

MOVABLE TOW BAR

FIELD OF THE INVENTION

[0001] The invention relates to a movable tow bar. In particular, the invention relates, but is not limited, to a tow bar which moves relative to a vehicle to provide a user with increased manoeuvrability and/or control.

BACKGROUND TO THE INVENTION

[0002] Reference to background art herein is not to be construed as an admission that such art constitutes common general knowledge.

[0003] Tow bars, also known as a tow or trailer hitch, are commonly used to connect a towing vehicle to a trailer, or the like. Typical standard tow bars used by consumers have an extension member with a tow ball. The tow ball can be received by a coupling on the trailer which securely connects the two together while allowing limited relative movement. Another towing attachment system uses a hook and ring and operates in a similar manner.

[0004] Drivers of non-tow vehicles can often find it difficult to manoeuvre a towed trailer. This is particular the case when travelling in reverse, where the trailer precedes the driven vehicle. Notably, turning the driven vehicle in a particular direction results in the trailer tending towards the opposite direction. Even for experienced drivers this behaviour can present significant manoeuvrability challenges. This can reduce safety, increase time taken, increase frustration, and/or result in an accident that causes damage to the vehicle, trailer, environment, and/or injures nearby people.

OBJECT OF THE INVENTION

[0005] It is an aim of this invention to provide a movable tow bar which overcomes or ameliorates one or more of the disadvantages or problems described above, or which at least provides a useful alternative.

- 2 -

[0006] Other preferred objects of the present invention will become apparent from the following description.

SUMMARY OF INVENTION

[0007] In one form, although it need not be the only or indeed the broadest form, there is provided a movable tow bar comprising:

a frame configured to be mounted to a vehicle;

a towing attachment connected to the frame; and

an actuator coupled to the towing attachment;

wherein the towing attachment is movable relative to the frame and actuation of the actuator moves the towing attachment towards a side of the vehicle.

[0008] In another form, there is provided a movable tow bar comprising:

a frame configured to be mounted to a vehicle;

an extension member connected to the frame;

a towing attachment located on the extension member; and

an actuator coupled to the extension member such that the actuator can move the extension member relative to the frame.

[0009] Preferably the actuator moves the extension member in a substantially horizontal plane. Preferably the extension member rotates relative to the frame. Preferably the extension member rotates around a vertical axis. In a preferred form the extension member pivots around a pivot pin that connects the extension member to the frame. Preferably the extension member is an elongate member having a longitudinal axis. Preferably the longitudinal axis of the elongate member is located in the substantially horizontal plane.

[0010] The movable tow bar may further comprise a locking assembly. The locking assembly preferably prevents movement between the frame and the towing attachment. In any embodiment the locking assembly prevents movement between the frame and the towing attachment by preventing

- 3 -

movement between the frame and the extension member. In a preferred form the locking assembly comprises a locking pin. Preferably the locking pin is received in corresponding locking apertures of the frame and the extension member.

[0011] The actuator may comprise a hydraulic cylinder, a pneumatic cylinder, an electric motor, and/or a gearbox. In a preferred form the actuator comprises a hydraulic cylinder. Preferably the hydraulic cylinder is connected to the extension member. Preferably the actuator is powered. Preferably the actuator is configured to be powered by the vehicle.

[0012] Preferably the extension member has two opposed ends. Preferably the hydraulic cylinder is connected at or adjacent a first end. Preferably the towing attachment is located at or adjacent a second end. Preferably the extension member is connected to the frame, e.g. by a pivot pin, between the hydraulic cylinder connection and the towing attachment.

[0013] The movable tow bar may further comprise a controller. Preferably the controller operates the actuator. The controller may signal the actuator wirelessly or, alternatively, the controller may signal the actuator electrically over wires or even mechanically. The controller preferably has an interface with controls that an operator can use to direct the actuator. Preferably the controller has one or more sensors and directs the actuator in response to measurements from the one or more sensors.

[0014] Preferably the towing attachment comprises a tow ball. Alternatively, the towing attachment may comprise a different type of towing attachment such as, for example, a tow ring. The towing attachment may be movable within a track of the extension member.

