(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 2 476 598 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
18.07.2012 Bulletin 2012/29

(51) Int Cl.:
B61C 17/12 *(2006.01)*

(21) Application number: **12000013.8**

(22) Date of filing: **02.01.2012**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(30) Priority: **12.01.2011 IT MI20110018**

(71) Applicant: **S.P.I.I. S.p.A**
21047 Saronno (VA) (IT)

(72) Inventors:
- **Samele, Donato**
  21047 Saronno (VA) (IT)
- **Zuffetti, Silvio**
  21047 Saronno (VA) (IT)

(74) Representative: **Lecce, Giovanni**
Ufficio Internazionale Calciati S.r.l.
Via Fratelli Ruffini, 9
20123 Milano (IT)

(54) Compact Railway Vehicle Manipulator

(57) A compact manipulator (10) for railway vehicle, especially usable for railway, streetcar and underground applications, comprises a plate-shaped element (12) fixed to the vehicle's drive bench, wherefrom a lever (14) protrudes, coming out of a case (16) with substantially semi-circular profile fixed to said plate-shaped element (12). The case (16) is provided with an extended longitudinal slit whereto a portion of a disc-shaped body or drum (20) is facing, whereto the lever (14) is fixed; said drum rotates on a fixed shaft (22) projecting from a support (38).

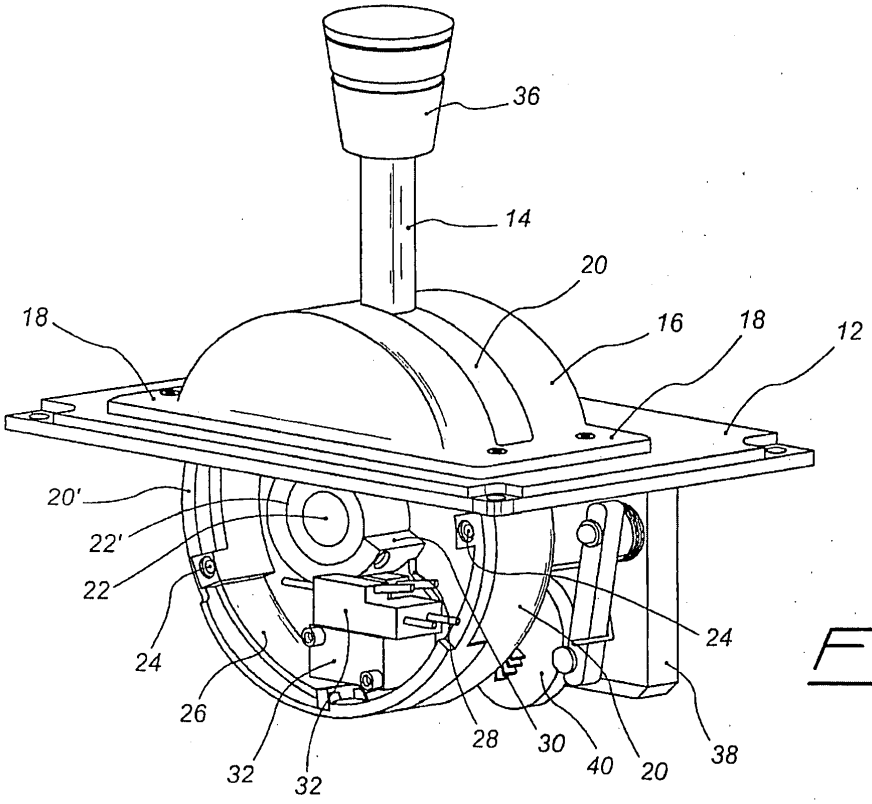


Fig.2

EP 2 476 598 A1

Description

[0001] The present invention relates to a compact manipulator used on board of a railway vehicle.

[0002] More in particular, the present invention relates to a modular single-lever manipulator with high function integration, advantageously usable for railway, streetcar and underground applications. It is known that railway vehicles comprise a plurality of controls adapted to allow the engine crew to drive the vehicle, which implies the activation of various functions. Said controls, actuable by levers, buttons and the like, located on the railway vehicle drive bench, are typically and mainly referred to the driving and braking functions, passing by an idle position. Moreover, there are other controls that, for example, relate to the activation of light indicators and sound alarms, as well as the speed setting in the automatic vehicle drive. This traditional setting, which implies the need of operating various controls arranged in different positions on the drive bench, either at the same time or in a sequence, exhibits some drawbacks.

