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(54) Title: CONTROL DEVICE

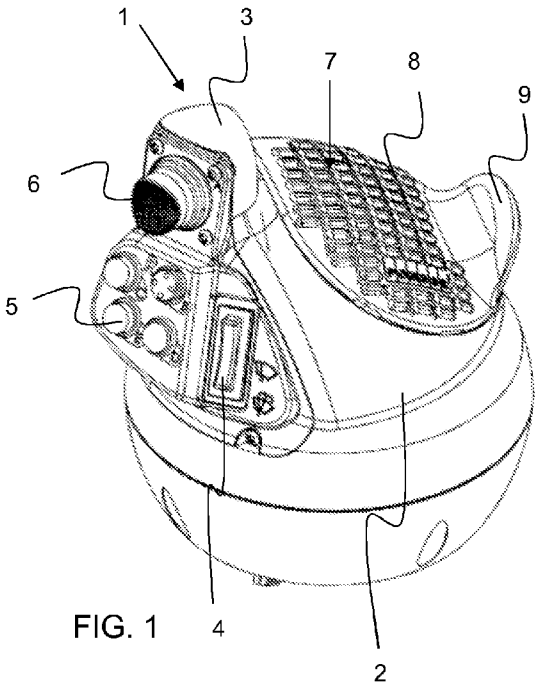

FIG. 1

(57) Abstract: The present invention relates to a control device (1) used in controlling operations of forest machines in particular. Such a control device comprises an outer surface (2) which is oriented towards an operator's hand and which has a mating surface (7) settling against the hand, as well as a set of different controls (4, 5, 6). The invention is characterized in that the outer surface (2) of the control device (1) is provided with at least one support device (8). Such a support device forms the mating surface (7) receiving the palm of the operator's hand using the control device. The support device comprises an edge portion, a part thereof being provided with a hand edge support (9) which extends therefrom with respect to the outer surface of the control device.

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— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

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Control device

Background of the invention

[0001] The invention relates to a control device according to the preamble of claim 1. Such a control device is used in controlling operations of various forest machines in particular.

[0002] For controlling the operations of modern forest machines, highly different control devices and controls are used, of which stick-type controls are probably the most common. Henceforth, these are called control sticks. Typically, some main operations of a forest machine, e.g. movements of a loader or a crane thereof, are controlled by moving such a control stick.

[0003] In addition to the movement of the control stick, other important operations of the forest machine, e.g. control of telescopic outwards and inwards directed movements of the loader or a boom of the crane, are often associated with separate pressure switches provided on a handle of the control stick. Such control sticks used in forest machines come in at least two kinds. A common control stick model is long, substantially vertical and capable of large movements, and it may also be compared to the controls model widely used in computer games and aircraft. An operator of the forest machine has to use his or her whole hand to grip such a control stick, and it has to be moved by using the whole hand and forearm. Furthermore, to grip such a control stick requires a substantially continuous, although light, grasp with the fingers and the hand. It has been noted that this, among other things, often causes the operator's shoulders to tense up excessively, which is why devices called mini handles have become increasingly popular in forest machines, for instance.

[0004] In such considerably smaller and substantially vertical control sticks, the lengths of movement are small enough for the control sticks to be used by moving the fingers and wrist only. This enables e.g. the forearm of the operator of the forest machine to mainly rest immovably on an arm rest or a corresponding support of a seat.

[0005] However, in sophisticated and complex machines, such as harvesting machines, the movements of the control stick and operating switches provided therein do not usually suffice to carry out all operations and selections of a forest machine. Consequently, in addition to these, a separate keyboard, located in the vicinity of the control stick and consisting of switches and advantageously and particularly provided with functions less frequently needed or needed at least less often than e.g. boom control, is often also

necessary. Usually, such a keyboard is therefore located such that it may be used with the fingertips of a controlling hand, and it is possible that the use requires loosening the grip of the actual control stick.

[0006] Since controlling a forest machine requires continuous high accuracy, great attention has also to be paid to the ergonomics of such controls. Although the movements of the control stick are made as small as possible, a problem with the control stick is how the operator controlling the forest machine will be able to keep on tirelessly grasping the control stick and, additionally, extending his or her fingers onto all push buttons in all operating positions of the control stick, and during his or her entire work shift.

