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- (81) **Designated States** (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM,

AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

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(54) **Title:** METHOD TO SAFELY BECOME A SKILLFUL USER DURING USE OF AN INTERACTIVE PIPE CLEANING EQUIPMENT COMPRISING A MACHINE HAVING ONE IN A FIXED COVER ROTATING FLEXIBLE SHAFT AND A MACHINE TO PERFORM SAID METHOD

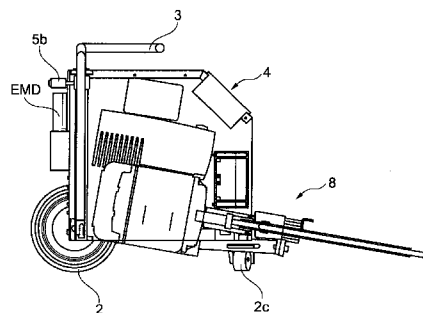
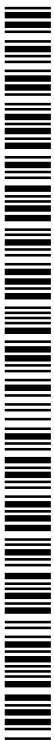


Fig. 2

(57) **Abstract:** The present invention relates to a method to safely become a skilled operator during use of an interactive pipe cleaning equipment (1) comprising one in a surrounding cover (9) rotating flexible shaft (12) carrying a suitable cutting front part to clean pipes or channels and to register parameters regarding time, and/or type of ongoing type of work performed by the tool. The invention is characterized in that working parameters as revolutions direction of rotation, torque load on the shaft (12) and type of used front part (7/tool head) are chosen on a display (4), that information regarding the working parameters are registered and stored in an experience memory unit (EMU), that torque performed on the flexible shaft (12) is registered during use and that this information is treated and compared with information in the experience memory unit (EMU) in a comparing search after earlier similar working cases and that the result will continuously be transferred to the user giving a support and a confirmation on the proceeding of the work.



Method to safely become a skilful user during use of an interactive pipe cleaning equipment comprising a machine having one in a fixed cover rotating flexible shaft and a machine to perform said method

5 The present invention relates to an interactive machine having a rotating flexible shaft in a fixed cover. More precisely the invention relates to a machine where the flexible shaft carries a working front part or a tool head to clean channels in connection to buildings and to in real time register parameters relating to position, rev per minute, torque, time and/or type of ongoing work. The invention also relates to a method to use the machine also
10 by a non skilled operator.

When a company make itself responsible for a contract there is a big need to have control of the procedures at the working place. The working staff sent
15 need to have a skill to manage the working tasks needed to fulfil the mission. As the present invention is restricted to treat channels, as channels for ventilation and drain in buildings, several of the tasks will be similar and should by this reason be handled by inexperienced staff members. Against this use are the risks involved in a cutting procedure of 40 to 50 years old
20 drain pipes in dwelling-houses It is difficult to make prior decisions of which type of cutting front parts or working tools being most suitable as the real reason for drain pipes being blocked as one example is not known. Of course there are rust deposits but also fat and limestone formations may be the reason for blocked drain pipes, which may cause flooding, especially if the blockings
25 exist in a main pipe drain. This is most likely in houses having several floors.

WO 2009/143497 discloses a tool machine to clean channels. This machine have a "naked" spiral shaft being winded on a drum on the machine. From this drum the naked spiral shaft is fed into a channel to be cleaned. This machine
30 is very awkward in handling and not very hygienic to an operator. An advantage may be that spiral shaft not used remains wound onto the drum. Thus it must be rotated also when a short channel length is to be cleaned, that is it uses power to be driven.

The main object of the present invention is to obtain an interactive machine
35 being easy to handle and comprising a rotating flexible shaft in a fixed cover and carrying a cutting front part/tool head for an efficient cleaning of channels and where the machine also can be handled by an inexperienced operator, e.g. an operator being trained or educated.

