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(72) Inventors:
• **Beretta, Roberto**
27020 Dorno (PV) (IT)
• **Lenzi, Luca**
27020 Dorno (PV) (IT)

(74) Representative: **Riccardi, Sergio**
IPSER S.r.l.
Via M. Melloni 32
20129 Milano (IT)

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(71) Applicant: **Ghibli S.p.A.**
27020 Dorno,
Pavia (IT)

(54) **ACTIVATION SYSTEM FOR SCRUBBING MACHINES**

(57) The present invention relates to an actuation system for scrubbing machines. In this sector both for household use or more particularly for use in larger environments, like for industrial use, the development of technology influenced also the functionality and technological level of designing these machines. This led to

more advanced but often expensive and complex machines. More particularly, the functions to be regulated are a larger number, and the present invention proposes a modern, inexpensive, performing and user friendly system, based on the use of touch sensors to control said functions.

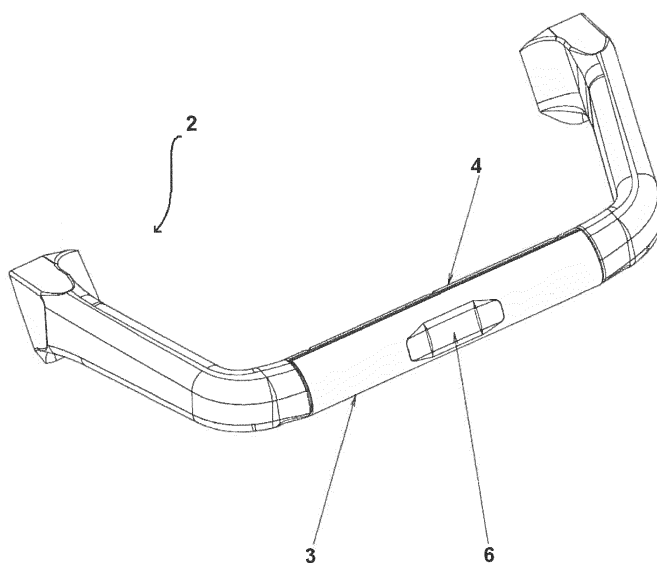


Fig. 5

Description

[0001] The present invention relates to an activation system for scrubbing machines or for manned mobile machines of any kind.

[0002] In the field of scrubbing machines, more particularly those adapted to be used in wide environments, as defined for industrial or professional use, the most recent technology influenced also the functionality and development level of these machines. More particularly, the number of functions that can be controlled is really big, and most of them may be controlled even by selection of the operator.

[0003] The functions such as activation of the various operations of the machine, such as sucking, washing, delivering or mixing the cleaning products, switching the brushes on/off, chemical or water cleaning and so on, at least in the scrubbing machines of the latest generation, are often controlled by systems with electronic displays or by on/off actuating buttons. In any case, a scrubbing machine comprises at least one or more actuation buttons, e.g. of the rocker type. More particularly, various types of potentiometers are frequently used for moving and accelerating the machines. Use of various mechanical levers, both for moving the machine and enabling the actuation of brushes of these machines is also common. Moreover, one or more common buttons are generally provided, which may be designed to carry out the switching on/off and regulating operations of most functions, such as the mentioned sucking, delivering, washing, brushing operations of water or chemical substances and so forth. In addition, said scrubbing machines generally comprise at least one pedal to speed up or brake said machines, that is usually provided for manned machines.

[0004] In any case each of these buttons, levers, pedals, switches requires suitable electronic and mechanical devices for its operation, and each device obviously has a specific function and therefore dedicated mechanical and/or electronic components for said device.

[0005] As above mentioned, the technologic progress requiring more and more compact, performing, simple instruments easy to be used and maintained, strongly influenced also the field of scrubbing machines, so that a great number of functions, of which the above mentioned ones are only some examples, are nowadays regulated electronically and accessible through a dedicated display making their use easy and intuitive.