Brief description of the invention

[0007] An object of the present invention is to substantially relieve the problems caused by the prior art and to provide a completely novel, ergonomically advantageous control device to significantly facilitate the usability of controls. This object is achieved such that the control device is, according to the present invention, provided with the characteristic features defined in the claims. In particular, the present problems may be solved by combining the characteristics as disclosed in the characterizing part of claim 1.

[0008] Preferred embodiments of the invention are disclosed in the dependent claims.

[0009] The invention is based on the idea that stresses on the hand are minimized by supporting the hand resting on the control device as well as possible by means of a mating surface provided in the control device. A particular task of the invention is to avoid the operator's need to actively grasp or grip the control device. By utilizing the present solution, it will suffice that the operator puts his or her hand onto a mating surface provided on the surface of the control device for the hand.

[0010] In an embodiment of the invention, this mating surface may be further arranged to decline towards an outer edge of the operator's hand. This enables the operator's arms and shoulders to settle on the control device in an unstrained and relaxed manner. In particular, for harvesting machine work an arrangement has proved to be comfortable wherein the surface of the control device settling against the hand has been inclined by 15 to 50 degrees, preferably by 25...40 degrees.

[0011] By further providing, in connection with the mating surface, a separate support for the outer edge of the edge of the hand, the position of

the hand on the control device may be made optimal and the control device may always be used in a natural manner. A good and relaxed grip by the hand also ensures the best possible grip of the control device, which enables working without unnecessary stresses.

[0012] The invention provides considerable advantages. Thus, the control device is always adaptable as well and as easily as possible to hands of very different sizes and shapes.

[0013] The fact that the hand always rests naturally on the mating surface of the control device enables excess stresses to be avoided and work ergonomics to be improved significantly.

[0014] This mating surface supporting the hand is achievable e.g. by a support device which is mounted in connection with the surface of the control device and against which the user's hand rests. When the surface of such a support device is e.g. provided with grooves, the breathability of the control device is simultaneously increased, whereby an unpleasant feel owing to sweating and possibly resulting erroneous movements may be avoided. The support device may not only be shaped to be as comfortable for use as possible, but it may also be made of a material which is pleasant to touch even over longer periods of time.

[0015] When said support device is made of an elastomer, e.g. rubber, silicone or polyurethane, the friction between the control device and the hand improves, which also contributes to improving the operator's control feel while simultaneously the touching comfort of the control device increases.

[0016] When the support device is a formed part to be separately mounted in the control device, a replaceable personifiable support device is provided. Consequently, each operator may have available and/or in connection with each forest machine may be provided e.g. a set of support devices having mutually different sizes or shapes, from among which he or she always finds a suitable piece to be mounted in the control device. It is even possible to mould and manufacture for an operator's personal use support devices which are adapted to his or her hands and which take into account the personal dimensions thereof. This may well be relevant since in the case of a forest machine, annual operating hours may be quite abundant and the manufacture of personal support devices may be justified. It is also possible that the replaceable parts of the control stick, such as the support device, are transferrable from one machine to another, e.g. together with the operator of a ma-

chine, whereby the control feel resembles as much as possible the control feel in connection with the machine mainly used by the operator.

[0017] When the support device is detachable, it is also washable or easily replaceable, in which case the hygiene of the surface of the control device increases and, with a small effort, the control device is as good as new as far as its feel to the touch is concerned.

[0018] In order to provide the hand with further support, it is also feasible to arrange a support device which settles substantially against the back of a hand, such as a belt, band or another plate-like structure, in connection with the control device.

[0019] In accordance with the above, the present support device may be formed of separate formed parts mounted one at a time onto the surface of the control device to replace one another, or even into a superimposed position so as to achieve an easy gradual decrease in the hand space. It may also be considered that the part of the support device which rests against the edge of the hand is arranged to be movable with respect to the surface of the control device e.g. by steplessly sliding or through small steps. In the embodiment comprising a substantially vertical control stick, such a hand edge support may at its simplest be implemented by annular distance blocks, whereby the position of an uppermost spacer ring with respect to an upper end of the control stick may be influenced by varying the number of the distance blocks. Thus, one and the same support device enables the differently sized hands of several operators to be adapted to the control device by means of few simple adjustment movements.