This object is obtained by providing the machine with a central control unit
40 having an experience memory unit (EMU) having stored typical working parameters for different tool heads to be chosen. There is an ongoing summarization against this EMU of current real time working parameters. EMU has a capacity to suggest different strategic choice of tool heads, e.g. by

suggesting choice of one type of cutting tool heads for heavily blocked pipes having a given dimension. If use of a suggested working head means that it is very easily fed through the channel EMU suggests use of a working head having a greater working diameter. When this happens a bigger resistance will probably occur being a sign of an increased performed cleaning process. Stored parameter information in the EMU for different tool heads are compared with ongoing real time information for different types of blocked pipes. Of course the reasons for blocked channels can vary in the one and same channel in that flushed down items of varied shape and properties may be obstacles. Plant roots may be the reason for fluid blocked channels. By registering changing torque on the rotating flexible shaft and by knowing exactly how the changes in torque starts to show up for the tool head used it is possible to give a pretty safe judgement of the reasons to blocking channels and to suggest change of the front part/tool head not to over load the flexible shaft.

Another object of the present invention is to obtain a safe and interactive tool having EMU where limits for parameter and/or parameter constellations are stored for different running conditions with different used tool heads and which, when exceeded, the tools may be emergency stopped.

Yet another object of the invention is to make a meaningful use of the tool possible also handled by an inexperienced operator out on the working site in that the tool for an ordered task will put pre-programmed questions demanding correct answers by interaction by a display prior starting the task. Preferably the tool according to the invention is set not to be able to exceed such working parameters which might damage the channels during treatment, the tool itself with completing equipment or damage on the operator.

Still another object with the invention is to obtain a tool having a clear interface/control panel being possible to take over and control remotely of an experienced operator, e.g. by a communication link. During a productive learning procedure the tool may all the time be connectable by said link to, when needed, inform a responsible education instructor that support out on the field is needed. Then the education instructor may log in and remotely control an ongoing working process and at the same time perform an explanative dialog with the adept.

Necessary steps taking care of a drain pipe in a building may be rebuild/relining or change of complete main drain pipes. To make economically correct decisions all channels must first be cleaned and prepared prior to a choice of a further step suitable. In some cases the result may be a need to change the whole channel or just parts of it.

Thus the tool according to the invention has a capacity for handling parameters using a suitable software registering different type of proceedings and decide working running conditions from a data bank and inform the user about this and suggests a suitable method to treat in combination with suitable tools. This computing power will also be able to "tell" the user about the tool if it is used in a wrong way and then suggest a more constructive use, or, as mentioned above, simply stop a preceding working process.

A GPS function will allow traction of the tool, which besides confirming that the tool is at a stated certain working place also essentially may contribute to limit the damage at not authorized removal of the tools from said working site out on the field.

A channel to be relined often needs a treatment with different types of working heads. Deposits on the channel walls may have different hardness and need special cutting tools. Also the lay out of channels means that they have bends of different radii. From this it is necessary to have a combination of a flexible, propelling shaft and cutting tools functioning at different bending radii. Therefore, e.g. prior to passing a bend, it is important that a tool change may be performed quick and easily, especially as there is clogging developed in the channel areas at such places.

The invention will now be described in connection to the shown embodiments on the drawings, where

Fig. 1 is an end view of the main propelling unit of the pipe cleaning equipment according to the invention

Fig. 2 is a side view of the main propelling unit of a pipe cleaning equipment according to fig. 1,

Fig. 3 is an enlarged view of the coupling mechanism between the flexible shaft and the main propelling unit of the pipe cleaning equipment, and where

Fig. 4 – 12 are views of different information shown on an interactive display unit.

The main drive unit 1 of the pipe cleaning equipment according to the present invention is carried by wheels 2. It has a handle 3 stretching in over the centre of gravity to make it possible to carry this part in balance. A display 4 being of the interactive type discloses the control symbols and which can be activated by the user to set wanted drive conditions for the main drive unit. An emergency stop 5 is placed easy accessible on top of the main drive unit 1.

A flashing warning light and a reset button is shown at 6 and 7 respectively. A connection mechanism for the flexible shaft 12 is shown diagrammatically at 8 in fig. 1 and 2.

5 In fig. 3 the interacting parts of the coupling mechanism 8 are shown as the quick release coupling 10 of bayonet type is locked to the flexible shaft 12 by a clamp ring coupling 11. A cover 9 surrounds the shaft 12 and is hold against axial movement by a socket locking into the periphery of said cover 9 – here shown as a threaded connection. The socket will be retained in an arc
10 interconnection by a foldable arc 14 being articulately connected to the main drive unit 1.

