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(54) Title: ADJUSTABLE UNIT FOR ATTACHING A TRAILER TO A TOWING VEHICLE

(Fig. 2)

(57) Abstract: An improved adjustable trailer coupler/hitch that can be mounted on a towing vehicle or built as part of a trailer is disclosed. The adjustable coupler/hitch allows for fast and easy connection to a variety of towing vehicles. The preferred embodiment of the disclosed coupler/hitch also provides the option to choose the correct towing height for the particular vehicle. The disclosed coupler/hitch can eliminate the need to have several conventional hitches with different drops or rises.
ADJUSTABLE UNIT FOR ATTACHING A TRAILER TO A TOWING VEHICLE

BACKGROUND

[0001] The present application generally relates to a coupler/hitch to connect two members together. More specifically, the present application is directed to a coupler/hitch for connecting a vehicle and a trailer together.

[0002] Trailer hitches are well known and problems with aligning a hitch assembly are also well known. Several prior art disclosures purport to provide an adjustable hitch assembly to address the issue of aligning the hitch assembly. However, there still exists a need for a better solution to the alignment problems. Accordingly, it would be advantageous to provide an improved adjustable trailer coupler hitch assembly.

SUMMARY OF THE PREFERRED EMBODIMENTS

[0003] The present application discloses preferred embodiments of an adjustable trailer coupler/hitch that can be mounted on a towing vehicle or that can be built as part of trailer. The preferred embodiments of the present disclosure provide a coupler/hitch that is adjustable in multiple directions. For example, the preferred embodiments are fully adjustable in six directions. The provided adjustability of the preferred embodiment makes it easier to connect to a trailer of any kind. It essentially makes connecting to a trailer a one person job.

[0004] The preferred embodiments also provide for fast and easy connection to a variety of towing vehicles. For example, the preferred embodiments allow the coupler/hitch to be lowered to disconnect the vehicle from the trailer coupler which can assist in disconnection of heavy loads.

[0005] The preferred embodiments can include an effective anti-theft function which doubles to providing a safety function by preventing the trailer coupler from disconnecting from the hitch during towing.

[0006] The preferred embodiments allow for a choice of towing heights. For safe and comfortable towing, a trailer should always be as level as possible. A level trailer will put less strain on the connection between the trailer and hitch. It will also help the trailer stay in line behind the vehicle. Because trailer and vehicle heights often differ, ball mounted hitches with different rises or drops are often needed for safe towing. The preferred embodiments disclosed can eliminate the need to buy a number of different hitches.
[0007] Preferably the coupler hitch's final position is set after a trailer is connected. Upon connection, the operator can push the trailer across until it locks in the straight position. It can then be pulled forward and raised or lowered by a provided screwjack until the ideal height for towing is set. Finally, a lock pin is put in place. Preferably the lock pin is spring loaded. If the trailer is heavily loaded and/or otherwise not easily susceptible to being moved by hand, the final position alternatively can be achieved by using the vehicle to effect positioning and locking of the hitch. In this alternate manner, the vehicle instead of the trailer is slowly moved with the steering wheel of the vehicle turned in the opposite direction to that which the hitch is extended.

Moving the vehicle with the wheels so oriented will cause the hitch assembly to move toward the direction of the extended trailer and permit the spring loaded pin to automatically snap into place when the coupler/hitch is properly aligned. After the spring loaded pin has snapped in place, the vehicle can be reversed until the hitch is back in the correct position. The ideal height for towing can then be selected, and the lock pin can be put in place.

[0008] Thus, the invention has several aspects. In keeping with a first aspect, an adjustable unit for attaching a trailer to a towing vehicle is provided comprising a bracket configured to be secured to one of the trailer and towing vehicle; a first elongated sleeve defining a track extending between first and second ends of the first sleeve, the first sleeve being secured in the bracket and rotatable relative to the bracket; a follower movable along the track of the first sleeve and lockable relative to the track at a plurality of selected positions; and a telescoping member associated with the follower and linearly movable with respect thereto to at least one fixed position relative to the first sleeve, the telescoping member having one of a coupler and a hitch associated therewith.

[0009] In keeping with a second aspect, the track in the first sleeve comprises one or more elongated slots, and the follower comprises a first member received interior of the first sleeve and a second member corresponding to each elongated slot extending through its associated slot, the telescoping member being slidable along the second member of the follower.