[0020] Such an adjustable solution which takes into account the personal dimensions and other characteristics of the operator's hand in particular enables a control event of a forest machine, the operator's general comfort and his or her physiological working conditions to be improved significantly. Other advantages of the invention are presented in the following in connection with a more detailed description of special embodiments of the invention.

Brief description of the figures

[0021] In the following, some preferred embodiments of the invention are explained in closer detail with reference to the accompanying drawing, in which

Figure 1 shows a control device according to the invention and an embodiment of a support device provided on a surface thereof,

Figures 2 to 4 show support devices of different sizes,

Figure 5 shows a second embodiment of a support device, wherein a support edge for an edge of a hand is movable,

Figure 6 shows a third embodiment of a support device, wherein a hand is further fastenable to a control device by means of a separate support belt, and

Figure 7 shows a fourth embodiment of a support device, wherein the support device is arranged in a substantially vertical control stick.

Detailed description of preferred embodiments

[0022] The present figures do not show the control device in scale but the figures are schematic, illustrating the structure and operation of the preferred embodiments in principle. Structural parts indicated by reference numerals in the figures then correspond to structural parts provided with reference numerals in this specification.

[0023] Figure 1 shows a preferred embodiment of the present control device 1. The figure shows a control device designed for the right hand in particular and comprising a convex outer surface 2 oriented towards the operator's hand, at least one control stick 3 extending from the outer surface 2, and controls 4, 5, and 6 provided in the control device. When being used, the control device rotates around the centre of the preferably convex outer surface it is provided with in this embodiment.

[0024] In the embodiment according to the figure, the control stick 3 abuts on a mating surface 7 against which the palm of the operator's hand rests when he or she is working (not shown). Figure 1 further shows a support device 8 which, settling against the outer surface 2 of the control device 1, forms the mating surface and comprises an edge portion, a part thereof being provided with a hand edge support 9 which extends therefrom with respect to the outer surface of the control device. In the embodiment according to the figure, the hand edge support extends from an edge portion 9 substantially opposite the control stick. Of course, it is also possible to provide the support device by combining with one another e.g. the separate mating surface and hand edge support in order to form a device with a desired shape.

[0025] The mating surface, which is also substantially convex, comprising such a support device 8 thus follows, at least mainly, the shape of

the outer surface 2 of the control device 1 underneath it. The support device is attached to the outer surface of the control device e.g. by means of fastening members provided in the control device. These fastening members seize the support device and lock it against the outer surface. Preferably, the fastening members are formed by a perforation adapted to receive at least one grip rebate extending from a bottom surface in the support device. Similarly, the fastening members may be formed by some other mechanical devices, self-adhesive surfaces or adhesive or self-adhesive surfaces allowing recurrent attachment and detachment or by another manner of fastening known per se.

[0026] According to its preferred embodiment, the control device 1 comprises one support device 8 arranged therein and formed to receive the hand of an operator controlling a forest machine at a given time in the best possible manner. The support devices may also be formed by devices having a gradually decreasing mating surface, as in Figures 2 to 4, from among which the operator may choose the most appropriate for him/herself. Thus, in the embodiments according to the figures, it is feasible that the mating surface provided between the control stick 3 and the hand edge support 9 is for instance 60 to 100 mm in width.

[0027] According to a second embodiment, it is also possible to mount a plurality of support devices 8 on top of or inside one another. In such a case, such support devices then comprise special connecting members for seizing another superimposed support device and for locking it so as to make it substantially immovable.

[0028] When the support device 8 is made of an elastomer, it is inexpensive to manufacture while at the same time it may be easily arranged to be detached from the outer surface of the control device e.g. for cleaning and disinfection to be subsequently reinstalled for use. A support device made of rubber in particular is also pleasantly soft against the operator's hand and has a surface friction which is advantageous for using the control device. In order to increase and/or arrange such a friction or improved ventilation, the mating surface 7 formed by the support device may also be provided with various grooves 10, as can be seen in Figures 2 to 4, for instance.

[0029] When the support device 8 is made of an elastomer, it is not only easy to replace or fasten but also easy to customize for each individual operator. It may thus be adapted to follow closely the shape of a given operator's hand while at the same time the mating surface 7 may be provided with

other elements supporting the hand, such as separate parallel recesses for at least partly receiving the fingers of the hand.