[0015] In an alternative embodiment, there may be no extension member and the towing attachment may be movable within a track of the frame. The track preferably comprises a channel. The channel may be any suitable shape but is preferably substantially linear. The channel preferably extends substantially perpendicularly to a towing axis. The towing attachment is

- 4 -

preferably movable in the channel by an actuator. The actuator may comprise an electric motor. The actuator preferably converts rotational movement of the motor into non-rotational movement, such as linear movement. The actuator may comprise a worm drive.

[0016] In an alternative embodiment, the towing attachment may be movable across a rail. Preferably the rail is substantially cylindrical. Preferably the towing attachment is mounted to a sleeve. Preferably the sleeve has a channel that corresponds to the shape of the rail. Preferably the sleeve is slidably mounted on the rail. Preferably the sleeve substantially surrounds a portion of the rail. Preferably the sleeve is movably connected to the rail via a fluid actuated cylinder.

[0017] Preferably the frame comprises a hollow member. Preferably the hollow member comprises a rectangular hollow section (RHS). Preferably the actuator comprises a hydraulic cylinder and the hollow member of the frame contains a hydraulic reservoir and/or a hydraulic pump.

[0018] In another form, there is provided a method of manoeuvring a trailer connected to a movable tow bar of a vehicle, the method comprising the steps of:

- operating a controller;

- actuating an actuator according to operation of the controller; and

- moving a towing attachment, to which the trailer is connected, with the actuator;

- wherein the towing attachment is moved towards a side of the vehicle.

[0019] Preferably the movable tow bar is mounted to a rear end of the vehicle and the controller is operated from inside the vehicle. Preferably the controller is operated by a user of the vehicle. Preferably the towing attachment is moved in a substantially horizontal plane by the actuator. In a preferred form the towing attachment is moved substantially perpendicularly to a towing axis.

- 5 -

[0020] Further features and advantages of the present invention will become apparent from the following detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0021] By way of example only, preferred embodiments of the invention will be described more fully hereinafter with reference to the accompanying figures, wherein:

[0022] Figure 1 illustrates a diagrammatic plan view of a movable tow bar according to an embodiment of the invention;

[0023] Figure 2 illustrates a diagrammatic plan view of a movable tow bar according to another embodiment of the invention;

[0024] Figure 3 illustrates a perspective view of a movable tow bar according to another embodiment of the invention;

[0025] Figure 4 illustrates a side view of the movable tow bar illustrated in figure 3; and

[0026] .Figure 5 illustrates a top plan view of the movable tow bar illustrated in figure 3 in various different positions.

DETAILED DESCRIPTION OF THE DRAWINGS

[0027] Figure 1 illustrates a movable tow bar 10 mounted to a vehicle 20 having a rear end 22 and two opposed sides 24. The movable tow bar 10 has a frame 100 mounted to the rear of the vehicle 20 and an extension member 120 connected to the frame 100. The frame 100 is preferably rigidly affixed to a chassis of the vehicle 20 with a support plate 102 adjacent the extension member 120. In a preferred form a pair of support plates 102 are provided. The pair of support plates 102 are preferably aligned in spaced apart parallel planes with the extension member 120 being received between the two support plates 102.

- 6 -

[0028] The extension member 120 has a towing attachment, in the form of a tow ball 122, at an end that is distal from the vehicle 20. In the illustrated embodiment the extension member 120 is connected to the frame 100 by a pivot pin 124. The extension member 120 also has a locking assembly in the form of a removable locking pin 126 that also connects the extension member 120 to the frame 100. The pivot pin 124 and locking pin 126 are both receivable in respective apertures in the frame 100 and the extension member 120.

[0029] The extension member 120 is also coupled to an actuator in the form of a hydraulic cylinder 140. The hydraulic cylinder 140 is connected substantially perpendicularly to a longitudinal axis of the extension member 120 such that extension and retraction of the hydraulic cylinder 140 causes the extension member to pivot around the pivot pin 124 when the locking assembly is unlocked, e.g. when the locking pin 126 is removed from the extension member 120 and/or frame 100.

[0030] Figure 2 illustrates an alternative embodiment of a movable tow bar 10 wherein the tow ball 122 is movable within a rail in the form of a channel 104 in the frame 100. The channel 104 is substantially linear with a longitudinal axis substantially perpendicular to a towing axis. The actuator (not shown in figure 2) for this arrangement preferably includes an electric motor and gearbox. A worm drive may also be utilised. Although a straight channel 104 is illustrated in figure 2 it will be appreciated that the channel could take other forms such as, for example, a curved channel.