[0010] In keeping with a third aspect, the unit further comprises a rotatable threaded shaft associated with the follower for moving the follower along the track of the first sleeve.

[0011] In keeping with a fourth aspect, the unit further comprises a first locking pin, the first sleeve comprises a series of apertures extending between the first and second ends of the first sleeve and the follower comprises at least one aperture, such that when the aperture
in the follower is aligned with one of the apertures in the first sleeve, the first locking pin may be inserted through the aligned apertures to fix the position of the follower relative to the track.

[0012] In keeping with a fifth aspect, the telescoping member includes at least one aperture, such that the aperture in the telescoping member is alignable with one or more of the apertures in the follower and one of the apertures in the first sleeve, the first locking pin may be inserted through the aligned apertures to fix the positions of the first sleeve, follower, and second sleeve relative to each other.

[0013] In keeping with a sixth aspect, the unit further comprises a second locking pin and wherein the follower comprises at least a first and second aperture and the second sleeve comprises a plurality of apertures, such that when the first aperture in the follower is aligned with one of the apertures in the first sleeve the first locking pin may be inserted through the aligned apertures to fix the position of the follower relative to the track, and when the second aperture in the follower is aligned with one of the apertures in the second sleeve the second locking pin may be inserted therethrough to fix the position of the second sleeve relative to the follower.

[0014] In keeping with a seventh aspect, the unit further comprises a stop to limit outward movement of the second sleeve relative to the follower.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0015] FIG. 1 is an exploded isometric view of a preferred embodiment of the adjustable coupler/hitch of the present application.

[0016] FIG. 2 is an isometric view of the adjustable coupler/hitch of FIG. 1.

[0017] FIG. 3 is a side view of the adjustable coupler/hitch of FIG. 2 showing vertical and horizontal adjustability of the coupler/hitch.

[0018] FIG. 4 is a top view of the adjustable coupler/hitch of FIG. 2 showing arcuate adjustability of the coupler/hitch.

[0019] FIG. 5 is an end view of the adjustable coupler/hitch of FIG. 2.

[0020] FIG. 6 is an enlarged side view of the adjustable coupler/hitch of FIG. 2.

[0021] FIG. 7 is an enlarged top view of the adjustable coupler/hitch of FIG. 2.

[0022] FIG. 8 is an enlarged end view of the adjustable coupler/hitch of FIG. 2.

[0023] FIG. 9 is an isometric view of an alternate embodiment of adjustable coupler/hitch of FIG. 2 including an anti-theft guard.
FIG. 10 is an isometric view of an alternate embodiment an adjustable coupler/hitch according to the present invention utilizing a cylindrical single slot design.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring then to the drawings mentioned the following description of an improved adjustable coupler/hitch disclosed is given to explain clearly how the disclosed preferred embodiments work so that any person with knowledge and experience in the field may be enabled to operate not only the preferred embodiments but also variations thereof which may achieve some or all of the benefits of the preferred embodiments.

The preferred embodiments of the improved adjustable coupler/hitch are constructed from materials that are strong and durable for the applicable applications. For example, a preferred material is steel. The adjustable coupler/hitch preferably is a super strong bracket assembly fitted with a number of precisely engineered moving parts which can be understood clearly by referencing this description and the drawings supplied. FIG. 1 shows the preferred embodiment in an exploded isometric view. The parts of the preferred embodiment in FIG. 1 are numerically labelled to be reference for a full understanding. The preferred embodiment includes a vertical bracket 100a.

