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

(11) EP 2 476 598 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
28.08.2013 Bulletin 2013/35

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

(21) Application number: **12000013.8**

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

(54) **Compact Railway Vehicle Manipulator**

Kompakter Manipulator für Schienenfahrzeug

Manipulateur compact pour véhicule de chemin de fer

(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

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

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

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Printed by Jouve, 75001 PARIS (FR)

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 as claimed in claim 1. Additional advantageous feature are recited in the dependent claims.

[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 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, said drum rotating a fixed shaft (22) projecting from a support (38), **characterized in that** the manipulator is a single-lever manipulator and **in that** the disc-shaped body (20) is externally delimited, on one face, by a crown (20') whereto a concave profile cam (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.

Patentansprüche

1. Kompakte Stellvorrichtung (10) für ein Schienenfahrzeug, die insbesondere zur Anwendung für Eisenbahnen, Straßenbahnen und Untergrundbahnen geeignet ist, umfassend:

   ein plattenförmiges Element (12), das am Fahrzeugantriebspult befestigt ist, von dem ein Hebel (14) hervorsteht, der aus einem Gehäuse (16) herausragt, das ein im Wesentlichen halbkreisförmiges Profil aufweist und an dem plattenförmigen Element (12) befestigt ist, wobei das Gehäuse (16) mit einem langgestreckten Schlitz versehen ist, der einem Abschnitt eines scheibenförmigen Körpers oder einer Trommel (20) gegenüberliegt, an dem der Hebel (14) befestigt ist, wobei die Trommel sich auf einer fest angebrachten Achse (22) dreht, die von einem Träger (38) hervorsteht,

   dadurch gekennzeichnet,
   dass die Stellvorrichtung ein Einhebelstellvorrichtung ist und
   dass der scheibenförmige Körper (20) an einer Seite durch eine Krone (20') außen begrenzt ist, an der ein Nocken (26) mit einem konkaven Profil durch Schrauben (24) oder dergleichen befestigt ist.

2. Kompakte Stellvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** die Krone (20') mit einem Arm (28) einstückig ausgebildet ist, der sich radial in Richtung von der festen Achse (22) erstreckt und einen geformten Träger (30) trägt, an dem mindestens ein Mikroschalter (32) befestigt ist, an dessen Kontakten (32') der Nocken (26) anliegt.

3. Kompakte Stellvorrichtung nach Anspruch 2, **dadurch gekennzeichnet, dass** der Mikroschalter oder die Mikroschalter mit einem redundanten Winkelgeber (34) zusammengesetzt ist oder sind, der Angaben über die kontinuierliche Positionierung des Hebels (14) zur Verfügung stellt.

4. Kompakte Stellvorrichtung nach Anspruch 1, **dadurch gekennzeichnet, dass** der Hebel (14) mit einem Griff (36) verbunden ist, der mindestens einen induktiven und/oder kapazitiven Fühler enthält, der mit elektronischen Leiterplatten verbunden und für die digitalen Steuerungen und Funktionen zum Fahren des Schienenfahrzeugs bestimmt ist.

5. Kompakte Stellvorrichtung nach Anspruch 4, **dadurch gekennzeichnet, dass** die digitalen Funktionen zum Fahren des Schienenfahrzeugs Lichtanzeigern oder L.E.D.s zugeordnet sind, die längs des Gehäuses (16) neben dem Hebel (14) angeordnet sind.

6. Kompakte Stellvorrichtung nach Anspruch 3, **dadurch gekennzeichnet, dass** die sich bewegenden Teile, wenigstens die Trommel (20) und der Nocken (26), mit Gleitmaterialien beschichtet oder behandelt sind.

Revendications

1. Manipulateur compact (10) pour véhicule ferroviaire, en particulier utilisable pour le chemin de fer, le tramway ou le métro, comprenant un élément en forme de plaque (12) fixé au banc de conduite du véhicule,

duquel dépasse un levier (14), sortant d'un boîtier (16) à profil sensiblement plus ou moins semi-circulaire fixé audit élément en forme de plaque (12), ledit boîtier (16) étant pourvu d'une fente en longueur, face à laquelle se situe pour partie un corps discoïdal ou tambour (20), auquel le levier (14) est fixé, ledit tambour étant rotatif sur un arbre fixe (22) faisant saillie d'un support (38), **caractérisé en ce que** le manipulateur est un manipulateur à simple levier et **en ce que** le corps discoïdal (20) est délimité extérieurement sur une face par une couronne (20'), contre laquelle une came (26) à profil concave est sollicitée par des vis (24) ou équivalent.