At the free end of the flexible shaft there is preferably a cutting tool suited for cutting channels having a smaller area, that is a so called chain cutter commonly used for cutting channels having a greater area, or a tip drilling
15 tool having very good cutting properties. Also special tools especially suited for lead, roots, concrete or collapsed insert stocks from failed relining procedures are to chose from.

The parameters being handled by the soft ware in the drive unit of the
20 equipment are voltage and amperes (torque) and the revolutions per minute. A memory unit in connection to the soft ware will register how the torque (amperes) will change during time, which is if the ongoing work cycle tends to be too heavy for the drive unit and/or for the chosen tool using the actual shaft length. A logic unit connected to the soft ware and to a memory bank
25 including preceding working cases may suggest a change of tool for the ongoing work after the parameters have been calculated during an ongoing activity. It is also possible to have a continuous information of ongoing activities by light bulbs on the control panel which will light green for an ok work, yellow for a work to be controlled and red for working conditions
30 needing an immediate attention. Thus if in the latter case a manually initiated change of working conditions does not take place the equipment and the tool will be immediately stopped.

In the following an example of safety routines and a dialog using an active
35 display to handle the equipment are shown.

1. Safety routines to use the machine

The invention has an advanced emergency stop system. The machine has two buttons for emergency stop. The first is in the chassis left of a display;
40 the other is on the remote control. The emergency stop loop will disconnect and stop the engine without delay.

There are two different positions for use/safety modes for the machine.

1. When operating from the display the remote control is inactive. In this case the emergency stop button on the machine is active.
2. When using the remote control both of the emergency buttons are active and operation from the display is not possible.

2. Resetting of safety loop

Emergency stop activated on the machine

1. Display is shown in fig. 4.
2. Reset the emergency stop button on the machine (no red light)
3. Accept and reset using the OK button.
4. Now the operating display is shown and the machine is ready to use.

If the remote control was connected at the moment of emergency stop an informative text is shown on the working display as in fig. 5 and then the remote control has to be disconnected and reconnected to reset the security loop.

Released emergency stop on the remote control

1. Display is shown as in fig. 4.
- Sign with OK button on display to go back to control by the display as alternative – Reconnect the remote control and use it for containment.

3. To get the machine started

1. Connect the plug to a grounded socket of 230 V
2. The machine starts and the display is charged with soft ware
3. PCT Logotype is shown in 5 sec – fig. 6.
4. After that the start display with the current set ups for speed, torque, sound and flash lightning is shown as in fig. 7.
5. To reset the security loop and go further on to the drive menu confirm by ticking off by the button (green hook).
6. For a detailed explanation press the question mark.

7. Now the drive menu is shown in fig. 8.

4. To control the machine from the display

1. Show clockwise or anti clockwise in the drive menu.
2. Set the wanted speed and torque as in fig. 9 using the (+) button and (-) button respectively.
- 5 3. Press the big round drive button with an arrow to start.
4. If and when reaching and exceeding the set torque the machine will stop and a big red cross will show up as in fig. 10.
5. Press the cross to return to an operative mode.

10

5. To control the machine from the remote control.

1. Connect the remote control by pressing button 1 for one sec, button 2 for one sec and again the button 1 for one sec.
- 15 2. The display 10 is shown and the remote control is connected.
3. Press button 2 to reset the security loop.
4. Now as is shown in fig. 11 the machine can be used.

20 Clockwise driving occurs when pressing the button X and is stopped by one more pressure on said button.

Anti clockwise driving occurs by keeping the button X pressed down, the machine will start when the button is released.

- 25 To adjust the speed one button in fig. 12 is used to decrease and to increase the speed and the other to decrease and increase the torque.

The invention is not restricted to the shown embodiments but modifications can be done within the scope of the following claims.