[0006] However, among the devices of a scrubbing machine which still are not always automated, the mechanism for enabling/disabling the machine movement is particularly important and is generally still actuated through a lever or a button, although many other functions were automated. These apparently simple mechanisms are actually relatively complex to be assembled, prone to failure and expensive as to maintenance and repair. It is well known that these mechanisms are very complex with regard to the used components; indeed a traditional

prior art actuation system comprises many mechanical components to forward the enabling or disabling order to the electronic control, requiring levers, buttons and other mechanical elements. Use of components with mechanical actuation requires also regulations and calibrations to be carried out either at the production, installation or marketing stage, that may be required also during use of the machine, because it is normal that in case of bumps, malfunctions or wrong commands, their calibrations must be corrected several times during the useful life of a machine. In this case, calibration involves many mechanical elements, and requires a non negligible time, moreover needing intervention of a servicing operator, thus affecting considerably the maintenance costs. It is further apparent that the number of required components may cause problems and errors in assembling the machine and it is obvious that the more elements are required, the higher is the margin of assembling errors, failures in operation and maintenance costs. Finally, assembling and installation time is long and expensive, as well the manufacturing cost of all the required components is clearly high.

[0007] Therefore it is clear that the traditional moving systems of the scrubbing machines, even when improved, are still based on a mechanical actuation and are actually expensive, complex and not updated. Probably one preferred to simplify actuation of other functions and regulations which were originally more complex, through more advanced electronic technology, also not to alter the manufacturing chains and/or not to oblige users to learn further technological measures; in any case said moving devices are actually expensive and complex to be manufactured and maintained, are prone to frequent mechanical failure and also to continuous calibration defects.

[0008] At last there is another factor, perhaps less technically relevant, but certainly relevant from the marketing point of view; indeed these actuation systems based on levers and buttons are not very appealing from the aspect of technological development, and this is nowadays, where the range of available products is broad and diversified, an important factor in the choice of the purchaser, and in the market place, thus having high commercial impact and efficacy.

[0009] Indeed highly technological complex and performing scrubbing machines were developed, fully controlled electronically, e.g. comprising liquid crystal displays where several machine functions are monitored, such as kind of delivered product, the operation mode, the cleaning mode and so forth. These machines are obviously belonging to the so-called high range products, but clearly expensive in view of the electronic complexity added to the technical one, since these machines comprise electric and electronic cables, connections and units related to each machine element to be controlled in view of the number and complexity of the operative and functional programs.

[0010] Said systems generally are also provided with

a display, which may also comprise the actuation of programs. In such a case, in order to move the machine it is first of all necessary to select the chosen function and then to move it, since at least one hand should be handling the display and/or said actuation systems. In this case, in order to disable any function it is generally necessary to move again at least one hand, to enable/disable the required function, with a consequent latency time between the desired event and its achievement. When such an event would be particularly the braking function, this might be very dangerous e.g. in case of steps, walls and so on. In addition, these systems generally are very expensive in comparison with the more traditional ones.

[0011] For instance document WO 2003/041554 A1 discloses a technological advanced automated complex system, that may be used to supply information adapted to improve management of industrial and commercial processes, with particular reference to the field of scrubbing machines, said method and system of data collection being adapted to optimize the cleaning process, for instance by an efficient allocation of cleaning materials, energy saving and labor force.

[0012] This and other methods related to systems for its actuation are of course advanced from the technological point of view and advantageous from many aspects pointing to automation, innovation and control of said procedures. However it appears apparent that these methods are certainly very complex and for their implementation they require electronic boards, connections, controls, mechanical elements to be controlled, remote controls and so on, custom made to be performing and certainly expensive starting from a base cost of an otherwise traditional machine. The above cited document, like others of similar nature disclosing technological advanced systems, methods or devices, though interesting, do not constitute related subject matter for the development of the present invention.

[0013] Of further interest is the aspect of complexity of said systems, leading to additional problems: for instance a less experienced user does not like a complex and articulated system, as he would prefer simplicity and immediateness.

