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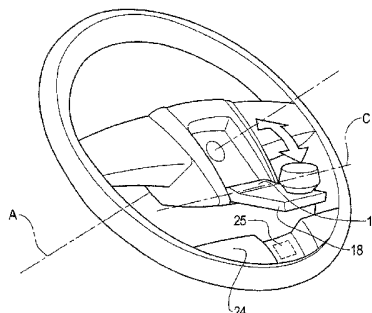
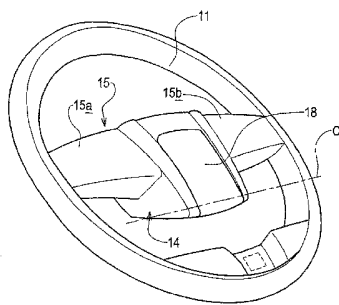
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For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: CONTROL APPARATUS



(57) Abstract: A control apparatus (10), such as a steering wheel, includes a mounting structure (14) which in use, mounts the apparatus (10) for movement about an axis A to effect a control function, the apparatus (10) including a rim (11) which is connected to the mounting structure (14) by at least one connecting structure (15), whereby the apparatus (10) is movable about the axis A by an operator moving the rim (11), at least one of the mounting structure (14) and the connecting structure (15) including a recess (20), the control apparatus (10) further including an auxiliary control device (16) by means of which an operator may move the apparatus (10) about the axis A, the auxiliary control device (16) being locatable in a stowed condition in the recess (20), and being movable from the recess (20) into a deployed condition.

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CONTROL APPARATUS

Description of Invention

5 This invention relates to a control apparatus and more particularly but not exclusively a control apparatus for effecting steering of a vehicle or machine as it moves over the ground.

 Such apparatus are commonly known as steering wheels, each apparatus having a rim by means of which an operator can steer the vehicle or machine by
10 moving the rim about an axis, usually rotationally although non-round rims have been proposed. The rim may be continuous or may be intermittent, e.g. having a pair of opposite rim parts. The rim or rim parts, is or are connected to a mounting structure which in use is secured to a control linkage to be moved, via a connecting structure. Steering wheels are intended for two operator hand
15 use.

 Particularly when steering a machine such as an excavating or loading machine at low speed, an operator may need simultaneously with steering the machine, to operate another control. Thus it is useful at low speeds for an operator to be able to steer the machine one handedly. It is known to provide on
20 the rim, an auxiliary control device which is commonly known as a spinner, which is rotatable about its own axis on or close to the rim, and is movable so as to move the steering wheel, one handedly by the operator. At higher speeds, and particularly where the machine may operate on a public road, it is desirable for no spinner to be provided, thus to encourage two handed steering.

25 The provision of spinners on vehicles, for example to facilitate steering by a disabled operators, is also known. However when such a vehicle is driven by a fully able bodied driver, the spinner may be a hindrance.

 According to a first aspect of the invention we provide a control apparatus including a mounting structure which in use, mounts the apparatus

for movement about an axis to effect a control function, the apparatus including a rim which is connected to the mounting structure by at least one connecting structure, whereby the apparatus is movable about the axis by an operator moving the rim, at least one of the mounting structure and the connecting
5 structure including a recess, the control apparatus further including an auxiliary control device by means of which an operator may move the apparatus about the axis, the auxiliary control device being locatable in a stowed condition in the recess, and being movable from the recess into a deployed condition.

Thus where the auxiliary control device is a spinner, when required, the
10 spinner may be deployed, and when not required, the spinner may be stowed.

The rim preferably is generally annular, although may be continuous or intermittent, and the mounting structure is preferably located generally centrally of the rim. The control apparatus is preferably mounted to the control link to be rotatably movable about the axis, so that the apparatus may be a steering wheel,
15 for example to effect steering of a machine or vehicle, in which case the control link may be a steering shaft. However the invention may have other applications where a control apparatus is desirably provided with an auxiliary control device which may be stowed or deployed.

The auxiliary control device may, when in the deployed condition, be
20 located radially outwardly of the mounting structure, for example, on or adjacent to the rim, and is graspable by the operator to facilitate one handed rotation of the control apparatus.

