member that defines the keyed surface **52**, and is configured to mate with the interior wall **64a** or **64b** of either of the cup **36a** that is configured for use with a motorized tailgate **14** or the cup **36b** that is configured for use with a non-motorized tailgate. Put another way, the combination of the hinge bracket **30** and the hinge key **32** is a common feature between the non-motorized tailgate **14** and the motorized tailgate **14** that includes the motor **44**. Hinge key **32** includes a first planar side surface **52a** that includes threaded aperture **54**, a second planar side surface **52b** connected to first planar side surface **52a** by a first elongated stepped surface **53a**, a third planar side surface **52c** connected to first planar side surface **52a** by a second elongated stepped surface **53b**, and an arcuate side surface **52d** that connects second planar side surface **52b** to third planar side surface **52c**.

[0041] The cup **36a** that is attached to the motorized tailgate **14** is best shown in FIG. 3A and the cup **36b** that is attached to the non-motorized tailgate **14** is best shown in FIG. 3B. In either configuration, the cups **36a** and **36b** may include a gap **66** that permits the tailgate **14** to be detached from hinge key **32**. That is, gap **66** may be formed such that when tailgate **14** is pivoted about horizontal axis H from the closed position to an angle of about 45 degrees, tailgate **14** may be pulled away from hinge key **32** and hinge key **32** can exit the gap **66**.

[0042] The cup **36a** that is attached to the motorized tailgate **14** illustrated in FIG. 3A is fixed relative to the side panel **16** and the L-shaped bracket **42** located within the interior **43** of the tailgate **14** because cup **36a** is fixed to hinge key **32** by pin **34** that passes through a through-hole **70** formed in a wall **68** of cup **36a** before engaging with threaded aperture **54** of hinge key **32**. Cup **36a** may include wall **68a** having an interior surface **64a** that is correspondingly shaped to mate with the keyed surface **52** of hinge key **32** and further prevent rotation of cup **36a** relative to hinge key **32**. Thus, when tailgate **14** is to be moved from the closed position (FIG. 4A) to the open position (FIG. 4B) by pivoting the tailgate **14** along the horizontal axis H, motor **44** that is connected to L-shaped bracket **42** by shaft **46** will rotate shaft **46**, L-shaped bracket **42**, and tailgate **14** relative to the fixed cup **36a**. It should be noted that tailgate **14** is omitted in FIG. 4B to show the movement of L-shaped bracket **42** relative to cup **36a**.

[0043] In contrast to the cup **36a** used in conjunction with the motorized tailgate **14** that is fixed to the fixed hinge key **32**, the cup **36b** is configured to be movable relative to the fixed hinge key **32** and, therefore, is fixed to the side panel **16** of the tailgate **14**. Inasmuch as cup **36b** is movable relative to hinge key **32**, cup **36b** does not include the through-hole **70** in the cup wall **68b** and does not include an interior surface **64b** that is shaped to correspond to the keyed surface **52** of hinge key **32**. In this regard, interior wall **64b** of the cup **36b** may include a predominantly smooth and uniform surface that terminates at a bumper **72**, which is an angled surface that extends radially inward from interior wall **64b**. As best shown in FIGS. 5A and 5B, the uniform surface of the interior wall **64** of the cup **36b** allows rotation of cup **36b** around the keyed surface **52** of the hinge

key **32** as the tailgate **14** is pivoted to the open position about horizontal axis H until bumper **72** is contacted by, for example, second elongated stepped surface **53b** that stops rotation of cup **36b** relative to hinge key **32**.

[0044] In summary, the present disclosure provides a combination of a hinge key **32** and a hinge bracket **30** that can be used with either a motorized tailgate **14** or a non-motorized tailgate **14**. Inasmuch as the combination of the hinge key **32** and hinge bracket **30** can be used in either design, manufacturing efficiency can be improved and the overall design of a motorized tailgate does not need to be substantially different from the design of a non-motorized tailgate.