[0014] Moreover said functional complexity is obviously reflected also on machine assembling that in this case would be very delicate from the functional point of view, and subject to defects and malfunctions, with a complex range of components, with consequent cost for possible spare parts and maintenance. As above mentioned, in view of these and other reasons, said technologically advanced machines do not concern the development of the present invention, that has instead the object of making simpler and cheaper but at the same time more updated the professional scrubbing machines.

[0015] An object of the present invention is to reduce the manufacturing costs of scrubbing machines.

[0016] Another object of the present invention is to achieve a greater reliability of the scrubbing machines and more particularly to its driving system, in respect of

its correct calibration and components.

[0017] An additional object of the present invention is also to improve the technical reliability of the machine, thus reducing need of maintenance and the related costs, thus enhancing the user's satisfaction.

[0018] A further object of the present invention is to provide for a system actuating the control, which is simple and intuitive.

[0019] Still an object of the present invention is to provide for a system enabling/disabling the desired functions having an immediate operation as well as response.

[0020] These and other objects are achieved by the system for actuating scrubbing machines according to the present invention, wherein the traditional actuation and driving systems of scrubbing machines are replaced by modern on/off systems by means of touch sensors. Moreover such a system will be very simple and intuitive to be managed, with consequent satisfaction of the end user.

[0021] The simplicity of said system advantageously consists mostly in its simple and immediate use; it is known that the touch activation system is one of the most widespread actuation systems more particularly for electronic devices, such as smart phones, tablets and the like, which are recognized as being new, performing, interesting, updated and consequently particularly appealing to the user and purchaser.

[0022] A touch system like the one that will be described hereinafter, was never proposed and adopted in the field of scrubbing machines; the system according to the present invention was conceived with the intention to put on the market innovative solutions that are able to characterize the machines provided with devices having greater reliability, simplicity of use, economic operation and an updated technological standard; moreover one can see from the present disclosure, that this touch actuation system has many technical advantages and considerable improvements in simplicity, reliability and immediateness of use, as well as very remarkable economic advantages both in the manufacturing stage and the maintenance and service post sale.

[0023] In a particularly advantageous way, the actuation system for scrubbing machines according to the present invention comprises use of a capacitive sensor, e.g. installed on the handle of the scrubbing machine, generally used for the physical motion of said machine.

[0024] It is to be noted that in a particularly advantageous way, said touch sensors are incorporated in the actuation structure, and not in a display or similar device.

[0025] In a still more advantageous way, said touch sensors are positioned in such a way, as to correspond with the position taken by the hands of an operator, when the machine is moving and/or working. This makes optimal the user's ergonomics and allows to carry out immediately any desired operation; indeed in an absolutely advantageous way, contrary to the mentioned electronic systems, user may carry out the desired operations, in practice without moving the hands from the comfortable

driving position, since to actuate the machine it is sufficient to put a finger on the sensor and remove it to stop the machine, as it is well known for the touch sensors.

[0026] In addition, in a further advantageous way, this innovative touch recognition system allows to interact immediately with the machine; as above indicated, in case an immediate stop is required, it is not necessary even to move the hand, it is sufficient just to move the finger, and the same applies for other functions that can be enabled/disabled.

[0027] The activation system therefore will be advantageously incorporated into the already existing structure of the machine, thus totally eliminating the additional mechanical elements which were previously used to put in motion said machines, and also the relevant actuation displays and so on.

[0028] In a further advantageous way, use of such a touch actuation system, clearly simple and smart, allows to eliminate all the possible mechanical calibrations and regulations, which were normally required when using the mechanical actuation components.

[0029] It is also clear that, in a particularly advantageous way, there is a considerable reduction of the components when assembling the machine, and this has as a consequence a considerable economic saving and a reduction of the assembling time of each machine, because the actuation system component will be integral with the handle or handlebar for the machine movement, and neither a plurality of mechanical components nor an alternative plurality of electronic control and interface systems will be anymore required.

[0030] Said integration may be carried out in many known ways, without departing from the object and scope of the invention. One known way may be the simple application of a glue or adhesive.

[0031] Moreover, having considerably reduced the number of components, the assembling operation of the machine is also easier and quicker.