The auxiliary control device preferably is itself rotatable about an axis which is located generally centrally of the auxiliary control device, at or
25 adjacent the rim.

In one example, the recess is located along the axis about which the control apparatus is movable, in the mounting structure, but could otherwise be located, provided that the auxiliary control device when stowed in the recess,

does not interfere in any way with operation of the control apparatus by the operator using only the rim to effect movement.

In one embodiment, the auxiliary control device is provided on a carrier which is attached to the mounting structure. Most simply, the carrier is a flap
5 which is hinged to the mounting structure, with the auxiliary control device mounted on one side of the carrier. The carrier may thus be moved by hinging from a first position in which the carrier overlies the mounting structure with the auxiliary control device stowed in the recess, to a second position in which the carrier extends radially away from the axis of movement of the control
10 apparatus, with the auxiliary control device positioned towards or at the rim.

Such hinging movement may be about an axis which extends along a chord of a circle drawn about the axis of movement of the control apparatus.

In a preferred embodiment, which is particularly but not exclusively for a construction, loading, tractor or other primarily off-road machine in which the
15 control apparatus effects steering of the machine, upon the auxiliary control device being moved between its stowed and deployed conditions, a sensor device may provide a signal to a controller, such as an engine management controller. This signal may be used by such a controller to ensure that when the auxiliary control device is deployed, the machine may not be driven at road
20 speeds, so that the auxiliary control device may not be used to effect machine steering at such speeds. The sensor device may be a simple proximity sensor, or a mechanical switch, or any other suitable sensor, which may sense when the auxiliary control device is stowed or is not stowed in the recess.

Particularly but not exclusively where the auxiliary control device is
25 carried on a hinged carrier, the auxiliary control device may be resiliently biased towards the deployed condition, but retained in the recess, when moved against the force of the resilient biasing to the stowed condition, by a latch, which may be released to deploy the device. The latch may be of the kind which is releasably by exerting pressure on the auxiliary control device

inwardly of the recess, e.g. along the axis of movement of the apparatus, where the recess is provided along this axis.

When the auxiliary control device is in its deployed condition, inter-engaging formations of the carrier where provided, or otherwise the auxiliary control device, and the rim, may co-operate to retain the auxiliary control device in the deployed condition. For example the rim may include a peripheral part with a recess to locate and receive the carrier. A mechanical and/or magnetic catch for examples, may be provided by the peripheral part, to achieve more positive location of the carrier when deployed, to avoid the inadvertent and unwanted movement of the auxiliary control device from its deployed condition in use, e.g. during one handed steering.

According to a second aspect of the invention we provide a machine or vehicle having a control apparatus according to the first aspect of the invention.

According to a third aspect of the invention we provide a method of controlling a control function of a machine using a control apparatus according to the first aspect of the invention, including the steps of effecting control by manually grasping and moving the rim of the apparatus in a first control mode, with the auxiliary control device stowed, deploying the auxiliary control device, and effecting control by manually grasping the auxiliary control device and moving the apparatus.

According to a fourth aspect of the invention we provide a steering wheel including a rim and a generally central mounting structure connected to the rim by a connecting structure, the wheel being movable about an axis by an operator moving the rim, to effect steering control, and there being an auxiliary control device by means of which an operator may effect steering control, at least one of the mounting structure and the connecting structure including a recess, the auxiliary control device being locatable in a stowed condition in the recess, and being movable from the recess into a deployed condition.

Embodiments of the invention will now be described with reference to the accompanying drawings in which:-

FIGURE 1 is a perspective and illustrative view of a steering wheel control apparatus in accordance with the invention with an auxiliary control device is a stowed condition;

FIGURE 2 is a view similar to that of figure 1 but showing the auxiliary in a condition intermediate a stowed and deployed condition;

FIGURE 3 is a top view of the control apparatus of figures 1 and 2, with the auxiliary control device in a deployed condition.