[0003] Basically, it is the need of operating and, with multiple movements oriented in a wide space, activating or deactivating the different functions related to the railway vehicle motion; this undoubtedly implies the need for a high level of concentration by the vehicle's driver, who has to do a job that does not allow distractions and for which it is necessary to set movements for controlling functions that cannot always be foreseen with proper advance. These operating difficulties may also cause hazardous or at least, uncomfortable conditions for the passengers, who are subject to sudden decelerations.

[0004] U.S. 4, 796, 480 describes an electromechanical manipulator wherein some controls, such as driving and braking, are articulated on a common horizontal axis. Such manipulator comprises an auxiliary shaft that carries a conical and a cylindrical gear, as well as a camshaft combined with a plurality of microswitches. The controls are activated by two different operating levers, connected to respective shafts. This is a complex solution that comprises multiple components and that forces the vehicle's driver to continuously operate two levers to activate the various functions. Moreover, this known manipulator does not allow multiple or redundant signals to be provided for the same information, for safety purposes.

[0005] Moreover, a manipulator of this type has large overall dimensions and cannot be coupled with other modules for obtaining an increase in functionality, according to the needs. The object of the present invention is to obviate the drawbacks mentioned hereinabove.

[0006] More in particular, the object of the present invention is to provide a compact manipulator for railway vehicle which, integrating multiple functions in a single control or in any case in localised positions, allows the engine crew to carry out the different operations required for the vehicle motion at any time and in a simple and ergonomic manner.

[0007] A further and consequent object of the invention is to provide a manipulator as defined above which would consequently prevent the waste of manual movements in various directions and along an extended zone, to the advantage of driving safety.

[0008] A further object of the invention is to provide a compact manipulator wherein the main functions are redundant, to the advantage of safety and performance, even in the event of a failure.

[0009] Last but not least, an object of the invention is to provide a compact manipulator that can be easily installed in new-generation maneuvering benches, according to the provisions of the UIC 612 standard, thanks to the reduced overall dimensions thereof and in particular, to the reduced depth thereof.

[0010] A further object of the invention is to provide a compact manipulator capable of being coupled with other modules in order to increase the functionality according to the needs.

[0011] A further object of the invention is to provide the users with a manipulator for railway vehicle intended for ensuring high level of resistance and reliability over time, also such as to be easily and inexpensively constructed. These and other objects are achieved by the compact manipulator for railway vehicle of the present invention, especially suitable for railway, streetcar and underground applications, which comprises a plate-shaped element fixed to the vehicle's drive bench, wherefrom a lever protrudes, coming out of a case with substantially semi-circular profile fixed to said plate-shaped element, said case being provided with an extended longitudinal slit whereto a portion of a disc-shaped body or drum is facing, whereto the lever is fixed, and which is essentially **characterised in that** said drum rotates on a fixed shaft projecting from a support.

[0012] The construction and functional features of the compact manipulator for railway vehicle of the present invention shall be better understood from the following description, wherein reference is made to the annexed drawing tables showing a preferred and non-limiting embodiment thereof, and wherein:

figure 1 shows a schematic perspective top view of the compact manipulator for railway vehicle of the present invention;

figure 2 shows a schematic perspective side view of the same manipulator; figure 3 shows a schematic perspective view from the opposite side of the same manipulator.

[0013] With reference to the above figures, the compact manipulator for railway vehicle of the present invention, globally indicated with reference numeral 10 in figure 1, comprises a plate-shaped element 12 which delimits the exposed portion of the same manipulator and which is fixed onto the drive bench of the railway vehicle by generic screws or equivalent.

[0014] The portion of the manipulator intended for being moved by the vehicle's driver protrudes from the

plate-shaped element 12; such portion comprises a lever 14, which protrudes from a case 16 with substantially semi-circular profile. Case 16 extends on the front and at the back into integral edges with planar development 18 for the fixing thereof by screws or the like to the plate-shaped element 12. Case 16 is provided with an extended longitudinal slit whereto a portion of a disc-shaped body or drum 20 is facing, wherein lever 14 is fitted and fixed to. The disc-shaped body 20 is keyed and rotates onto a shaft 22, which on one face is externally delimited by an integral rim 20'.