[0030] According to a second embodiment of the support device 8, its hand edge support 9 located opposite the control stick 3 is arranged to be movable substantially in a direction of the outer surface 2 of the control device. Thus, a single support device is adaptable to suit a plurality of operators, with no need to detach the support device from the outer surface of the control device. In order to achieve an appropriate working position, it will suffice that the hand edge support is moved closer to or farther away from the control stick. One such solution is shown in Figure 5.

[0031] When it is to be ensured that the hand stays on the mating surface 7, it is even possible to provide the control device 1 or the support device 8 with a special support belt 11 to enable the hand to be even better attached to or supported against the control device in a manner shown in Figure 6, for instance.

[0032] Figure 7, in turn, shows an embodiment wherein the substantially vertical control device 1 is provided with a support device 8 which at least partly surrounds the control device. In such a case, such a support device in its operating position comprises in a lower edge 12 a hand edge support 9 on which the operator may lay his or her hand. As shown in the figure, the hand edge support may surround the control device in its entirety, or it may be formed by one or more parts having different sizes. Such a solution may simply consist of a set of sleeves having different lengths and different diameters, and by joining together such sleeves it is possible to achieve a desired diameter for the control device and a desired position of the edge part with respect to the outer (upper) end of the control device. By arranging this hand edge support to be movable in a direction of a longitudinal axis 13 of the control device, it is possible to find a best possible position for the operator's hand, regardless of the size and shape of the hand. By thus supporting the edge of the operator's hand against the hand edge support provided in the control device, it is possible to avoid the operator's need to actively grasp or grip the control device. This enables the stresses on the hand to be minimized even in such a control device, and the grip of the hand on the mating surface of the control device is relaxed.

[0033] When the support device 8 is implemented such that it does not surround the control device in its entirety, the control device and the sup-

port device are preferably interconnected by fastening members formed by a groove located in the direction of the longitudinal axis 13 of the control device and adapted to receive at least one grip rebate extending from the bottom surface in the support device. Consequently, the grip rebate may be formed by a device equal in size with the entire support device, but it may also comprise several successively arranged rebate parts. When the rebate is arranged in the groove, a particularly form-blocked joint is achieved which securely fastens the support device to the outer surface of the control stick.

[0034] It is apparent to one skilled in the art that as technology advances, the basic idea of the solution described above may be implemented in many different ways. The disclosed solution and its embodiments are thus not restricted to the examples described above but may vary within the scope of the claims.

Claims

1. A control device (1) for use in controlling operations of forest machines in particular, the control device (1) comprising an outer surface (2) oriented towards an operator's hand,

a mating surface (7) provided in this outer surface and settling against the hand, and

controls (4, 5, 6),

characterised in that

the outer surface (2) of the control device (1) is provided with at least one support device (8) for forming the mating surface (7) receiving the palm of the operator's hand using the control device, whereby

the support device comprises an edge portion, a part thereof being provided with a hand edge support (9) which extends therefrom with respect to the outer surface of the control device.

2. A control device (1) as claimed in claim 1, characterised in that the edge portion of the support device (8) located substantially opposite a control stick (3) comprises the hand edge support (9) which extends therefrom with respect to the outer surface (2) of the control device (1).

3. A control device (1) as claimed in claim 1 or 2, characterised in that the outer surface (2) of the control device (1) comprises fastening members for seizing the support device (8) and for locking it to the outer surface.

4. A control device (1) as claimed in claim 3, characterised in that the fastening members are formed by a perforation adapted to receive at least one grip rebate extending from a bottom surface in the support device (8).

5. A control device (1) as claimed in claim 3, characterised in that the fastening members are formed by a groove made in the outer surface (3) in a direction of a longitudinal axis (13) of the control device (1) and arranged to receive at least one grip rebate extending from the bottom surface in the support device (8).

6. A control device (1) as claimed in any one of the preceding claims, characterised in that the support device (8) comprises connecting members for seizing another superimposed support device to be arranged therein and for locking it so as to make it substantially immovable.

7. A control device (1) as claimed in any one of the preceding claims, characterised in that the support device (8) is made of an elastomer.

8. A control device (1) as claimed in any one of the preceding claims, characterised in that the mating surface (7) provided in the support device (8) and settling against the hand is convex.