Referring to the drawings a control apparatus 10 is in this example, a steering wheel which is in use, moved by rotating about a steering axis A to effect steering of a machine or vehicle. However the invention may be applied to other control apparatus which are movable to effect a control function, preferably about an axis.

The steering wheel 10 includes a rim 11 which in this example is a continuous circular construction, e.g. with an inner metal frame and an outer cushioned covering. The rim 11 need not be circular, and need not be continuous e.g. the rim 11 may be intermittent, including two (or more) separated rim parts.

The steering wheel 10 shown has been designed for use on an off-road construction, loading or tractor type machine.

The rim 11 is connected to a generally central in this example, mounting structure 14, which as will be apparent to the person skilled in the art, includes a boss with an opening to receive a control link, in this case a steering shaft, to which the steering wheel 10 is mounted by means of a fastener. However, other mountings may be provided.

The mounting structure 14 is connected to the rim 11 by a connecting structure 15, which in this example includes a pair of arms 15a, 15b which extend between the rim 11 and mounting structure 14.

In accordance with the invention, the steering wheel includes an auxiliary control device 16, which in this example is a spinner, which includes a knob 17 which is rotatable about its own axis B, which in use is located at or close to the rim 11. The auxiliary control device 16 is carried on a carrier 18 by means of which the auxiliary control device 16 is movable between a stowed condition as seen in figure 1, to a deployed condition as shown in figure 3, in the manner indicated in figure 2.

The mounting structure 14 includes a recess 20 which in this example extends along the axis A of movement of the control apparatus 10. The carrier 18 is hinged to the mounting structure 14 so as to be movable about an axis C which extends along a chord of a circle drawn about the axis A of movement of the apparatus 10, so that in the figure 1 stowed condition, the auxiliary control device 16, which is carried on one side of the carrier 18, is moved into the recess 20. In this stowed condition, the carrier 18 is in a first position in which the carrier 18 overlies the mounting structure 14, so as to conceal the recess 20 beneath.

As the carrier 18 is hinged away from the axis A of movement of the control apparatus 10 about its own axis, the auxiliary control device 16 is moved out of the recess 20, and as this reaches a fully deployed condition with the carrier 18 in a second condition, as shown in figure 3, the auxiliary control device 16 is located at, or at least close to the rim 11. In this example, it can be seen that the rim 11 includes a peripheral part 24 which extends from the rim inwardly towards the mounting structure 14, chord-like, and the peripheral part 24 includes a recess 25 with which the carrier 18 locates when in its deployed condition. The carrier 18 sides and the recess 25 in the peripheral part 24, provide inter-engaging formations which co-operate to locate and retain the carrier 18 and thus the auxiliary control device 16 in a deployed condition.

This location may be sufficient to enable the auxiliary control device 16 to be used for one handed steering of the machine or vehicle, but if more

positive location is required, a mechanical and/or magnetic retaining device may be used to lock the carrier 18 in the second position in which the auxiliary control device 16 is deployed.

There may be provided a sensor device 26, such as a mechanical and/or electronic sensor, e.g. a proximity sensor or switch, to determine when the auxiliary control device 16 is present in the recess 20 in the mounting structure 14. Such a sensor device 26 may provide a signal to a controller such as an engine management controller which responds by ensuring that when the auxiliary control device 16 is deployed, the machine or vehicle can only be driven as slow speeds, so that there is an incentive for an operator to stow the auxiliary control device 16 in the recess 20 when it is desired to drive the machine or vehicle at higher speed, e.g. on the road. Thus an operator must stow the auxiliary control device 16, and then is encouraged to two-handedly steer the machine or vehicle at higher road speeds.

In one arrangement, there may be a resilient biasing device, such as a coil torsion spring acting about the axis C about which the carrier 18 hinges, to urge the carrier 18 and thus the auxiliary control device 16 towards the figure 3, deployed condition, in which case there may be provided a latch or catch, which may be mechanically or electrically released, to retain the carrier 18 and the auxiliary control device 16, in the figure 1, stowed, condition until required. The latch may be of the kind which is releasably by exerting pressure on the auxiliary control device inwardly of the recess, e.g. along the axis of movement of the apparatus, where the recess is provided along this axis.