Vertical bracket 100a is preferably a rectangular U shape and dimensioned to receive an elongated sleeve in the form of a rectangular box 100c. Vertical bracket 100a includes atop plate or holder 100b and a bottom plate or holder 100b’ with a circular recess milled out of each of the top holder and bottom holder 100b and 100b’ to rotatably seat the elongated sleeve/rectangular steel box 100c. The elongated sleeve 100c has two milled slots 100e and is closed on both ends with circular plates or disks 100d, 100d’ preferably milled from a suitable material and designed to fit snugly into the circular recesses in the top holder 100b and bottom holder 100b’ of the vertical bracket 100a. The slots 100e define a track that extends between the ends of the sleeve 100c. Fixed to each side of the vertical rectangular box 100c are two flat plates 200a and 200b which have holes for fixing the appropriate height of the coupler/hitch, as will be discussed in greater detail below. The sleeve/rectangular steel box 100c houses a follower 200c, preferably formed of a solid piece of precisely engineered steel and including two elongated extensions 200f that pass horizontally through the two slots 100e in the sleeve/steel box steel 100c.
The follower 200c includes a throughbore 200g preferably internally threaded with, e.g., a Whitworth or square thread, or similar, to facilitate vertical movement of the follower 200c along the track defined by the sleeve by means of a screw jack 200d running vertically from the bottom inside of the vertical bracket upward to the top inside of the vertical bracket. An unthreaded portion of the screw jack exits through the top of the vertical bracket and has a handle 200e attached. The extensions 200f of the follower 200c that pass through the two slots 100 of the rectangular steel box 100c have a flat piece 300a fixed to the top thereof the extensions and another flat piece 300b fixed to the bottom thereof, with a slot 300d cut from the bottom piece 300b. These two pieces 300a, 300b combine with the extensions 200f of the follower 200c to make a box. Slidingly received in this box is a telescoping member 300c in the form of a rectangular piece that includes a stopping mechanism 400a extending from its underside that is received in the slot of bottom piece 300b. The end of the telescoping member 300c is fitted with either a hitch 400c (as best seen in FIGS. 8-10) or coupler 400b (as seen in FIGS. 2-7, 11 and 12) depending upon the application used. If fitted with a ball hitch 400c, the top plate 300a may include an anti-theft guard 700 (see, e.g., Figs. 8-10) that prevents relative vertical movement between the hitch 400c and an associated coupler 400b. In the preferred embodiment shown in FIG. 1, the telescoping member is fixed relative to the follower in two positions by means of two pins 500a and 500b.

The preferred embodiment described although not limited to the mentioned applications can function as part of a trailer design or as an extension of an existing hitch assembly. It will be appreciated that the disclosed improved adjustable coupler/hitch can be made in different sizes and strengths to suit the five different trailer classes that presently exist in the United States or to suit the weight ratings for trailers or hitches in the European Union. It will also be appreciated that the disclosed improved adjustable coupler/hitch can be built as a permanent part of a trailer or the coupler/hitch can be mounted on a vehicle. This means that future trailers can be constructed with the improved coupler/hitch or existing trailers can be towed using the 'hitch' application.

FIGS. 3-5 are elevation, plan and end views of the preferred embodiment showing the positional adjustability of the coupler or hitch. In both applications, the system moves in six directions, up and down in the direction of (u) and (v) (in FIG. 5) by means of turning the handle marked 200e. Left and right in a radius by means of
applying force at the coupler 400b in the direction on either (w) or (x) (again in FIG. 5). Out and back in to the locked position by means pulling or pushing the coupler or hitch 400a in the directions of (y) and (z) (in FIG. 3). When a trailer is connected at any point along the radius of movement it can be either be pushed across to lock in position (s) (in FIG. 4), or alternatively position (s) can achieved moving the vehicle while turning the steering wheel in the opposite direction.

Figs. 6-9 show greasing points 600a which promote safe operation of the disclosed preferred embodiment. As illustrated, the system includes a plurality locking pins to maintain the positions of the sleeve, follower and telescoping member relative to each other. Locking pin one 500a is spring loaded and automatically snaps into place when the coupler/hitch is in position (s). From that position pin one 500a which is designed not to overextend can be lifted and the coupler/hitch can be moved in a radius into position (r) or (t). The two machined discs 100d, 100d' pivoting within the vertical bracket 100a. Locking pin two marked 500b shown also on drawings 4A is a safety lock pin which is put in place after the final height is decided. The two flat plates marked 200a and 200b allow for a choice of fixing heights for the coupler/hitch. This locking pin 500b locks two positions. It prevents the coupler/hitch 400a from moving up or down, and locks the rectangular piece 300c preventing it from extending out.

The trailer application of the preferred embodiment can be locked at pin one 500a and pin two 500b as already stated. Additionally, or alternatively, the telescoping member can be locked relative to the follower in a number of extended positions in any of the holes marked (h) along the extending assembly at pin three marked 500c.