[0031] Figures 3 to 5 illustrate an alternative embodiment of a movable tow bar 10 wherein the tow ball 122 is located on a sleeve 150 via bracket 122'. The sleeve 150 is slidably mounted to a rail 160. In the illustrated embodiment the rail 160 is substantially cylindrical, with the sleeve 150 having a correspondingly shaped substantially cylindrical opening or channel running therethrough. The rail 160 is contained between two end stops 162. The

- 7 -

sleeve 150 can slide along the rail between the end stops 162 as illustrated in figure 5.

[0032] The sleeve is connected to one end of a concealed hydraulic cylinder (not shown) and the rail is connected to another end of the hydraulic cylinder. As seen in figure 4, hydraulic ports 152 are provided to control the hydraulic cylinder. The hydraulic ports 152 can be utilised to connect the hydraulic cylinder to a hydraulic reservoir and pump. In a preferred embodiment, the reservoir and pump (not shown) are contained inside the frame 100.

[0033] In use, the movable tow bar 10 of figure 1 may be used like a normal tow bar with the extension member 120 locked such that its longitudinal axis substantially coincides with the longitudinal axis of the vehicle 20. When additional manoeuvrability is required, such as when reversing the vehicle 20 with a towed vehicle such as a trailer attached to the tow ball 122, additional control over the towed vehicle may be obtained by removing the locking pin 126 and actuating the hydraulic cylinder 140.

[0034] The hydraulic cylinder 140 is preferably controlled from a cabin of the vehicle 20, to enable a user to pivot the extension member 120 with tow ball 122 thereon towards either the left or right side of the vehicle. The pivot movement will also bring the tow ball 122 closer to a rear of the vehicle 20. As the tow ball 122 is moved the angle between the vehicle 20 and the towed vehicle is altered. This change in angle can be used to the driver's advantage to direct the towed vehicle in a particular direction to achieve a desired path for the towed vehicle to travel.

[0035] The movable tow bar 10 of figure 2 is operated in a similar manner, with the tow ball 122 being movable with respect to the frame 100 and hence the vehicle 20. As the tow ball 122 is moved in the channel 104, the angle between the vehicle 20 and the towed vehicle is altered and, again, can be used to the driver's advantage to direct the towed vehicle in a particular direction to achieve a desired path for the towed vehicle to travel.

- 8 -

[0036] The movable tow bar 10 of figures 3 to 5 is operated in a similar manner, with the tow ball 122 being movable with respect to the frame 100 and hence the vehicle 20 by sliding the sleeve 150 across the rail 160. As a controller is operated, manually or automatically, the hydraulic cylinder slides the sleeve 150 longitudinally along the rail 160 to move the tow ball 122 towards a side of the vehicle to which the movable tow bar 10 is mounted.

[0037] Advantageously, the movable tow bar 10 operates like a normal tow bar during usual towing, but allows the tow ball 122 of the tow bar 10 to be moved when desired. This provides additional control over a towed vehicle during difficult manoeuvres, such as when reversing the vehicle 20. The additional control over the towed vehicle can vastly improve safety by reducing the likelihood of the towed vehicle having a collision with either the environment or bystanders. The movable towbar 10 further provides additional convenience and efficiency during difficult towing manoeuvres.

[0038] In this specification, adjectives such as first and second, left and right, top and bottom, and the like may be used solely to distinguish one element or action from another element or action without necessarily requiring or implying any actual such relationship or order. Where the context permits, reference to an integer or a component or step (or the like) is not to be interpreted as being limited to only one of that integer, component, or step, but rather could be one or more of that integer, component, or step etc.

[0039] The above description of various embodiments of the present invention is provided for purposes of description to one of ordinary skill in the related art. It is not intended to be exhaustive or to limit the invention to a single disclosed embodiment. As mentioned above, numerous alternatives and variations to the present invention will be apparent to those skilled in the art of the above teaching. Accordingly, while some alternative embodiments have been discussed specifically, other embodiments will be apparent or relatively easily developed by those of ordinary skill in the art. The invention is intended to embrace all alternatives, modifications, and variations of the present

- 9 -

invention that have been discussed herein, and other embodiments that fall within the spirit and scope of the above described invention.