[0032] In a still more advantageous way, reliability of the machine is strongly increased, because the drastic reduction of mechanical components reduces or even eliminates the possibility of alteration of the regulations and calibrations made in the assembling stage.

[0033] In addition, in a further advantageous way, the responsive attitude of the machine is clearly bigger than the response of any other prior art machine, since it is sufficient to move the hand or even one finger relative to the sensor to disable the machine, thus increasing considerably safety of use of said machine.

[0034] Finally, in a particularly advantageous way, the total manufacturing cost of a scrubbing machine provided with the actuation system according to the present invention, is strongly reduced, since the components for the touch actuation system inclusive of the sensor, have sensibly lower costs in comparison with the traditional systems e.g. comprising mechanical components to carry out the same function, and also lower costs when compared with the complex and expensive systems provided

with sophisticated electronic controls.

[0035] These and other advantages achieved by the actuation system of the present invention will be described in more detail hereinafter with reference to the figures of the accompanying drawings, in which:

Fig. 1 is an exploded view of an example of a prior art mechanical actuation system;

Figs. 2 and 3 are two exploded views of a handlebar provided with the actuation system of the present invention;

Fig. 4 is a cross-sectional view of said handlebar, showing a possible position of said sensor; and

Fig. 5 is a general view of a handlebar, provided with an actuation system according to the present invention.

Fig. 1 shows a common prior art system, which is largely widespread because of the intuitiveness of enabling and disabling the machine movement. Since the object of the invention, as above mentioned several times, is to make cheaper said machines but at the same time simpler and more updated, in any case reference is made to prior art machines with mechanical actuation, which are closer to the present invention.

[0036] However these systems, besides appearing obsolete, involve considerable assembling costs and difficulties; for instance such a system generally comprises at least an arc shaped member 1', e.g. of stainless steel or other suitable material, a plate or bracket 2' for supporting and fixing said arc shaped member 1', an adjusting screw 4' for fastening said arc shaped member 1', a mechanical switch 3' or contact button, a ring nut 7' for fixing said switch 3', a plate 5' covering the room in which the arc shaped member 1' is arranged, as well as a plurality of screws (not shown) and/or fastening bolts 6'. These components are generally made of stainless steel or other suitable material, that should be adapted to last with time, be cleaned frequently and to be worn the least possible for accidental contact with water or cleaning substances. It is to be noted that these components are made of valuable materials, thus having a significant cost, both for their raw materials and for the processes required for their manufacture. For instance an arc shaped member of stainless steel requires bending, cutting, boring steps having a non-negligible cost and involve also energy consumption, and this is true also for plates, brackets, buttons, levers, screws and any other element required for their production.

[0037] It was also ascertained that the elimination of just one moving device comprising the here illustrated prior art elements or similar devices including levers, buttons or similar mechanical members, reduces the average assembling times of about 15 minutes, which is certainly important in the time frame of a production chain. Such a reduction of time is absolutely useful to decrease costs and it is to be noted that said assembling times are

indeed increased for the above mentioned new and sophisticated electronic machines.

[0038] In figure 2 and the following figures a preferred embodiment of the present invention is shown. More particularly Figures 2 and 3 are exploded views of any handle adopted to be mounted on scrubbing machines, showing a touch sensor 1 mounted on said handle 2. Said actuation system with touch sensor 1 is for instance incorporated into a preferably revolution shaped handle 2, provided with a rear shell 3 having the function of grip (with one or two hands according to the user's preference), and a front shell 4, closing and isolating from the outer agents the assembling zone for said touch sensor.

[0039] For instance the touch sensor system comprises at least a capacitive sensor 1, which is installed in a determined gripping position in a preferably recessed zone 5, which is therefore more protected in a chosen point of handle 2, depending on the production process. Positioning of the sensor(s) 1 in any case preferably occurs in a zone suitable for a comfortable rest of one or both user's hands on said handle. Therefore to actuate the touch sensors system 1, user should simply lean one or both hands or their finger(s), according to the chosen configuration, on the gripping zone where the sensor is integrated, which will be hereinafter referred to a sensitive area 6 (that will be indicated in such a way to be easily recognized on touch, but also on sight), while to disable the machine it is sufficient to remove the hand/finger from the sensor (as a touch sensor is obviously of the "on" type) and the machine stops immediately.