Various modifications may be made without departing from the scope of the invention. For example, in another design of steering wheel or other control apparatus 10, the recess 20 for stowing the auxiliary control device 16 may be provided wholly or partly by the connecting structure 15. The auxiliary control device 16 may not be mounted on a carrier 18 as described, and where a carrier 18 is provided, this may be hinged for a more complex movement than simple

pivoting about the axis C as described, to move the auxiliary control device 16 between its stowed and deployed conditions.

As well as off-road machines and vehicles, the invention may be applied to an on-road vehicle such as a lorry or truck, where the optional provision of a spinner 16 to facilitate one handed steering, particularly at slower speeds, may be beneficial.

In this case, the mounting structure 14 and/or connecting structure 15 may also accommodate other controls, such as electrical controls, as well as possibly an air bag safety device.

The features disclosed in the foregoing description, or the following claims, or the accompanying drawings, expressed in their specific forms or in terms of a means for performing the disclosed function, or a method or process for attaining the disclosed result, as appropriate, may, separately, or in any combination of such features, be utilised for realising the invention in diverse forms thereof.

CLAIMS

1. A control apparatus including a mounting structure which in use, mounts the apparatus for movement about an axis to effect a control function, the
5 apparatus including a rim which is connected to the mounting structure by at least one connecting structure, whereby the apparatus is movable about the axis by an operator moving the rim, at least one of the mounting structure and the connecting structure including a recess, the control apparatus further including an auxiliary control device by means of which an operator may move the
10 apparatus about the axis, the auxiliary control device being locatable in a stowed condition in the recess, and being movable from the recess into a deployed condition.
2. A control apparatus according to claim 1 wherein the rim is generally
15 annular, and the mounting structure is located generally centrally of the rim.
3. A control apparatus according to claim 1 or claim 2 wherein the control apparatus is mounted to the control link to be rotatably movable about the axis.
- 20 4. A control apparatus according to any one of the preceding claims wherein the auxiliary control device when in the deployed condition, is located radially outwardly of the mounting structure, and is graspable by the operator to facilitate one handed rotation of the control apparatus.
- 25 5. A control apparatus according to claim 4 wherein the auxiliary control device when deployed, is located on or adjacent to the rim.
6. A control apparatus according to any one of the preceding claims wherein the auxiliary control device, when deployed, is itself rotatable about an

axis which is located generally centrally of the auxiliary control device, at or adjacent the rim.

7. A control apparatus according to any one of the preceding claims
5 wherein the recess is located along the axis about which the control apparatus is movable, in the mounting structure.

8. A control apparatus according to any one of the preceding claims
10 wherein the auxiliary control device is provided on a carrier which is attached to the mounting structure.

9. A control apparatus according to claim 8 wherein the carrier is a flap
which is hinged to the mounting structure, with the auxiliary control device
mounted on one side of the carrier.

15

10. A control apparatus according to claim 9 wherein the carrier is movable
by hinging from a first position in which the carrier overlies the mounting
structure with the auxiliary control device stowed in the recess, to a second
position in which the carrier extends radially away from the axis of movement
20 of the control apparatus, with the auxiliary control device positioned towards or at the rim.

11. A control apparatus according to claim 10 wherein such hinging
movement is about an axis which extends along a chord of a circle drawn about
25 the axis of movement of the control apparatus.

12. A control apparatus according to any one of the preceding claims
wherein the control apparatus effects steering of the machine, upon the

auxiliary control device being moved between its stowed and deployed conditions, a sensor device provides a signal for controller.

13. A control apparatus according to claim 12 where applied to a machine or
5 vehicle having an engine, in which the controller is an engine management controller, the signal being used by such a controller to control the speed at which the machine or vehicle may be driven.

14. A control apparatus according to claim 12 or claim 13 wherein the
10 sensor device is a proximity sensor, or a mechanical switch which senses when the auxiliary control device is stowed or is not stowed in the recess.