One of the difficulties in trying to connect any trailer, especially if it has a load, is attempting to get the hitch of the vehicle directly under the coupler so that the coupler of the trailer can be lowered onto the hitch. The adjustable coupler/hitch of the preferred embodiment eliminates the need for exact positioning solving the problem in an efficient manner by offering a series of simple quick adjustments that can be done with ease by a person competent in the field.

Taking the trailer application as an example, the improved adjustable coupler is constructed as part of a trailer, which is to be connected to a vehicle with a standard hitch assembly. Reverse the vehicle towards the trailer as close as possible. A competent driver will get close on most attempts. The real difficulty lies in getting the hitch and coupler lined up exactly. But this exact positioning is not necessary with a
coupler/hitch of the preferred embodiment. Once the hitch is near the person can exit the vehicle lift pin one 500a and push the coupler towards the ball hitch. In most cases the distance will need to be adjusted also. Simply remove pin two 500b and pin three 500c and pull the coupler 400a. Once the coupler is directly over the hitch the handle 200e lowers the coupler onto the hitch. When connection is made and the trailer stand is lifted and the coupler can be pushed across into the straight position (s). Then the trailer can be pulled towards the rear of the vehicle or the vehicle can be reversed until the extended coupler 400a is back in position. Alternatively locking pin three 500c can lock the unit in an extended position which may be more suitable for certain vehicles. Finally the appropriate height can be set by readjusting the handle 200e and locking pin two 500b is put in place.

[0034] Ideally a trailer should be level with a towing vehicle before it is loaded. This makes towing safe and comfortable and easier because a level trailer will put less strain on the connection between the trailer and hitch. It will also help the trailer stay in line behind the vehicle. When the trailer is loaded the weight should be evenly spread on all the tires of the trailer. The load will change the position of the trailer and the rear of the vehicle. If the trailer is loaded correctly 85 - 90% of the weight will be on the trailer and 10 - 15% will be on the rear of the vehicle. This weight that sits on the rear chassis at the point of the ball assembly of the vehicle is known as 'tongue' weight and is the most important consideration in towing a trailer safely. However, even if the weight is correctly distributed from the trailer to the vehicle, the final height setting can be off because the suspension of the vehicle is too soft or too hard. One of the most important aspects of towing safety is having the vehicle and trailer at the right height. Therefore there are currently many different fixed hitches on the market which have different drop heights or different rise heights. Some of these are reversible but that only gives two height options. Achieving the correct height is very difficult with the hitches and trailer designs currently on the market. The preferred embodiment deals with this difficulty by allowing for adjustment after the trailer is loaded therefore making towing safer and easier.

[0035] If a trailer is mounted too high or too low, when loaded it will mean the tongue weight will tend to be either too much or too little. Both cause a series of problems for the trailer and the vehicle. In both cases it will mean that the two tires on either the front axle or the rear axle of the trailer will bear most of the weight and will overheat, increasing the possibility of a blowout. Both of these also cause problems for the braking system on the vehicle and on the trailer. If too high, it will have a tendency to cause sway at the rear
of a vehicle and there is extra pressure on the coupler which might cause decoupling of
the trailer. If too low the addition tongue weight will cause the steering on the vehicle
to be light especially when breaking. With the adjustable couple/hitch of the present
invention, if the trailer is too low or too high the height can be adjusted at the handle

200e before loading begins and again after loading is complete. One of the preferred
features of the preferred embodiment is the ability to be adjustable so that it can be
adjusted to the correct height after the load has been put on the trailer.

[0036] It should be noted here that variations of the preferred embodiment can be
constructed with one, two or three or more slots depending upon the strength required
and the two slot design illustrated herein is for purposes of representation of the
preferred embodiment.

[0037] For example, an alternative embodiment of the disclosure can be seen in
FIG. 10. This design has one slot and is similar in regard to movements and
functionality. For purposes of clarity in these drawings the different parts are labelled
with their own designation. In this embodiment the sleeve 100c that fits into bracket
100a is in the form of a cylinder. The cylinder 100c fits into the vertical bracket 100a
and therefore there is no need for the disk 100d shown in FIG. 1, as the cylinder 100c
fits directly into the vertical bracket 100a. Also the embodiment shown in FIG.10 has
one slot 100e milled out of the front of the cylinder 100c and has a flat plate 200b fixed
to the front in line with the slot. This plate 200b, as with the first design mentioned, has
a number of holes which allows for fixing different heights. The follower 200c has a
different shape. It is now cylindrical so it can move up and down within the cylinder
100c and a single extension 200f passes out through the slot. A horizontal sleeve 300f
in the form box is fixed to the extension of the follower 200c that passes through the
slot. This horizontal sleeve 300f has a slot 300d cut from the underside and telescoping
member 300c moves in and out within this sleeve 300f.