9. A control device (1) as claimed in any one of the preceding claims, characterised in that the mating surface of the support device (8) is provided with grooves (10).

10. A control device (1) as claimed in any one of the preceding claims, characterised in that the hand edge support (9) is arranged to be substantially movable in a direction of the outer surface (2) of the control device (1).

11. A control device (1) as claimed in any one of the preceding claims, characterised in that the support device (8) is provided with a support belt or another corresponding structure supported against a back of the hand for fastening the hand to the control device (1) or for supporting the hand against the control device (1).

12. A control device (1) as claimed in any one of the preceding claims, characterised in that the support device (8) comprises a mating surface (7) and a hand edge support (9) interconnected with one another for forming a device with a desired shape.

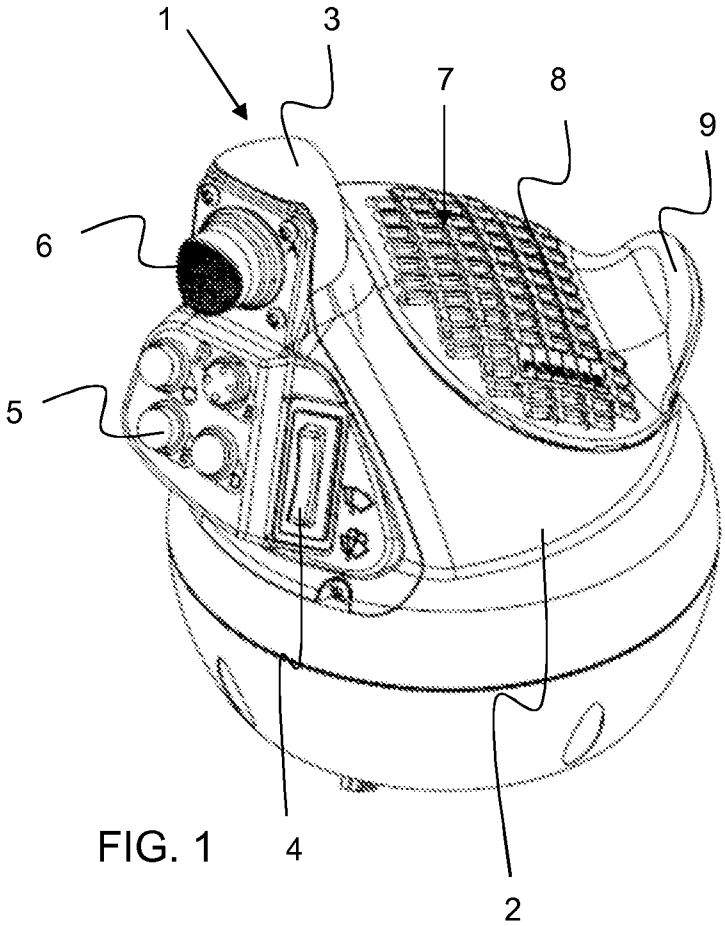

FIG. 1

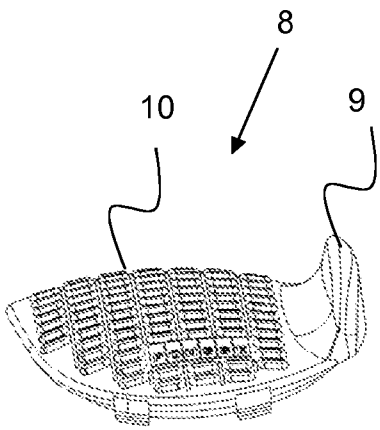

FIG. 2

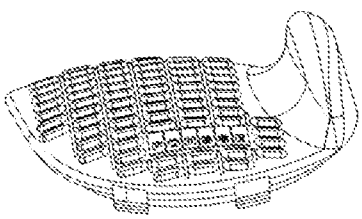

FIG. 3

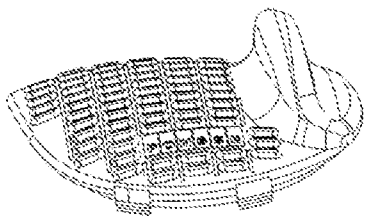

FIG. 4