[0045] The foregoing description of the embodiments has been provided for purposes of illustration and description. It is not intended to be exhaustive or to limit the disclosure. Individual elements or features of a particular embodiment are generally not limited to that particular embodiment, but, where applicable, are interchangeable and can be used in a selected embodiment, even if not specifically shown or described. The same may also be varied in many ways. Such variations are not to be regarded as a departure from the disclosure, and all such modifications are intended to be included within the scope of the disclosure.

## Claims

1. A hinge assembly configured to couple either a motorized tailgate or a non-motorized tailgate to a side wall of a bed of a vehicle, the hinge assembly comprising: a hinge bracket configured to be fixed to the side wall; and an elongated hinge key having a proximate end attached to the hinge bracket and a distal end including a keyed surface, wherein the elongated hinge key is configured to be fixed to a first cup that is configured to be attached to the motorized tailgate and configured to be received within a second cup that is configured to be attached to the non-motorized tailgate such that the second cup can rotate about the elongated hinge key.
2. The hinge assembly of claim 1, wherein the distal end includes a threaded aperture configured for receipt of a threaded pin that fixes the hinge key to the first cup and prevents the first cup from rotating relative to the hinge key.
3. The hinge assembly of claim 2, wherein the first cup has a through-hole configured to be aligned with the threaded aperture and configured for receipt of the threaded pin.
4. The hinge assembly of claim 1, wherein the keyed surface includes a profile that is configured to mate with an interior surface of the first cup that has a profile that corresponds to the profile of the keyed surface to prevent the first cup from rotating relative to the hinge key.
5. The hinge assembly of claim 4, wherein the first cup is fixed to the hinge key such that when the motorized tailgate is moved from a closed position to an open position, the motorized tailgate moves relative to the first cup.
6. The hinge assembly of claim 1, wherein second cup includes a smooth interior surface that terminates at a bumper that extends radially inward from the interior surface and is configured to be abutted by the keyed surface of the hinge key, the second cup being configured to rotate relative to the hinge key until keyed surface of the hinge key abuts the bumper.
7. The hinge assembly of claim 6, wherein the second cup is fixed to the non-motorized tailgate and is configured to rotate about the hinge key as the non-motorized tailgate is moved from a closed position to an open position.
8. A vehicle comprising: a vehicle body having a bed defined by a pair of side walls; either a motorized tailgate or a non-motorized tailgate positioned between the pair of sidewalls and pivotably coupled to at least one sidewall of the pair of sidewalls by a hinge assembly, the hinge assembly including: a hinge bracket configured to be fixed to the one side wall; and an elongated hinge key having a proximate end attached to the hinge bracket and a distal end including a keyed surface, wherein the elongated hinge key is configured to be fixed to a first cup that is configured to be attached to the motorized tailgate and configured to be received within a second cup that is

configured to be attached to the non-motorized tailgate such that the second cup can rotate about the elongated hinge key.

**9.** The vehicle of claim 8, wherein the distal end includes a threaded aperture configured for receipt of a threaded pin that fixes the hinge key to the first cup and prevents the first cup from rotating relative to the hinge key.

**10.** The vehicle of claim 9, wherein the first cup has a through-hole configured to be aligned with the threaded aperture and configured for receipt of the threaded pin.

**11.** The vehicle of claim 8, wherein the keyed surface includes a profile that is configured to mate with an interior surface of the first cup that has a profile that corresponds to the profile of the keyed surface to prevent the first cup from rotating relative to the hinge key.

**12.** The vehicle of claim 11, wherein the first cup is fixed to the hinge key such that when the motorized tailgate is moved from a closed position to an open position, the motorized tailgate moves relative to the first cup.

**13.** The vehicle of claim 8, wherein second cup includes a smooth interior surface that terminates at a bumper that extends radially inward from the interior surface and is configured to be abutted by the keyed surface of the hinge key, the second cup being configured to rotate relative to the hinge key until keyed surface of the hinge key abuts the bumper.

**14.** The vehicle of claim 13, wherein the second cup is fixed to the non-motorized tailgate and is configured to rotate about the hinge key as the non-motorized tailgate is moved from a closed position to an open position.

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