15. A control apparatus according to any one of the preceding claims wherein the auxiliary control device is resiliently biased towards the deployed
15 condition, but is retained in the recess, when moved against the force of the resilient biasing to the stowed condition, by a latch, which is releasable to deploy the device.

16. A control apparatus according to claim 15 wherein the latch is releasably
20 by exerting pressure on the auxiliary control device inwardly of the recess.

17. A control apparatus according to any one of the preceding claims wherein when the auxiliary control device is in its deployed condition, inter-engaging formations of the carrier where provided, or otherwise the auxiliary
25 control device, and the rim, co-operate to retain the auxiliary control device in the deployed condition.

18. A control apparatus according to claim 17 wherein the rim includes a peripheral part with a recess to locate and receive the carrier.

19. A control apparatus according to claim 16 or claim 17 wherein a mechanical and/or magnetic catch is provided by the peripheral part, to locate and retain the auxiliary control device in its deployed condition in use.

5

20. A control apparatus substantially as hereinbefore described with reference to and/or as shown in the accompanying drawings.

21 A machine or vehicle having a control apparatus according to any one of
10 the preceding claims.

22. A method of controlling a control function of a machine using a control apparatus according to any one of claims 1 to 20 including the steps of effecting control by manually grasping and moving the rim of the apparatus in a first
15 control mode, with the auxiliary control device stowed, deploying the auxiliary control device, and effecting control by manually grasping the auxiliary control device and moving the apparatus.

23. A method of controlling a control function substantially as hereinbefore
20 described with reference to the accompanying drawings.

24. A steering wheel including a rim and a generally central mounting structure connected to the rim by a connecting structure, the wheel being movable about an axis by an operator moving the rim, to effect steering control,
25 and there being an auxiliary control device by means of which an operator may effect steering control, at least one of the mounting structure and the connecting structure including a recess, the auxiliary control device being locatable in a stowed condition in the recess, and being movable from the recess into a deployed condition.