30

Claims

1. A method to safely become a skilled operator during use of an interactive pipe cleaning equipment (1) comprising one in a surrounding cover (9) rotating flexible shaft (12) carrying a suitable cutting front part to clean pipes or channels and to register parameters regarding time, and/or type of ongoing type of work performed by the tool, **characterized in** that working parameters as revolutions direction of rotation, torque load on the shaft (12) and type of used front part(/tool head are chosen on a display (4), that information regarding the working parameters are registered and stored in an experience memory unit (EMU), that torque performed on the flexible shaft (12) is registered during use and that this information is treated and compared with information in the experience memory unit (EMU) in a comparing search after earlier similar working cases and that the result will continuously be transferred to the user giving a support and a confirmation on the proceeding of the work.
2. A method according to claim 1, **characterized in** that a GPS receiver at the pipe cleaning equipment collects and registers the present position in the experience memory unit (EMU).
3. A method according to claim 1, **characterized in** that the result from the treated information is given as a judgement concerning degree of suitability (skilfulness) in handling of the tool, the quickness in performing, and as suggestions to possible improvements when a comparison has been done with earlier performed and into the experience memory unit (EMU) stored working cases, also from other users.
4. An interactive pipe cleaning equipment (1) comprising one in a covering shield (9) rotating flexible shaft (12) carrying a suitable cutting front part for cleaning pipes or channels and to register parameters concerning time and/or type of work carried out by the tool and to perform the method according to claim 1, characterized in that a wheel carried (2) main drive unit (1) having handle (3), interactive display (4), emergency stop (5), flash light (6), resetting button (7) and a quick coupling device (8) to connect to a flexible shaft (12) in front carrying a cutting tool head and an experience memory unit (EMU) to store working parameters as rpm, direction of rotation, torque load on the shaft (12) and type of used front part/tool head, and in a remote control module also transferring working information to the user giving a support and a confirmation of the proceeding of the work.

5. A coupling mechanism between main drive unit (1) of the pipe cleaning equipment and the flexible shaft (12), comprising a bayonet coupling mechanism (1), a clamping ring mechanism (11), **characterized in** that the shield (9) of the flexible shaft (12) is locked in axial direction to the main drive unit (1) by a foldable protecting socket (14).
6. A coupling mechanism according to claim 5, **characterized in** that the front part (14a) of the protecting socket (14) is folded down over a socket (13) fixed on the shield of the shaft (12).
7. A coupling mechanism according to claim 6, **characterized in** that the socket (13) is winded threaded to lock to the shield (9) of the shaft (12).