2. Manipulateur compact selon la revendication 1, **caractérisé en ce que** la couronne (20') est intégrée à un bras (28) qui se déploie radialement selon la direction de l'arbre fixe (22) et qui porte un support formé (30), auquel il est fixé au moins un microrupteur (32) sur les contacts (32') duquel ladite came (26) vient en butée.

3. Manipulateur compact selon la revendication 2, **caractérisé en ce que** ledit microrupteur ou lesdits microrupteurs sont appariés à un transducteur angulaire redondant (34) qui fournit des indications sur le positionnement continu du levier (14).

4. Manipulateur compact selon la revendication 1, **caractérisé en ce que** le levier (14) est connecté à une poignée (36) qui comporte un ou plusieurs capteurs inductifs et/ou capacitifs connectés à des cartes électroniques et prévus pour les commandes et fonctions numériques d'entraînement du véhicule ferroviaire.

5. Manipulateur compact selon la revendication 4, **caractérisé en ce que** lesdites fonctions numériques d'entraînement du véhicule ferroviaire sont en corrélation avec des voyants-témoins ou diodes électroluminescentes disposées le long du boîtier (16) adjacent au levier (14).

6. Manipulateur compact selon la revendication 3, **caractérisé en ce que** les pièces mobiles, au moins pour ce qui concerne le tambour (20) et la came (26), sont revêtues de matériaux anti-fi-iction ou traitées anti-friction.