25. Any novel feature or novel combination of features described herein and/or as shown in the accompanying drawings.

1 / 2

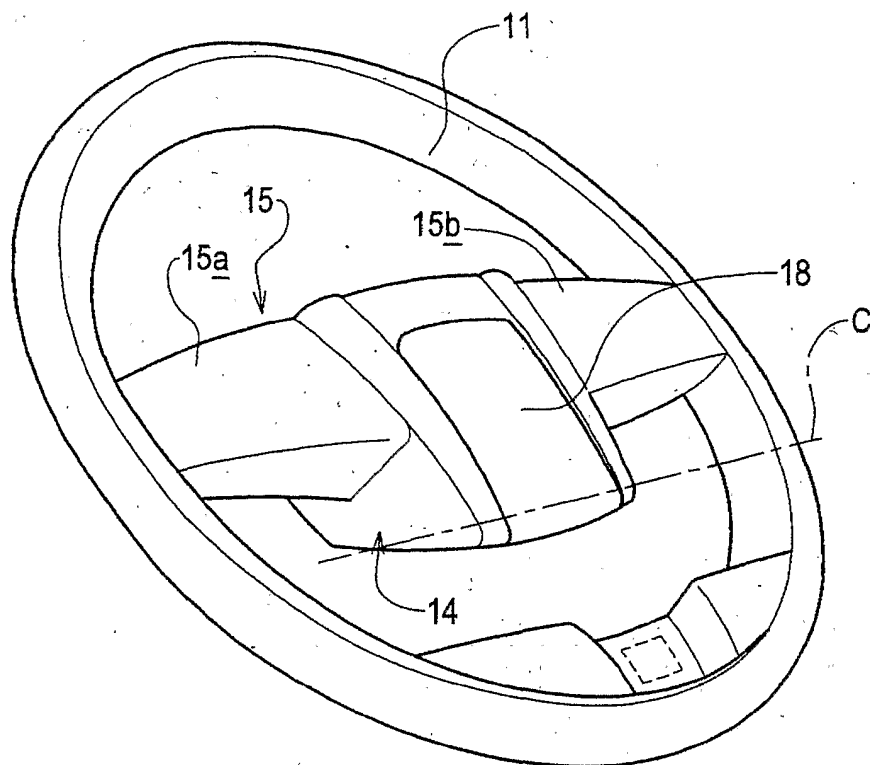


FIG. 1

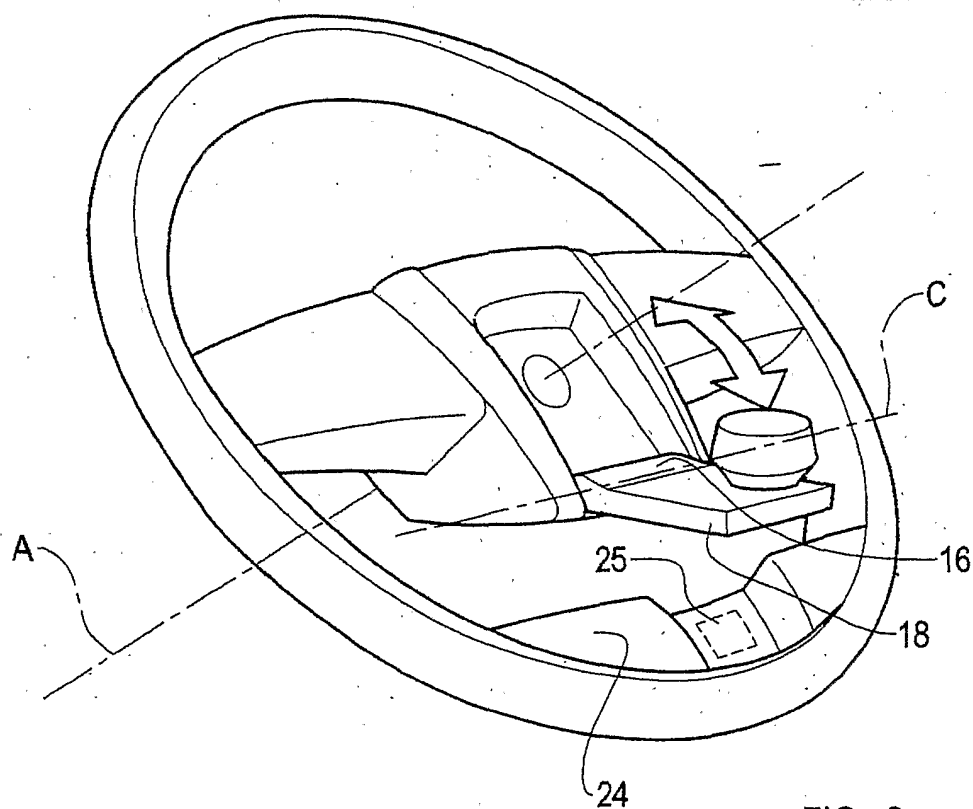
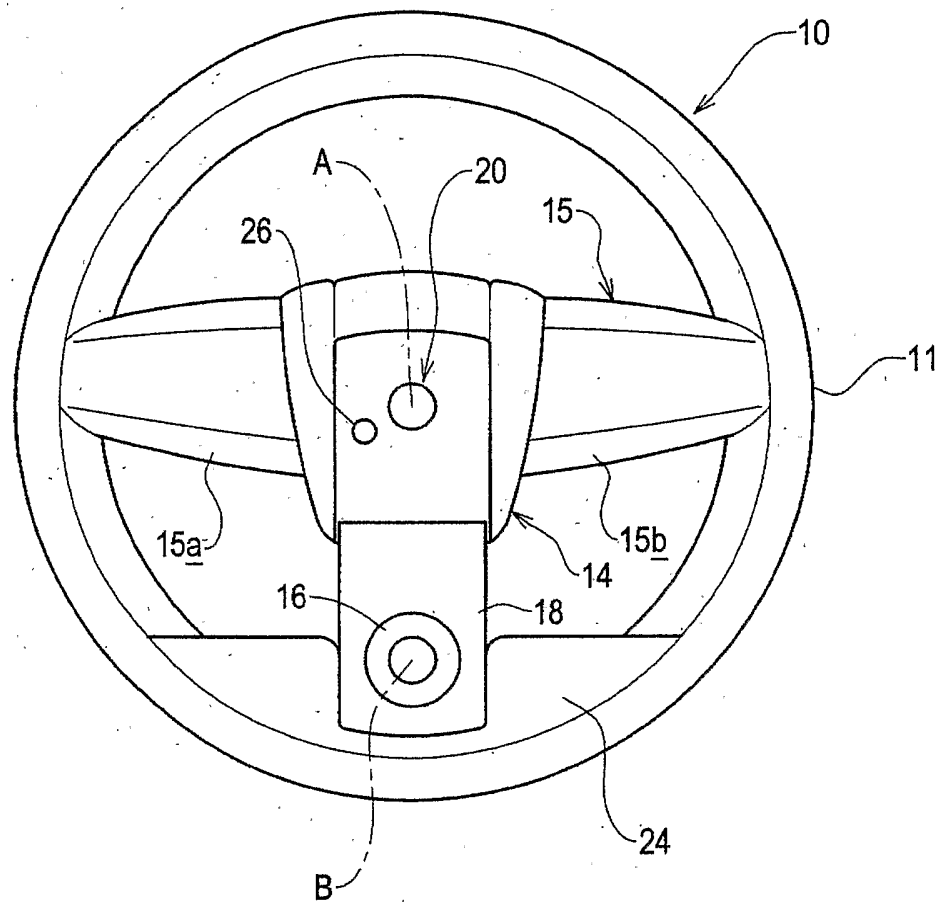