15

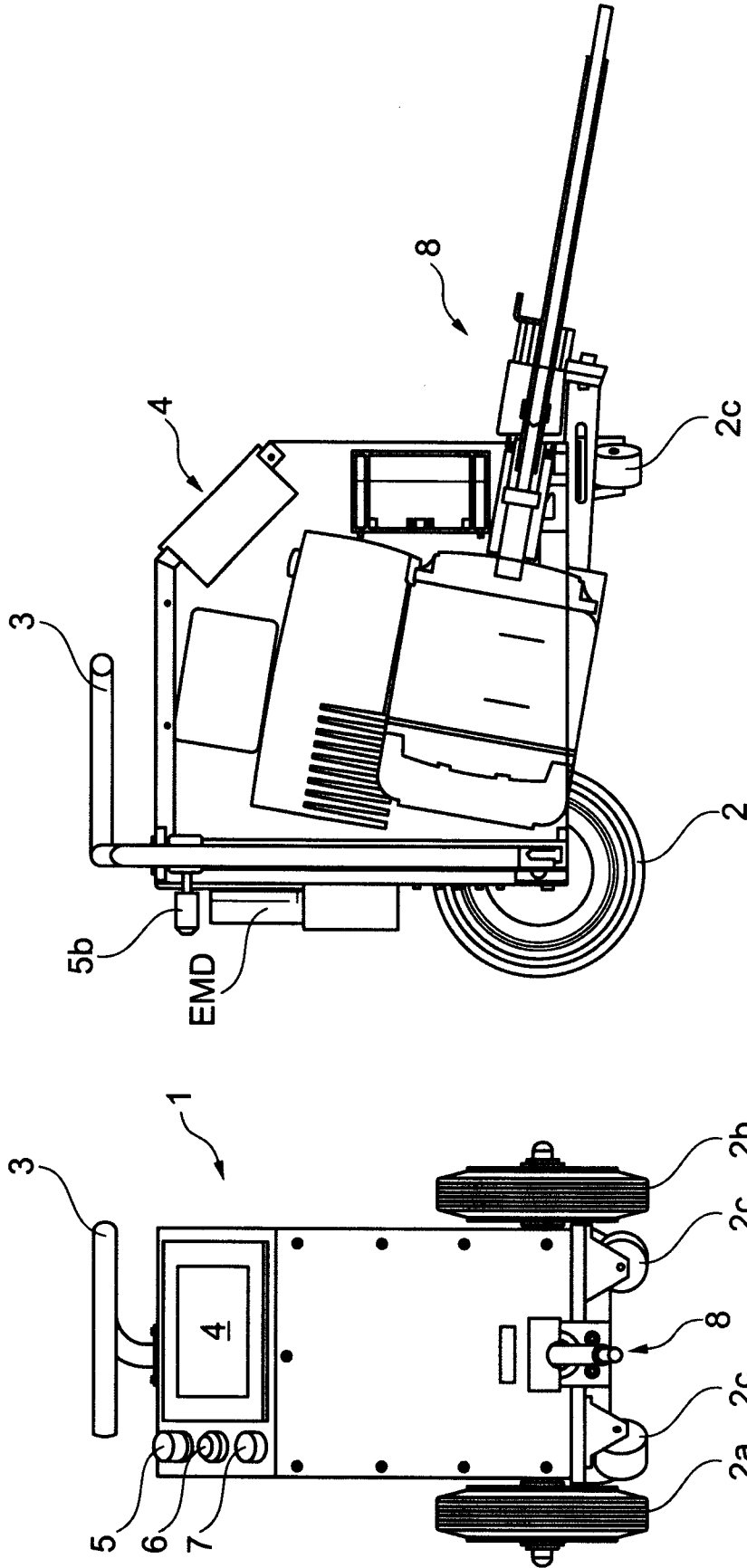


Fig. 2

Fig. 1

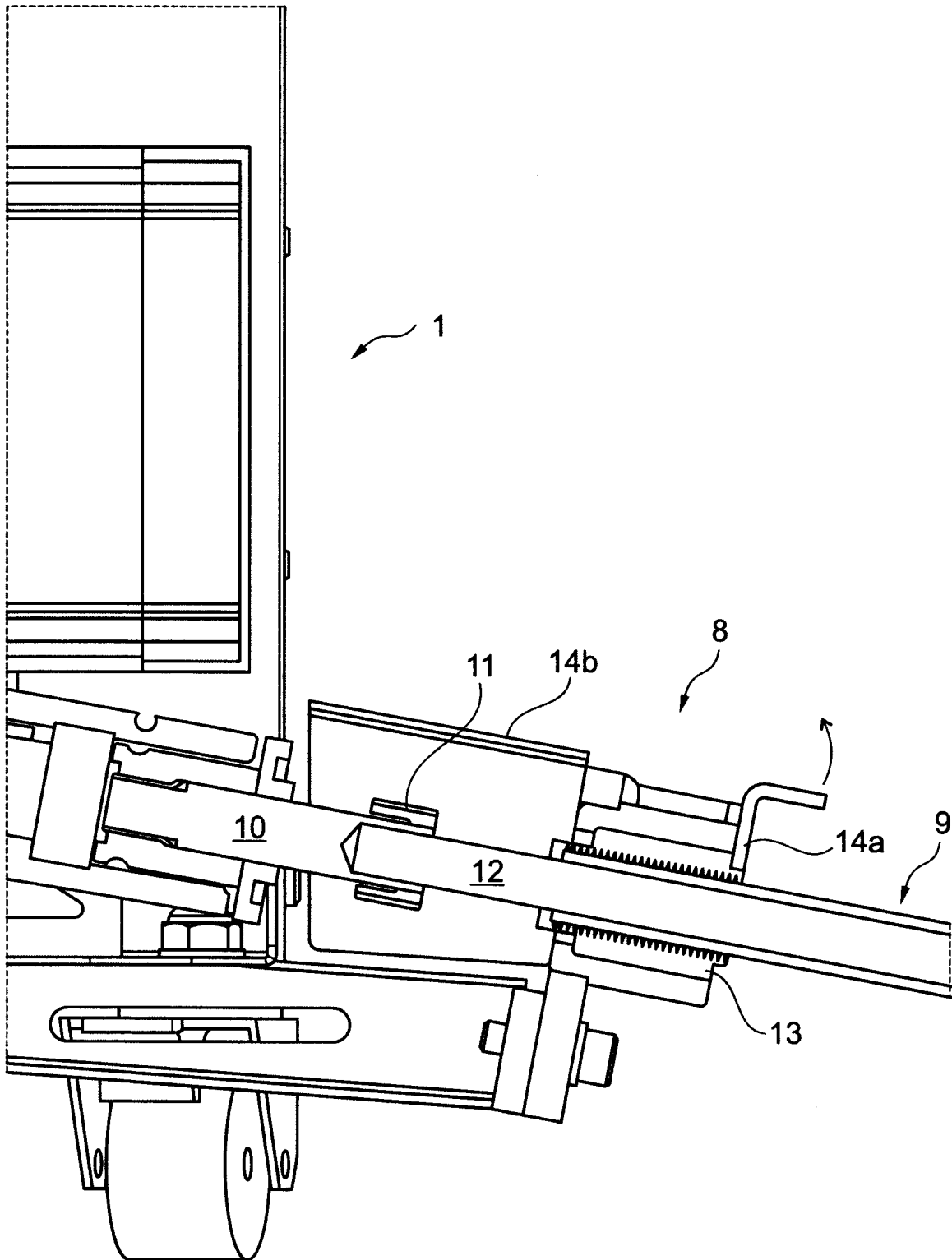


Fig. 3

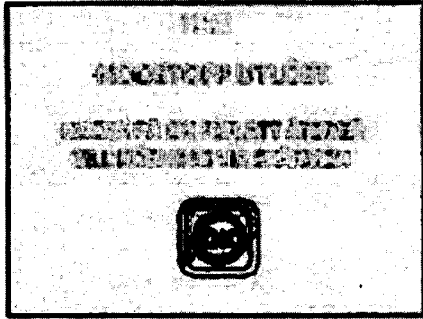


Fig. 4

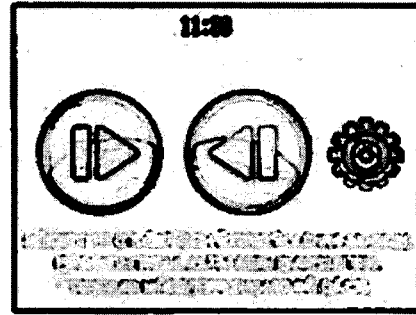


Fig. 5



Fig. 6

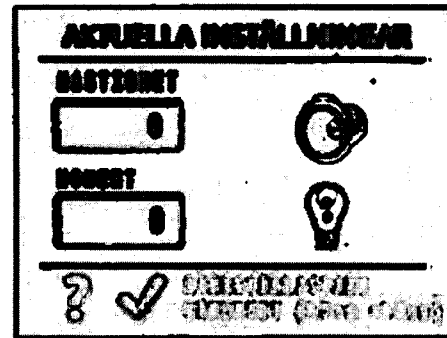


Fig. 7

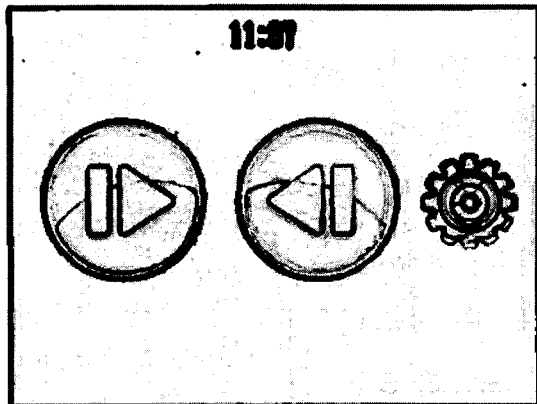


Fig. 8

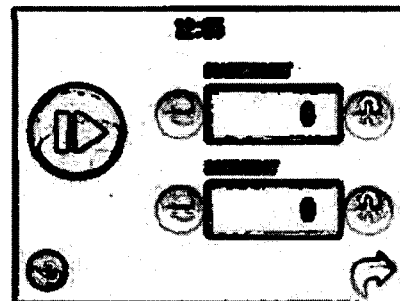


Fig. 9

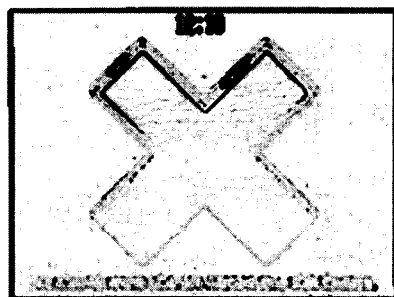


Fig. 10

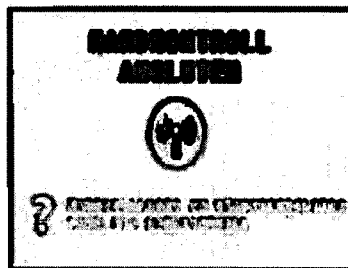


Fig. 11

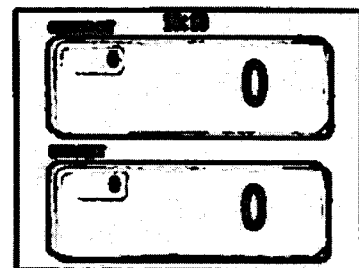


Fig. 12

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/000065

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: B08B, F16L, G07C

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, WPI data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 2009143497 A2 (EMERSON ELECTRIC CO ET AL), 26 November 2009 (2009-11-26); paragraphs [0009], [0092], [0113], [0155], [0156], [0159], [0163], [0179]-[0180], [0184], [0189]	1-4
	--	
Y	US 2679061 A (BAKER VIRGIL H), 25 May 1954 (1954-05-25); figures 1-4	1-4
	--	
A	GB 199459 A (FRANK GILMAN ET AL), 21 June 1923 (1923-06-21); figures 1,5	1-4
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 Further documents are listed in the continuation of Box C. See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

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"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

07-09-2012

Date of mailing of the international search report

07-09-2012

Name and mailing address of the ISA/SE