[0040] In this specification, the terms 'comprises', 'comprising', 'includes', 'including', or similar terms are intended to mean a non-exclusive inclusion, such that a method, system or apparatus that comprises a list of elements does not include those elements solely, but may well include other elements not listed.

- 10 -

CLAIMS:

1. A movable tow bar comprising:
a frame configured to be mounted to a vehicle;
a towing attachment connected to the frame; and
an actuator coupled to the towing attachment;
wherein the towing attachment is movable relative to the frame
and actuation of the actuator moves the towing attachment towards a side of
the vehicle.
2. The movable tow bar of claim 1, wherein the frame includes a rail
and the towing attachment is slidably mounted to the rail.
3. The movable tow bar of claim 2, wherein the towing attachment is
located on a sleeve that is slidably mounted to the rail.
4. The movable tow bar of claim 3, wherein the sleeve substantially
surrounds a portion of the rail.
5. The movable tow bar of claim 3 or claim 4, wherein the rail is a
cylinder and the sleeve is substantially tubular.
6. The movable tow bar of any one of claims 3 to 5, wherein the
sleeve is movably connected to the rail via a fluid actuated cylinder.

- 11 -

7. The movable tow bar of claim 6, wherein the fluid actuated cylinder is located at least partially inside the sleeve.

8. The movable tow bar of any one of the preceding claims, wherein the towing attachment is movable relative to the frame along an axis that is substantially perpendicular to a longitudinal axis of the vehicle.

9. The movable tow bar of any one of the preceding claims, wherein the frame comprises a hollow member.

10. The movable tow bar of any one of the preceding claims, wherein the hollow member comprises a rectangular hollow section (RHS).

11. The movable tow bar of claim 9 or claim 10, wherein the actuator comprises a hydraulic cylinder and the hollow member of the frame contains a hydraulic reservoir and/or a hydraulic pump.

12. The movable tow bar of any one of the preceding claims, further comprising a controller configured to control the actuator.

13. The movable tow bar of claim 12, wherein the controller has an interface with controls that an operator can use to direct the actuator.

14. The movable tow bar of claim 12 or 13, wherein the controller has one or more sensors and directs the actuator in response to measurements from the one or more sensors.

- 12 -

15. The movable tow bar of any one of the preceding claims, further comprising an extension member connected to the frame wherein the towing attachment is located on the extension member and the actuator is coupled to the extension member such that the actuator can move the extension member relative to the frame.

16. The movable tow bar of claim 15, wherein the actuator moves the extension member in a substantially horizontal plane.

17. The movable tow bar of any one of the preceding claims, comprising a locking assembly that prevents movement between the frame and the towing attachment.

18. The movable tow bar of claim 9, wherein the locking assembly comprises a locking pin.

19. A method of manoeuvring a trailer connected to a movable tow bar of a vehicle, the method comprising the steps of:

operating a controller;