[0015] Said shaft 22 is fixed and the disc-shaped body or drum 20 rotates thereon, manually moved by lever 14. At least one cam with inside shaping 26 is interchangeably constrained to rim 20' of drum 20, for example by screws 24. An arm 28 integral to rim 20' develops radially in the direction of shaft 22 and carries a shaped support 30 at the free end. Said last-mentioned constitutes the fixing means of one or more microswitches 32, intended for cooperating with said cam with inside shaping 26. In particular, the contacts of microswitches 32 are abutted by the different shaped sectors of cam 26 and thereby provide two or more alternating signals that typically refer to the driving and braking positions of lever 14; this allows a very accurate identification of the discrete lever position by means of said microswitches that are combined with a redundant angular transducer or encoder 34 which, on the other hand, provides indications about the continuous positioning of said lever.

[0016] The solution of coupling the angular transducer to the operating lever 14, obtained in a known manner and for example with a pair of suitably shaped toothed wheels, allows the mechanical clearances to be reduced, ensuring a considerable accuracy of the output signal.

[0017] The use of the cam with inside shaping 26 allows using a much larger rolling profile of the microswitch actuator, the overall dimensions being the same; reduced overall dimensions result therefrom, along with the guarantee or more accurate although more complex operating sequences compared to solutions that provide for the use of outside cams.

[0018] According to a further advantageous feature of the invention, handle 36 of lever 14 incorporates one or more electronic boards provided with inductive and/or capacitive sensors intended for the digital controls and functions for driving the railway vehicle; such controls are referred, for example, to the activation of the security guard button, wherewith the engine crew periodically shows its presence, the automatic drive button for speed setting, the electro-dynamic braking to electro-dynamic or pneumatic braking switching button, and the bitonal horn button.

[0019] All these functions activated by the buttons are correlated to light indicators, which consist in L.E.D. advantageously arranged along case 16, adjacent to lever 14; this facilitates the location of the position of the same lever during night drive. The function of the security guard button is activated by a dual yield device with_the compression of handle 36 of lever 14, which lowers by a predetermined height overcoming the resistance of a spring; right after the compression, said spring returns the handle to the original position. On the other hand, a stronger compression, connected to a second spring that provides for greater resistance, is carried out by the train drivers to switch from the idle zone to the driving zone by eliminating a conventional mechanical lock.

[0020] The per se known release device of lever 14 is positioned on the fixed manipulator portion, indicated with reference numeral 38 and consisting of a plate-shaped support, corresponding to the drum indicated with reference numeral 22' in figure 2, as well as a clutch or adjustable clutching device 40 for rotating drum 20, thus for adjusting the effort to apply onto lever 14 for actuating it. This solution allows easily adjusting the control effort of said levers 14 based on the operators' needs/preferences.

[0021] Advantageously, the movable portions of manipulator 10, such as for example drum 20 and cam 26, are coated or treated with anti-friction materials, typically with anodic oxidation of materials such as Teflon (polytetrafluoroethylene) and the like.

[0022] These treatments impart a high wear resistance and a low friction coefficient to the components as they are obtained with self-lubricating substances.

[0023] As can be noticed from the above, the advantages achieved by the invention are clear.

[0024] The compact manipulator for railway vehicle of the present invention ergonomically includes, within a single equipment, the controls required for driving the vehicle, made possible by the operation on handle 36 of a single lever 14; thereon, the train drivers can operate in both standing and sitting position and both with the right and with the left hand. Thanks to the presence of a fixed shaft whereon drum 20 rotates, it is possible to reduce the driving gears and significantly limit the overall dimensions.

[0025] Moreover, the provision of a cam with inside shaping 26 abutted by the contacts of microswitches 32 allows achieving a considerable reduction of the overall dimensions whereas the coupling of the angular transducer 34 with the operating lever 14 on the one side reduces the mechanical clearances, and on the other ensures a precise output signal.

[0026] The provision of inductive/capacitive sensors incorporated in handle 36 intended for the digital controls and functions for the railway vehicle driving is further advantageous.

[0027] While the invention has been described hereinbefore with particular reference to an embodiment thereof made by way of a non-limiting example, several changes and variations shall clearly appear to a man skilled in the art in the light of the above description. This invention, therefore, is intended to include any changes and variations thereof falling within the spirit and the scope of protection of the following claims.

Claims

1. A compact manipulator (10) for railway vehicle, especially usable for railway, streetcar and underground applications, comprising a plate-shaped element (12) fixed to the vehicle's drive bench, wherefrom a lever (14) protrudes, coming out of a case (16) with substantially semi-circular profile fixed to said plate-shaped element (12), said case (16) being provided with an extended longitudinal slit whereto a portion of a disc-shaped body or drum (20) is facing, whereto the lever (14) is fixed, **characterised in that** said drum rotates on a fixed shaft (22) projecting from a support (38), the disc-shaped body (20) being externally delimited, on one face, by a crown (20') whereto a cam with inside shaping (26) is constrained by screws (24) or equivalent.