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/000065

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 20100005603 A1 (LIU CHIN-YUAN), 14 January 2010 (2010-01-14); figure 2 --	1-4
A	EP 0542212 A1 (VELTRUP ELMAR M), 19 May 1993 (1993-05-19); figure 1 --	1-4
A	US 20100263140 A1 (KHANI MOGHANAKI MEHDI), 21 October 2010 (2010-10-21); abstract -- -----	1-4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE2012/000065

Box No. 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.:
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:

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 No. 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:

See additional sheet.

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 additional fees, this Authority did not invite payment of additional fees.
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.: **1-4**

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

Continuation of: Box No. III

The following separate inventions were identified:

1: Claims 1-4 directed to a method to become a skilled operator and an interactive pipe cleaning equipment.

2: Claims 5-7 directed to a coupling for transmitting rotation between a main device and a flexible shaft.

The present application has been considered to contain 2 inventions which are not linked such that they form a single general inventive concept, as required by Rule 13 PCT for the following reasons:

Invention 1 relates to the problem of handling of a pipe cleaning equipment and the equipment. This problem appears to be solved by an interactive memory device for storing operating parameters such as torque, rotational speed and tool identification.

Invention 2 relates to the problem of transmitting the rotation between a main device and a flexible shaft. This problem is solved by a quick acting coupling of bayonet type.

As both the problems and solutions are technically different, no single general concept can be formulated based on the technical features of the inventions. Consequently, the requirements of Rule 13.1 PCT are not met.

It was investigated under Rule 13.2 if any further feature, either in the claims or derivable from the description, could be considered as a same or corresponding feature, and could be considered a special technical feature establishing a technical link between the two groups of inventions.

No such features were identified.

Consequently, the two groups of inventions are not so linked as to form a single general inventive concept as required by Rule 13.1 PCT.

Continuation of: second sheet

International Patent Classification (IPC)

B08B 9/045 (2006.01)

F16L 37/107 (2006.01)

G07C 3/08 (2006.01)

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Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SE2012/000065

WO	2009143497 A2	26/11/2009	CA	2722769 A1	26/11/2009
			CN	102036759 A	27/04/2011
			EP	2313211 A2	27/04/2011
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EP	0542212 A1	19/05/1993	AT	128387 T	15/10/1995
US	20100263140 A1	21/10/2010	NONE		