actuating an actuator according to operation of the controller; and

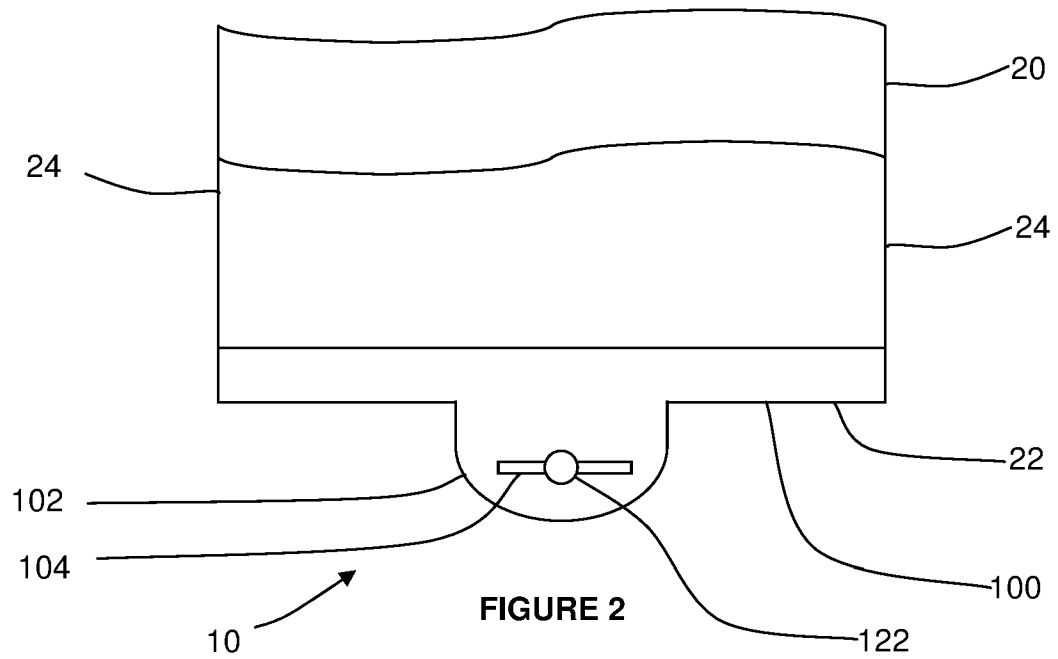
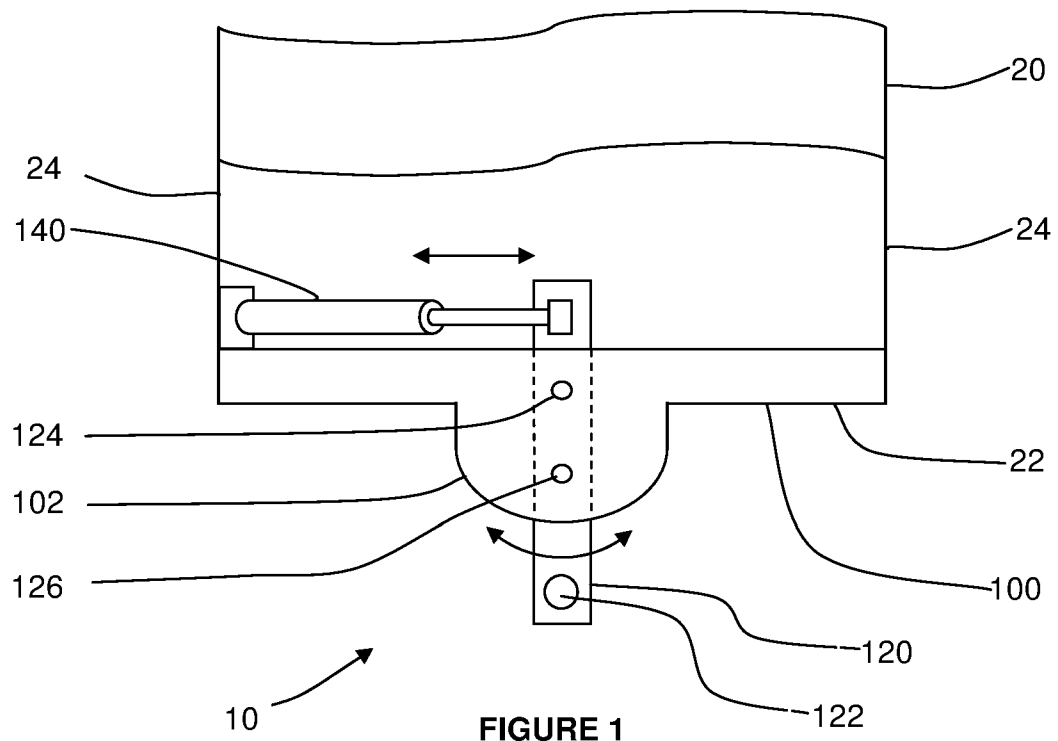
moving a towing attachment, to which the trailer is connected, with the actuator;

wherein the towing attachment is moved towards a side of the vehicle.

- 13 -

20. The method of manoeuvring a trailer connected to a movable tow bar of a vehicle wherein the movable tow bar is mounted to a rear end of the vehicle and the controller is operated by a user inside the vehicle.