[0040] For instance said sensitive area may be recognized by a recessed zone 5 or tactile reliefs which may be made in the sensor zone in the form of protrusions, printed on plastics, depressions, in any case any kind of element adapted to allow at least the tactile recognition of said at least one touch sensor 1.

[0041] When touching sensor 1 positioned on the grip, said sensor 1 sends a signal to the dedicated electronic board, which enables the functions previously programmed by the operator, according to his requirements.

[0042] Sensor 1 advantageously is of a very reduced size, and is positioned on the grip in such a way that touch of sensor 1 occurs in a fully natural way relative to the traditional position of the operator's hand. Touch sensors adapted for the object of the present invention are for instance touch or proximity sensors of various kinds, e.g. capacitive, resistive, infrared ones.

[0043] In a particularly preferred embodiment, only one sensor 1 is placed at the centre of the lower shell 3, therefore the machine is actuated by resting at choice one of the thumbs on the sensitive central area 6. In this way, besides saving the cost of a sensor, there are advantages from the safety point of view, since it is possible in any case to firmly grasp the handle with both hands, e.g. in order to avoid bumping into an obstacle, without the risk that an unskilled operator carries out this operation keeping the hands on the sensitive zone, that could happen in a variation with sensors applied on the front shell.

[0044] More particularly it is to be noted that the outer portions of the scrubbing machines are considerably reduced, thus simplifying a careful cleaning of the machine and of the outer surfaces subject to possible wear, more particularly the very linear conformation of the handle including said touch actuation system, is very easy to be cleaned, since it does not include bends, protruding screws, buttons with slits, protrusions due to the display, or delicate parts with liquid crystals or similar elements. It is to be noted that said factor of greater cleaning ease is important in the field of scrubbing machines, as the rooms to be cleaned are often hospitals rooms where hygiene is fundamental, or very dirty places, and bacterial stagnation on mechanical or complementary outer surfaces difficult to be cleaned is an important aspect for choosing the machine in the relevant sector.

[0045] Fig. 4 is a sectional view of the system with the touch sensor 1 assembled in the revolution shaped handle 2, and more particularly one can see that the front shell 4 and rear shell 3 are mounted on the handle, thus protecting the touch sensor 1, which in this particularly preferred embodiment is integral with the handle 2. As one can also see from Figure 5, said front shell 4 and rear shell 3 are so assembled on said handle 2 as to form a grip 7 adapted to be held by the user or whereon one or more fingers or hands may be laid, in order to drive the scrubbing machine. Said grip 7 comprises one or more sensitive areas 6, indicating the position of the touch sensors 1 and allowing their actuation, this either starting or stopping the scrubbing machine. As above mentioned, said sensitive areas may be recognized by said exemplary recessed zones 5, but they may be alternatively or additionally other recognition tactile means for this purpose though not described here.

[0046] From the description and the accompanying drawings, it is clear that in a particularly advantageous way, use of a system with touch sensor 1 for enabling and disabling the movement of a scrubbing machine has considerable advantages, involving use of simple and inexpensive electronic components, and in addition to be user friendly is very appealing for the purchasers from a marketing point of view, having an updated shape, involving also a very simple maintenance, a highly intuitive use, a greater technical reliability of the machine, as well as reduced manufacturing and maintenance costs. As above highlighted the aspect of immediateness and simplicity of use for the operator, as well as the ergonomic and immediate access to the machine controls, the whole combined with the cost reduction of a machine including this activation system, are all together a very advantageous characteristic of said system, proposing an economic and innovative updated solution combined with technical improvements and commercially appealing aspects from many points of view.

[0047] It is also to be noted that a possible type of touch sensor is advantageously implemented with an adhesive side (e.g. the sensitive side), so that the system may be easily installed anywhere without needing any tool. Al-

ternatively other sensors of the same kind and also suitable for the objects of the present invention may require installation through screws and/or may be provided without applied adhesive. In this case it is however generally possible to glue the sensor either with double-sided tape or suitable glues.