FIG. 2

2/2

FIG. 3

INTERNATIONAL SEARCH REPORT

Intern I Application No
PCT/GB2005/004093

A. CLASSIFICATION OF SUBJECT MATTER
B62D1/04 G05G1/08

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)
B62D G05G

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 practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 16, 8 May 2001 (2001-05-08) -& JP 2001 001908 A (TOYOTA AUTOM LOOM WORKS LTD), 9 January 2001 (2001-01-09) abstract; figures 1-6	1-11, 17-19, 21,22,24
X	US 2 579 165 A (WOODRUFF ROY PAUL) 18 December 1951 (1951-12-18) column 2, line 10 - column 3, line 73; figures 1-4	1-6,8, 10,11, 15-17, 21,22,24
A	DE 94 03 903 U1 (TRUCKER-SHOP-SERVICE H. TOLLKUEHN GMBH, 28816 STUHR, DE) 8 September 1994 (1994-09-08) the whole document	1,21,22, 24
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *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)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *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
- *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
- *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.
- *&* document member of the same patent family

Date of the actual completion of the international search

22 November 2005

Date of mailing of the international search report

30/11/2005

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INTERNATIONAL SEARCH REPORT

Intern. Application No
PCT/GB2005/004093

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2 592 413 A (GARFIELD SYDNEY) 8 April 1952 (1952-04-08) the whole document -----	1,21,22, 24
A	US 2 716 903 A (HANSEN HANS PETER) 6 September 1955 (1955-09-06) the whole document -----	1,21,22, 24
A	US 2 139 546 A (HANSEN HANS P) 6 December 1938 (1938-12-06) the whole document -----	1,21,22, 24

INTERNATIONAL SEARCH REPORT

International application No.
PCT/GB2005/004093

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☒ Claims Nos.: 20, 23, 25
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.2

Claims Nos.: 20,23,25

Claims 20, 23 and 24 contain references to the description and/or the drawings. According to Rule 6.2(a) PCT, claims should not contain such references except where absolutely necessary, which is not the case here. Therefore said claims do not meet the requirements of Article 6 PCT, because they do not clearly define the matter for which protection is sought.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

information on patent family members

International Application No

PCT/GB2005/004093

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2001001908	A	09-01-2001	NONE
US 2579165	A	18-12-1951	NONE
DE 9403903	U1	08-09-1994	NONE
US 2592413	A	08-04-1952	NONE
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US 2139546	A	06-12-1938	NONE