- 1/3 -



- 2/3 -

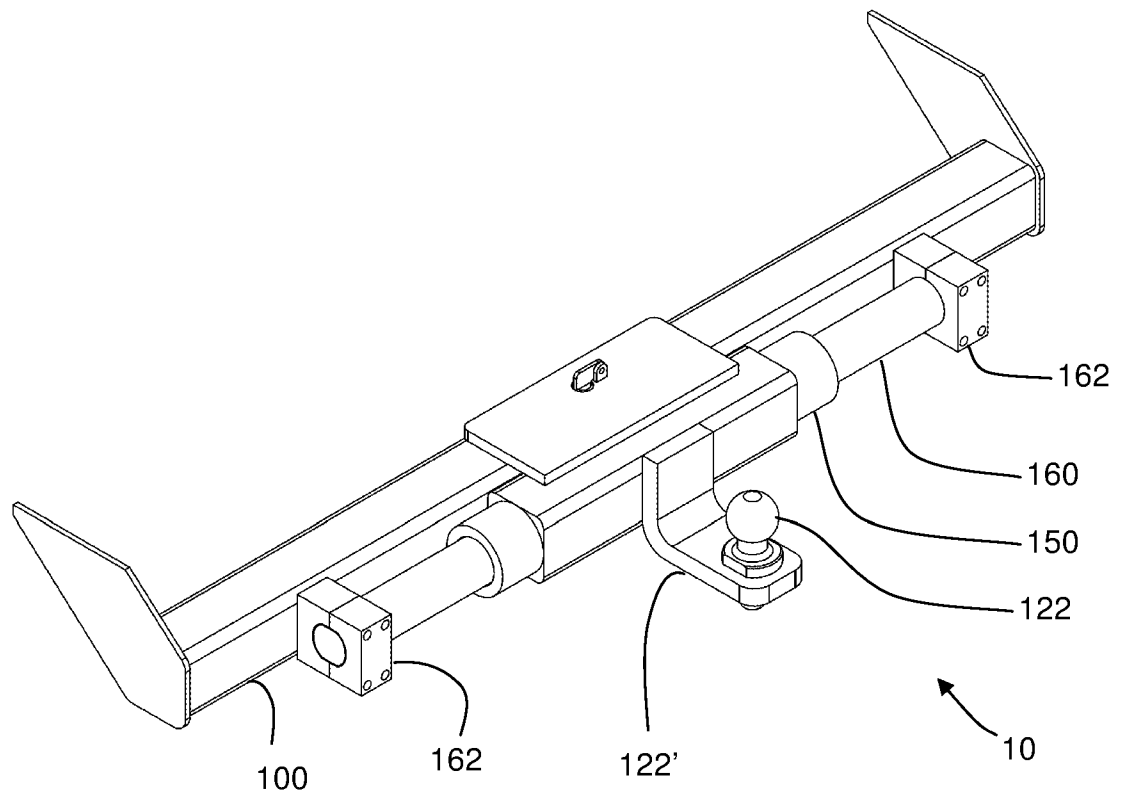


FIGURE 3

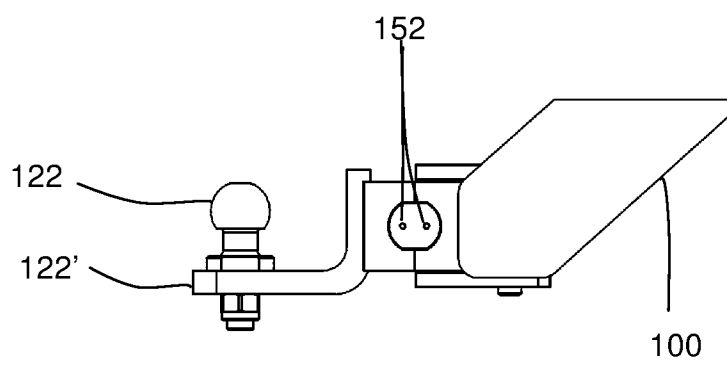


FIGURE 4

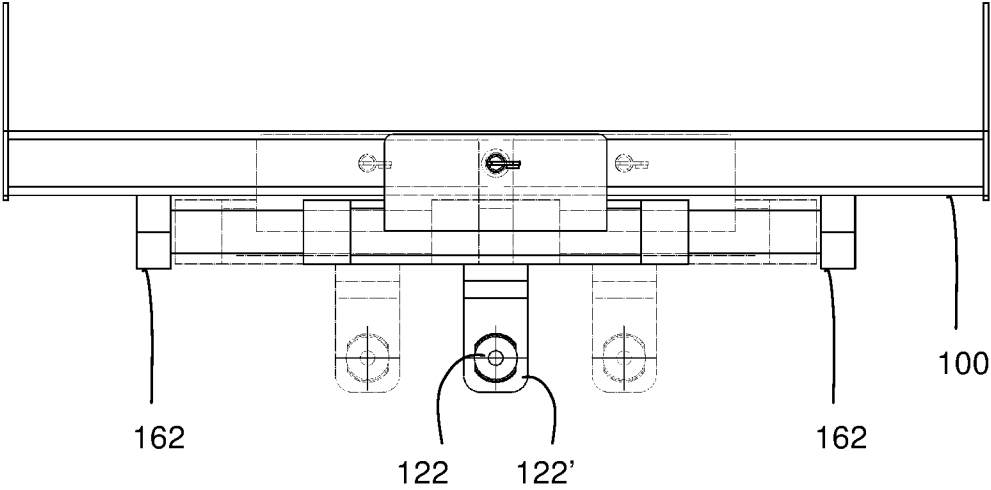


FIGURE 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/AU2015/050692

A. CLASSIFICATION OF SUBJECT MATTER

B60D 1/32 (2006.01) B60D 1/42 (2006.01)

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

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)

Databases: EPODOC, WPIAP, IPC/CPC marks B60D1/32, B60D1/42, B62D115, B60P3/12, B62D63/08 and keywords tow, hitch, draw, bar, actuate, hydraulic, cylinder, move, swivel, swing, slide, adjust, telescopic, extend, retract, sensor, sense, side and like terms.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* "A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search
21 December 2015

Date of mailing of the international search report
21 December 2015

Name and mailing address of the ISA/AU

AUSTRALIAN PATENT OFFICE
PO BOX 200, WODEN ACT 2606, AUSTRALIA
Email address: pct@ipaustalia.gov.au

Authorised officer

Behzad Vafa
AUSTRALIAN PATENT OFFICE
(ISO 9001 Quality Certified Service)
Telephone No. 0262256132

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/AU2015/050692
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 3318929 A1 (GRONHOLZ CLAUS) 29 November 1984 & English translation retrieved from Espacenet. Figures 1-2, English translation	1-10, 12-16, 19-20
X	GB 1217987 A (DEERE & COMPANY) 06 January 1971 Figures 1-2, page 2, lines 10-23 & 129-130 - page 3, lines 1-20	1-2, 8-10, 15-18