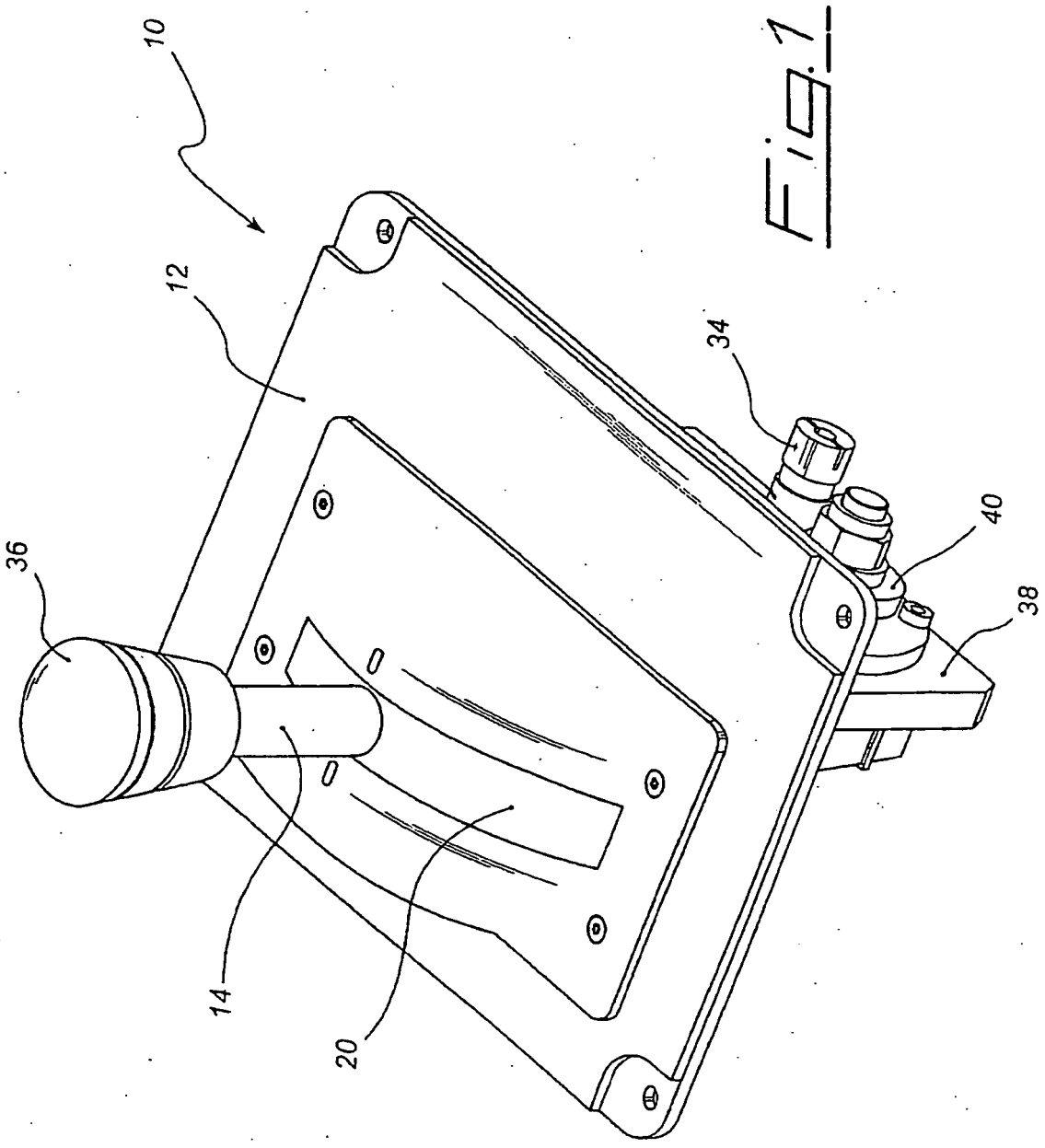


Fig.1

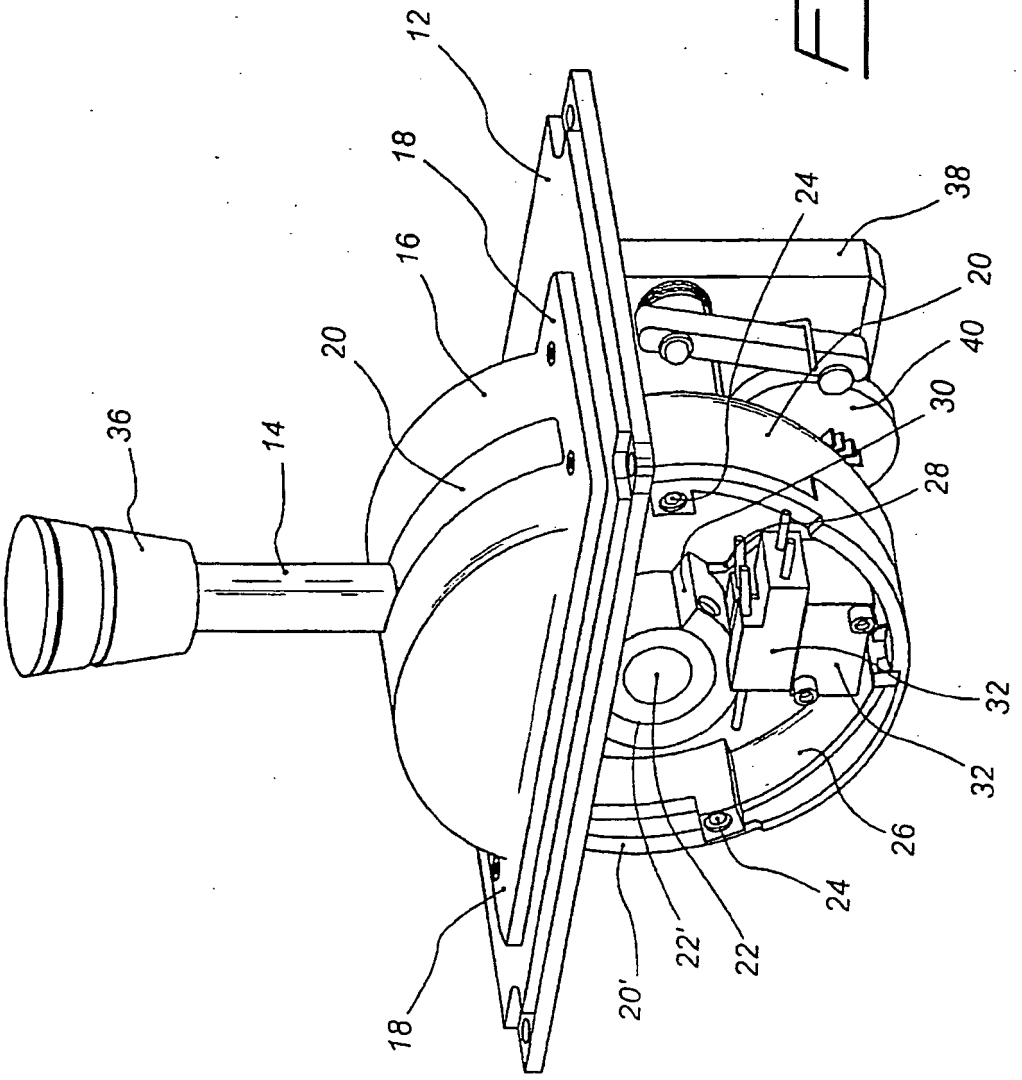
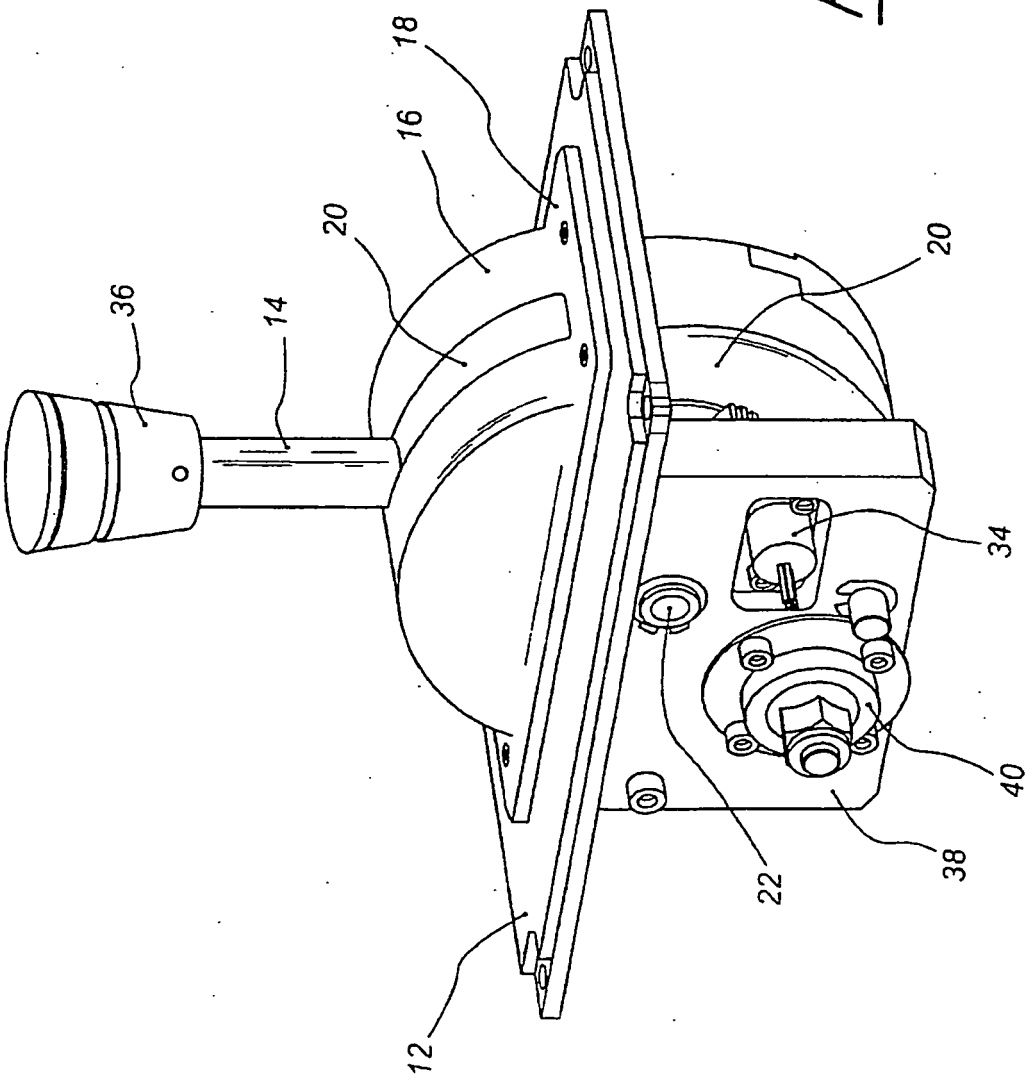


Fig.2

Fig.3



REFERENCES CITED IN THE DESCRIPTION

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