[0048] In particular, as previously mentioned, it is to be noted that the simplicity of this system, as well as the advantageous at least tactile recognition of the sensor, are certainly innovative, combining the technological advantages with a system which is inexpensive, simple and immediate for operator's use.

[0049] Sensor 1 is connected to the machine electronic board, which is the same used with the conventional activation systems, through a simple wiring with connectors, like those in any case required to connect a mechanical switch.

[0050] In a malfunctioning case, that in view of the absence of the other components should only be ascribed to a malfunction of the sensor 1, this sensor may be accessed very easily, by removing the protection shells, that are united for instance by common screws for plastics. In this case sensor 1 may be easily removed lifting it from its seat and replaced by a new one by suitable glueing or fastening means. Therefore it is clear that maintenance and repair are very easy and economically advantageous in comparison with those previously described with reference to prior art actuation mechanisms, and the complex mechanical parts therein contained.

[0051] In any case it is clear that the above described system relates only to a particularly preferred embodiment of the present invention, because the actuation system with touch sensor is adapted to be incorporated into any scrubbing machine provided with a grip or handle or any other kind of grasping system.

[0052] Said touch sensors may also be adapted to carry out additional chosen functions and to replace one or more elements which were hitherto actuated mechanically in the prior art scrubbing machines.

[0053] Moreover, said touch sensors may also be implemented with a touch operation to start the machine and another touch operation to stop the machine, without departing from the scope of the invention and the advantages related to the present invention.

[0054] The foregoing is only related to some of the preferred embodiments of the actuations system for scrubbing machines with touch sensors according to the present invention. It is also to be pointed out that this system may be positioned in any point of the machine, provided that it can be reached by an operator to enable one or more functions of the machine. Thus it is possible to comprise one or more sensors, adapted to perform even different objects, for instance enabling and/or disabling other functions, such as brushing, washing or any other functions adapted to be controlled by this kind of touch sensors.

[0055] Further variations in which the elements of the system are combined in different ways, by mutual oppo-

sition, engagement, insertion, or have different configurations, in any case adapted for the object of the present invention, or are made with any kind of material, or any other modification falling in the scope of the present invention, should be considered as alternative embodiments to the preferred ones previously described, wherein modifications and substitutions concerning for instance the geometries selected for the various mobile and fixed elements, the materials chosen for each member, and also the specifications of the actuation system, may be resorted to, without departing however from the scope of protection as defined in the appended claims.

15 Claims

1. An actuation system for professional scrubbing machines, comprising at least a handle (2) adapted to house said system to actuate one or more machine functions, said system comprising one or more touch sensors (1) adapted to be enabled and/or disabled by one or both hands of an operator directly through a touching operation, **characterized in that** each of said one or more touch sensors (1) is directly incorporated into the body of said machine handle (2), and said at least one touch sensor (1) has a sensitive external area (6) that can be recognized at least by touch of an operator, to enable and disable the function related to at least one sensor (1).
2. The actuation system of claim 1, wherein said at least one touch sensor (1) integral with said handle (2), is protected by a rear shell (3) engaged by a front shell (4), said shells (3,4) fully providing for the gripping function of said handle (2).
3. The actuation system of the preceding claims, wherein said rear shell (3) comprises at least one of said sensitive areas (6) for each sensor (1), said area being adapted to interface said at least one touch sensor (1) with the operator, by means of at least an identification tactile recognition on the surface of said handle (2) of said sensitive area (6).
4. The actuation system of claim 3, wherein said sensitive area (6) for housing and recognizing the sensor (1) is a recessed region (5) of said handle (2).
5. The actuation system of claim 1, wherein said at least one touch sensor (1) is adapted to enable/disable one single function.
6. The actuation system of claim 1, wherein said at least one touch sensor (1) is inserted into a recessed region (5) of said handle (2), adapted to house said actuation system, said sensitive area (6) and at least one hand of the operator.