X	US 2004/0021292 A1 (ABAIR) 05 February 2004 Abstract, figure 1, paragraphs [0025]	1-4, 8-10, 12-13, 15-20
X	FR 2592339 A1 (COSNET PASCAL) 03 July 1987 & English translation retrieved from Espacenet. Figures 1-3, English translation	1-4, 6, 8-10, 12-14, 19-20
X	EP 1163829 A1 (LELY ENTERPRISES AG) 19 December 2001 Abstract, figures 1-2, paragraph [0026]	1-6, 8-9, 12-16, 19-20
X	US 4153132 A (BIEDEBACH) 08 May 1979 Abstract, figures 1-5, column 2, line 57 - column 3, line 12	1-5, 8-10, 12-13, 15-16, 19-20
X	US 3891239 A (LEO et al.) 24 June 1975 Abstract, figures 1-5, column 2, line 58 - column 3, line 3, claim 2	1-3, 6-12, 17, 19-20

INTERNATIONAL SEARCH REPORT Information on patent family members		International application No. PCT/AU2015/050692	
This Annex lists known patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.			
Patent Document/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
DE 3318929 A1	29 November 1984	DE 3318929 A1	29 Nov 1984
GB 1217987 A	06 January 1971	GB 1217987 A	06 Jan 1971
		DE 1911853 A1	06 May 1970
		ES 364526 A1	16 Dec 1970
		FR 2003629 A1	14 Nov 1969
		FR 2003629 B1	25 May 1973
		JP S4819962 B1	18 Jun 1973
US 2004/0021292 A1	05 February 2004	None	
FR 2592339 A1	03 July 1987	FR 2592339 A1	03 Jul 1987
		FR 2592339 B1	09 Jun 1989
EP 1163829 A1	19 December 2001	EP 1163829 A1	19 Dec 2001
US 4153132 A	08 May 1979	None	
US 3891239 A	24 June 1975	None	
End of Annex			
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001. Form PCT/ISA/210 (Family Annex)(July 2009)			