[0038] For a three slot version the scale would increase and another slot is cut to the
front of a bigger vertical rectangular box 100c. The end result is a design that is
stronger but is the same in regard to movement and functionality.

[0039] The disclosure in any embodiment can be made from a range of materials
such as steel, magnesium, titanium, cast metals and mixed alloys, depending upon the
application and required strength.

[0040] The foregoing description of the preferred embodiments is not intended to
limit the scope of the present disclosure. For example, while preferred embodiments of
an improved adjustable coupler/hitch have been disclosed, persons of ordinary skill in
the art will understand that a variety of other designs and alternative arrangements can
be envisioned with the benefit of the present disclosure.
Claims:

1. An adjustable unit for attaching a trailer to a towing vehicle comprising:
   a) A bracket configured to be secured to one of the trailer and towing vehicle;
   b) A first elongated sleeve defining a track extending between first and second ends of the first sleeve, the first sleeve being secured in the bracket and rotatable relative to the bracket;
   c) A follower movable along the track of the first sleeve and lockable relative to the track at a plurality of selected positions; and
   d) A telescoping member associated with the follower and linearly movable with respect thereto to at least one fixed position relative to the first sleeve, the telescoping member having one of a coupler and a hitch associated therewith.

2. The unit of claim 1 wherein the track in the first sleeve comprises one or more elongated slots, and the follower comprises a first member received interior of the first sleeve and a second member corresponding to each elongated slot extending through its associated slot, the telescoping member being slidable along the second member of the follower.

3. The unit of claim 1 or 2 further comprising a rotatable threaded shaft associated with the follower for moving the follower along the track of the first sleeve.

4. The unit of any of the preceding claims further comprising a first locking pin, and wherein first sleeve comprises a series of apertures extending between the first and second ends of the first sleeve and the follower comprises at least one aperture, such that when the aperture in the follower is aligned with one of the apertures in the first sleeve, the first locking pin may be inserted through the aligned apertures to fix the position of the follower relative to the track.

5. The unit of any of the preceding claims further comprising a stop to limit outward movement of the second sleeve relative to the follower.
6. The unit of claim 4 wherein the telescoping member comprises at least one aperture, such that the aperture in the second sleeve is alignable with the aperture in the follower and one of the apertures in the first sleeve, a locking pin being inserted through the aligned apertures to fix the positions of the first sleeve, follower, and telescoping member relative to each other.

7. The unit of claim 4 further comprising a second locking pin and wherein the follower comprises at least a first and second aperture and the telescoping member comprises a plurality of apertures, such that when the first aperture in the follower is aligned with one of the apertures in the first sleeve, the first locking pin may be inserted through the aligned apertures to fix the position of the follower relative to the track, and when the second aperture in the follower is aligned with one of the apertures in the telescoping member the second locking pin may be inserted therethrough to fix the position of the telescoping member relative to the follower.
(Fig. 6)

(Fig. 7)
INTERNATIONAL SEARCH REPORT

According to International Patent Classification (IPC) or to both national classification and IPC:

A. CLASSIFICATION OF SUBJECT MATTER

INV. B60D1/44 B60D1/46 B60D1/155 B60D1/06

ADD.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

B60D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched:

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used):

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 2007/284851 AI (ADCOCK JUSTIN TODD [US]) 13 December 2007 (2007-12-13) paragraphs [0019], [0020], [0021], [0026], [0028], [0030] figures 2, 3, 5</td>
<td>1, 3-7</td>
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<td>X</td>
<td>US 5 236 214 A (TAYLOR W LLIAM L [US]) 17 August 1993 (1993-08-17) column 2, line 55 - column 3, line 47 column 4, line 13 - line 43 figures 1, 2, 3</td>
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Name and mailing address of the ISA:

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