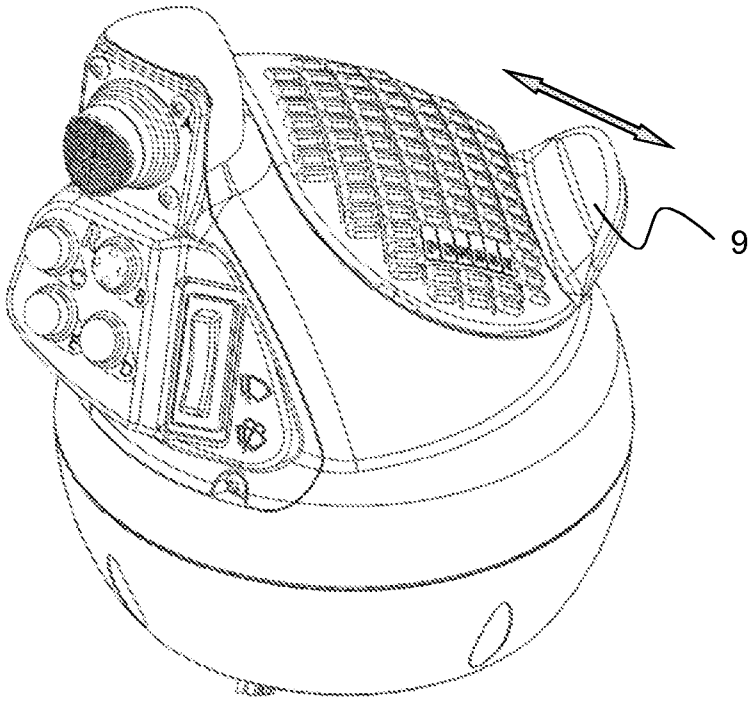

FIG. 5

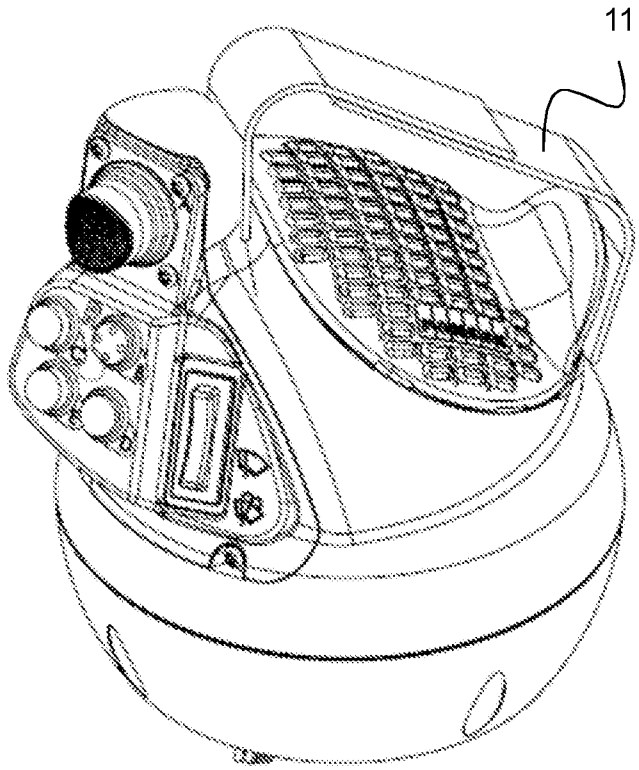

FIG. 6

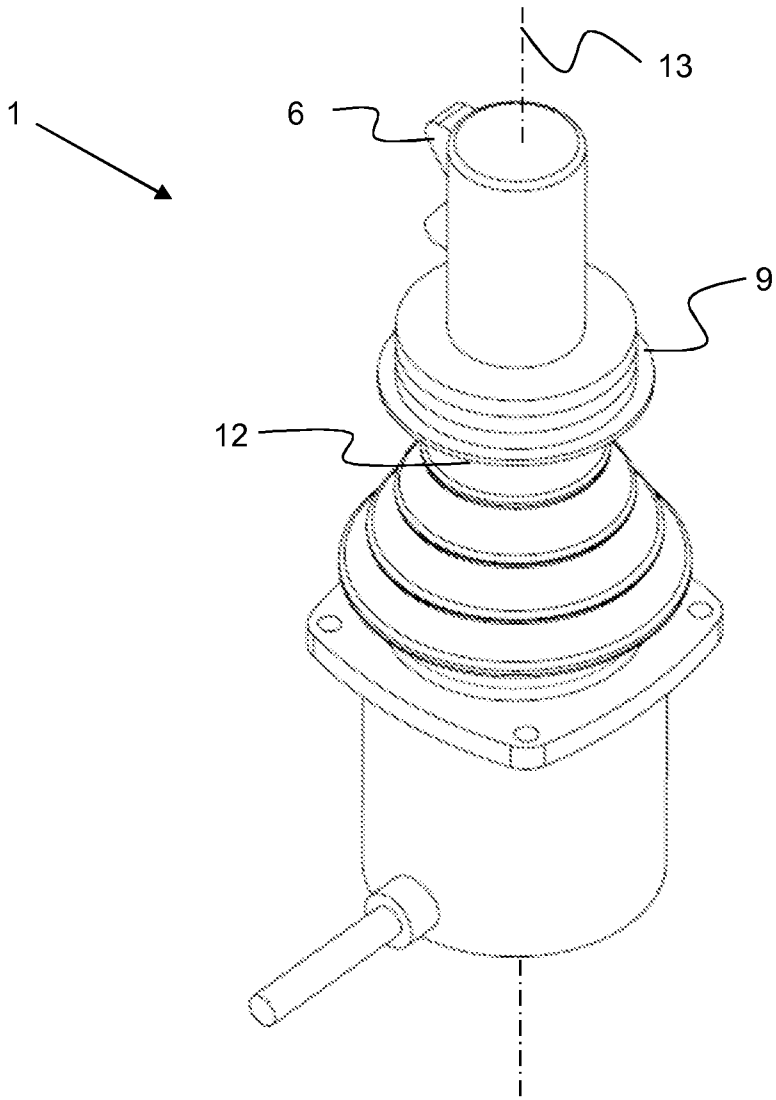

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC: see extra sheet

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)

IPC: E02F, G05G

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

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, 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	US 20080128253 A1 (MACK FRANZ), 5 June 2008 (2008-06-05); paragraphs [0011], [0019]; figures 1-5	1, 2, 7-9, 11
Y	--	3-6, 10, 12
Y	FR 2903204 A1 (NOREMAT SA - (B1) NOREMAT [FR]), 4 January 2008 (2008-01-04); abstract; figures 1,2	3-6, 12
A	--	1, 2, 7-11

☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
11-06-2012	12-06-2012

Name and mailing address of the ISA/SE	Authorized officer
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20020184735 B2 (GILLMAN UWE ET AL), 12 December 2002 (2002-12-12); paragraphs [0001]-[0003], [0018], [0025]; figures 1-6	10
A	--	1-9, 11, 12
X	DE 2828781 A1 (KOEPPE DETLEF), 3 January 1980 (1980-01-03); page 8, line 1 - line 4; figures 1-7	1, 2, 7-9, 11
A	--	3-6, 10, 12
X	EP 2131261 A2 (VALTRA OY AB), 9 December 2009 (2009-12-09); paragraph [0016]; figures 1-3	1, 2
A	--	3-12
A	EP 0712062 A2 (JUNGHEINRICH AG), 15 May 1996 (1996-05-15); figures 2,5,6	1-12
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A	JP 2000347757 A (HONDA MOTOR CO LTD), 15 December 2000 (2000-12-15); abstract; figures 1-2	11
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A	US 20060012574 A1 (KAUK OLIVER ET AL), 19 January 2006 (2006-01-19); figures 2-5,7	1-12
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A	US 20080165123 A1 (SEGALLE JULIO ABEL), 10 July 2008 (2008-07-10); paragraphs [0020], [0024]; figures 3-6	1-12
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A	WO 9859316 A1 (BERING CHARLOTTE), 30 December 1998 (1998-12-30); figures 1-10	1-12
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A	WO 0025258 A1 (TRULSSON CHRISTER), 4 May 2000 (2000-05-04); figures 1-10	1-12
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International Patent Classification (IPC)

G05G 1/06 (2006.01)
E02F 9/20 (2006.01)
G05G 1/58 (2008.04)
G05G 9/047 (2006.01)

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International application No.
PCT/FI2012/050188

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