2. The compact manipulator according to claim 1, **characterised in that** the crown (20') is integral to an arm (28) that develops radially in the direction of the fixed shaft (22) and carries a shaped support (30) whereto at least one micro-switch (32) is fixed, the contacts (32') whereof are abutted by said cam (26).

3. The compact manipulator according to claim 2, **characterised in that** said micro-switch or micro-switches are matched with a redundant angular transducer (34) that provides indications on the continuous positioning of the lever (14).

4. The compact manipulator according to claim 1, **characterised in that** the lever (14) is connected to a handle (36) that incorporates one or more inductive and/or capacitive sensors connected to electronic boards and intended for the digital controls and functions for driving the railway vehicle.

5. The compact manipulator according to claim 4, **characterised in that** said digital functions for driving the railway vehicle are correlated to light indicators or L.E.D. arranged along the case (16) adjacent the lever(14).

6. The compact manipulator according to claim 3, **characterised in that** the moving parts relating to at least the drum (20) and the cam (26) are coated or treated with anti-friction materials.

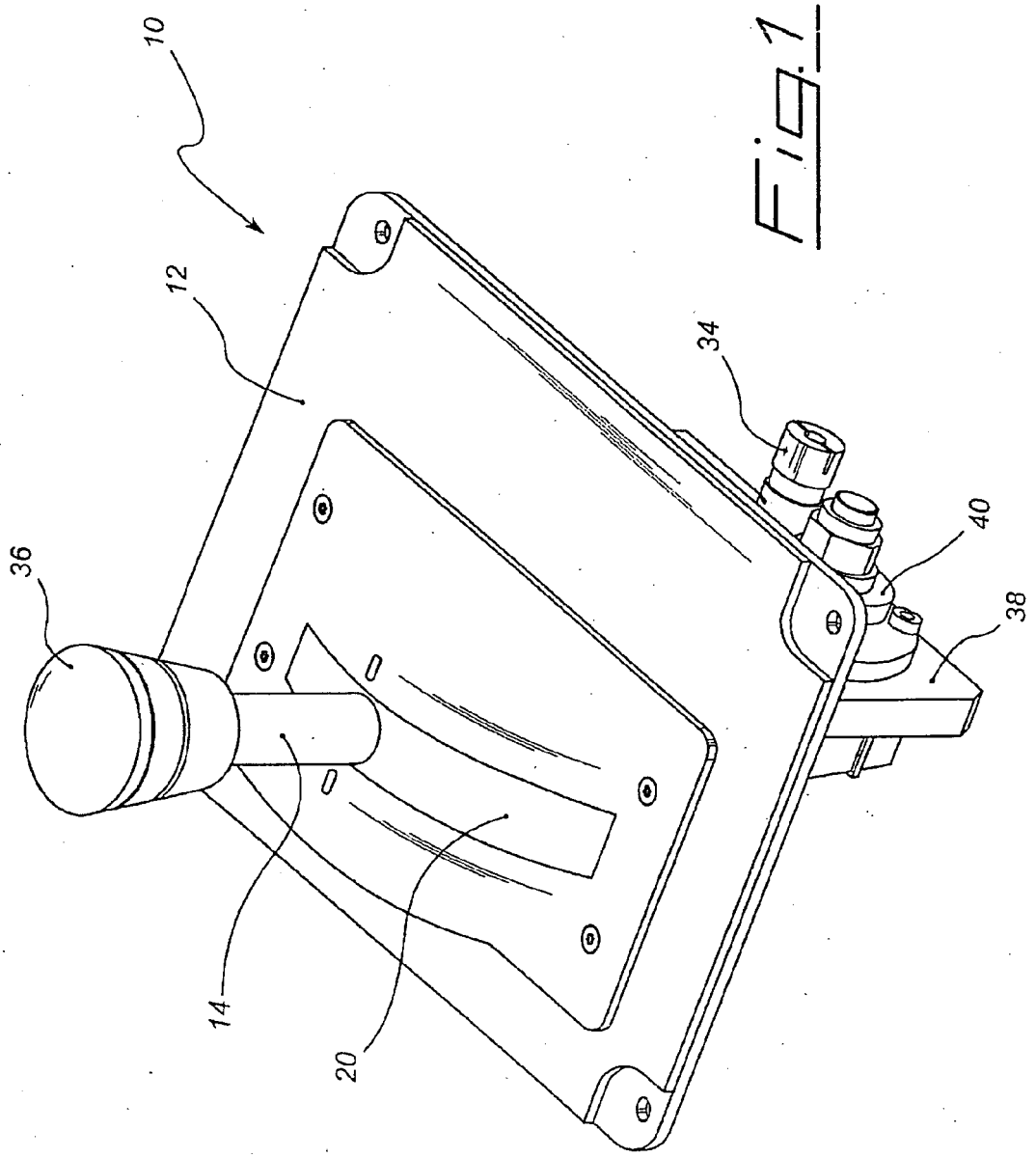


Fig.1

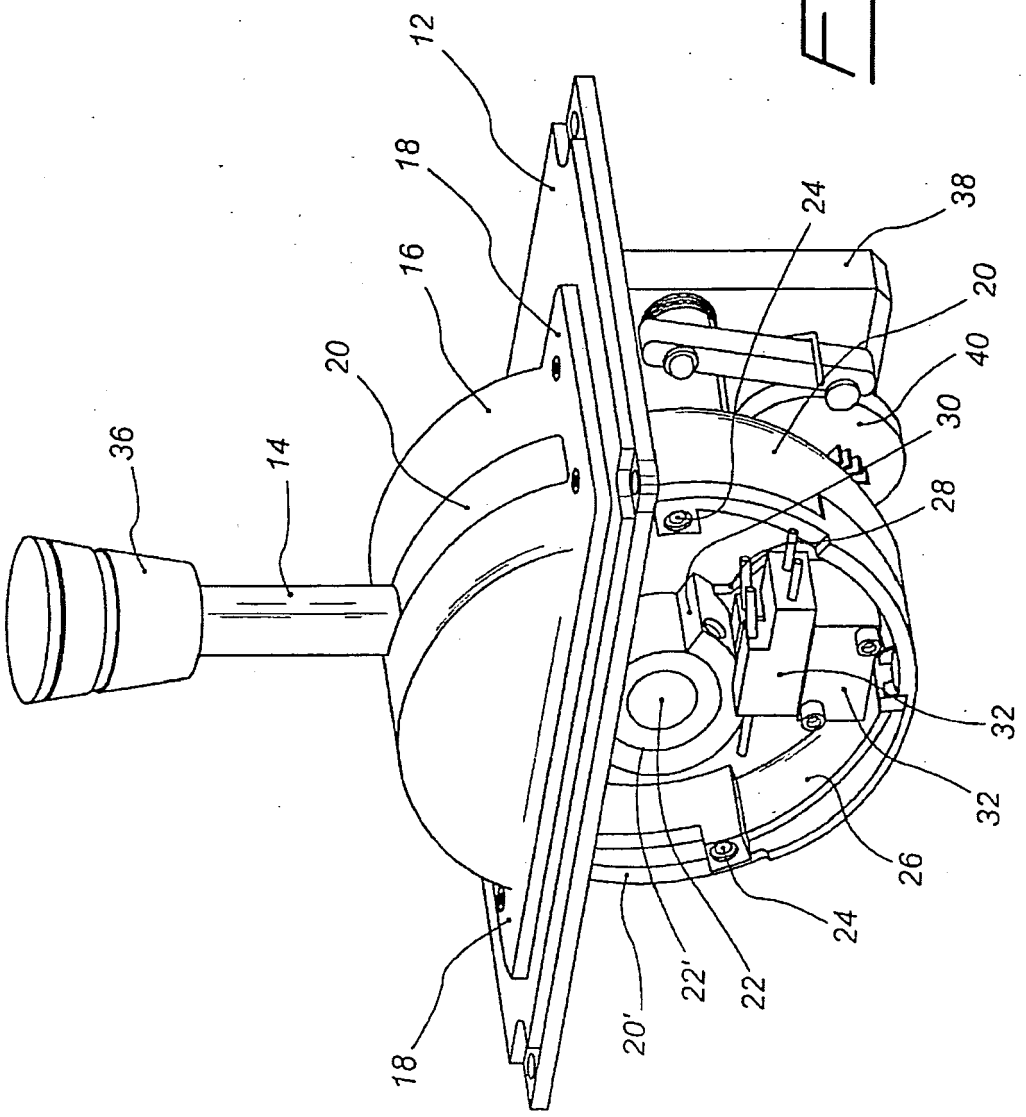
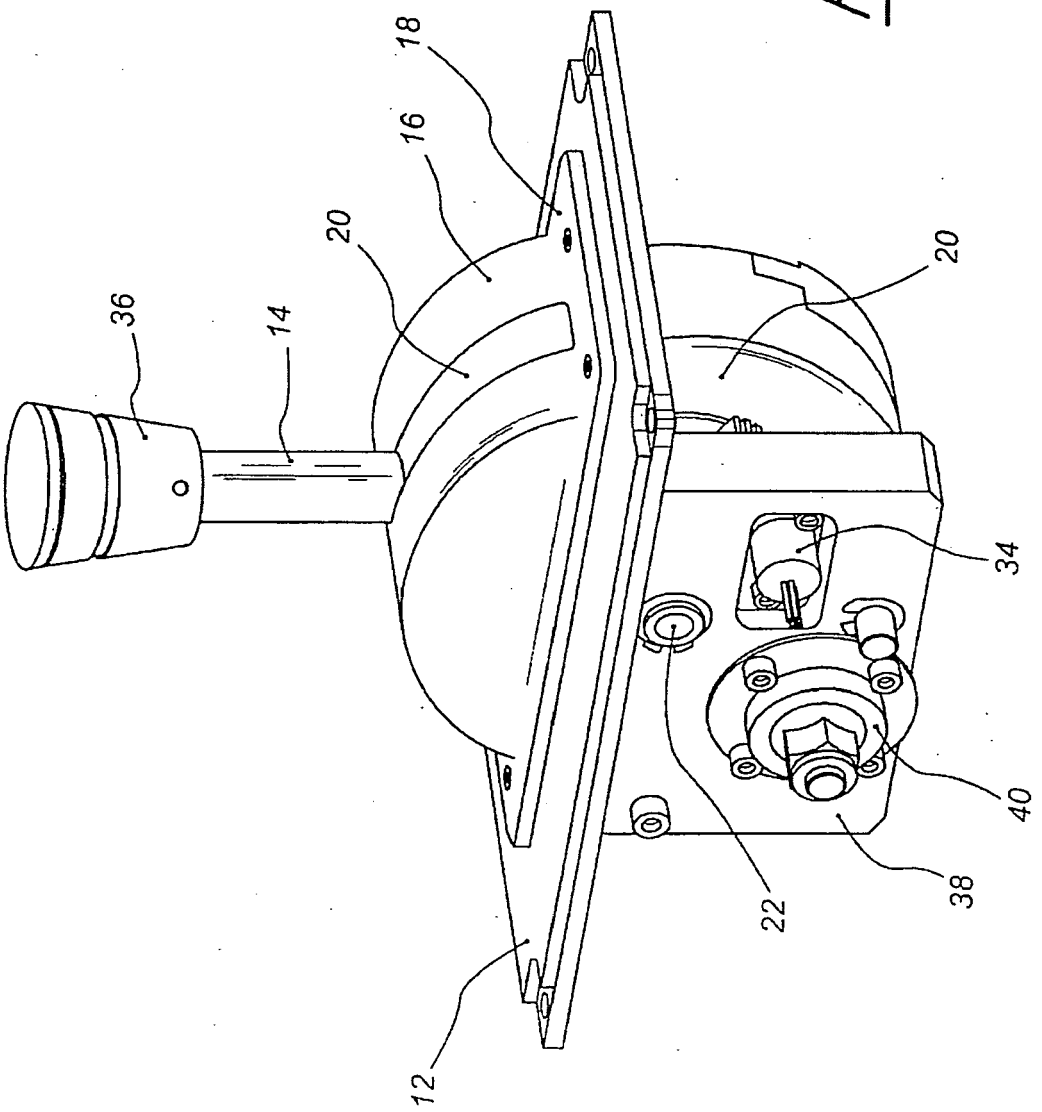


Fig.2

Fig.3



Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 12 00 0013

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 796 480 A (AMOS BARRY L [CA] ET AL) 10 January 1989 (1989-01-10) * figures 1,3,4 *	1	INV. B61C17/12
A	US 2 647 415 A (DEAN WALTER B ET AL) 4 August 1953 (1953-08-04) * figure 5 *	1	

TECHNICAL FIELDS SEARCHED (IPC)

B61C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	21 March 2012	Lorandi, Lorenzo

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

1

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 12 00 0013

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

21-03-2012

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4796480 A	10-01-1989	CA 1290653 C	15-10-1991
		US 4796480 A	10-01-1989
US 2647415 A	04-08-1953	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 4796480 A **[0004]**