7. The actuation system of the preceding claims, wherein one or more sensors (1) for actuation for one or more functions of said scrubbing machine, may be arranged on any part of said handle (2) of said scrubbing machine.

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8. The actuation system of the preceding claims, wherein said touch sensors are capacitive or resistive or infrared sensors.

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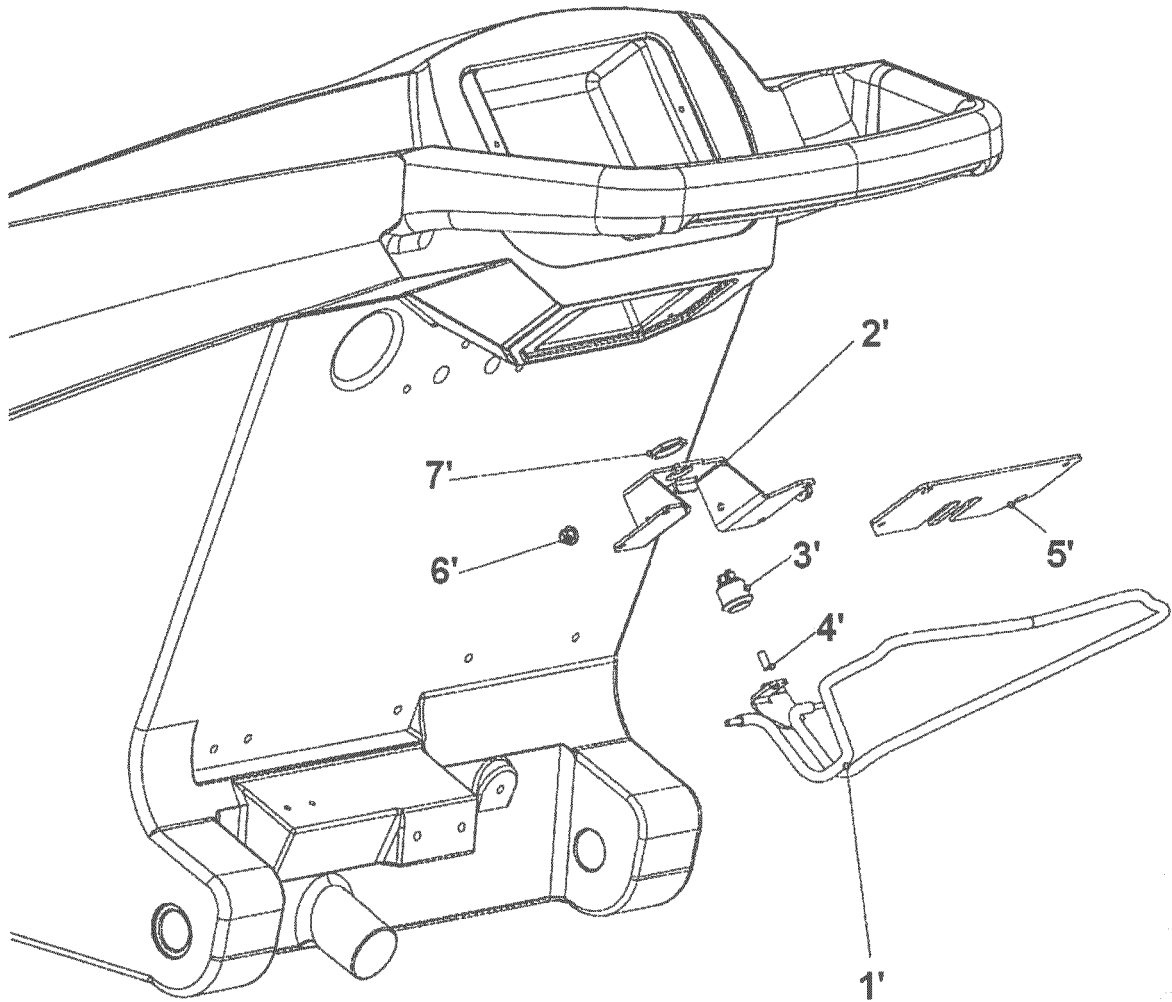


Fig. 1

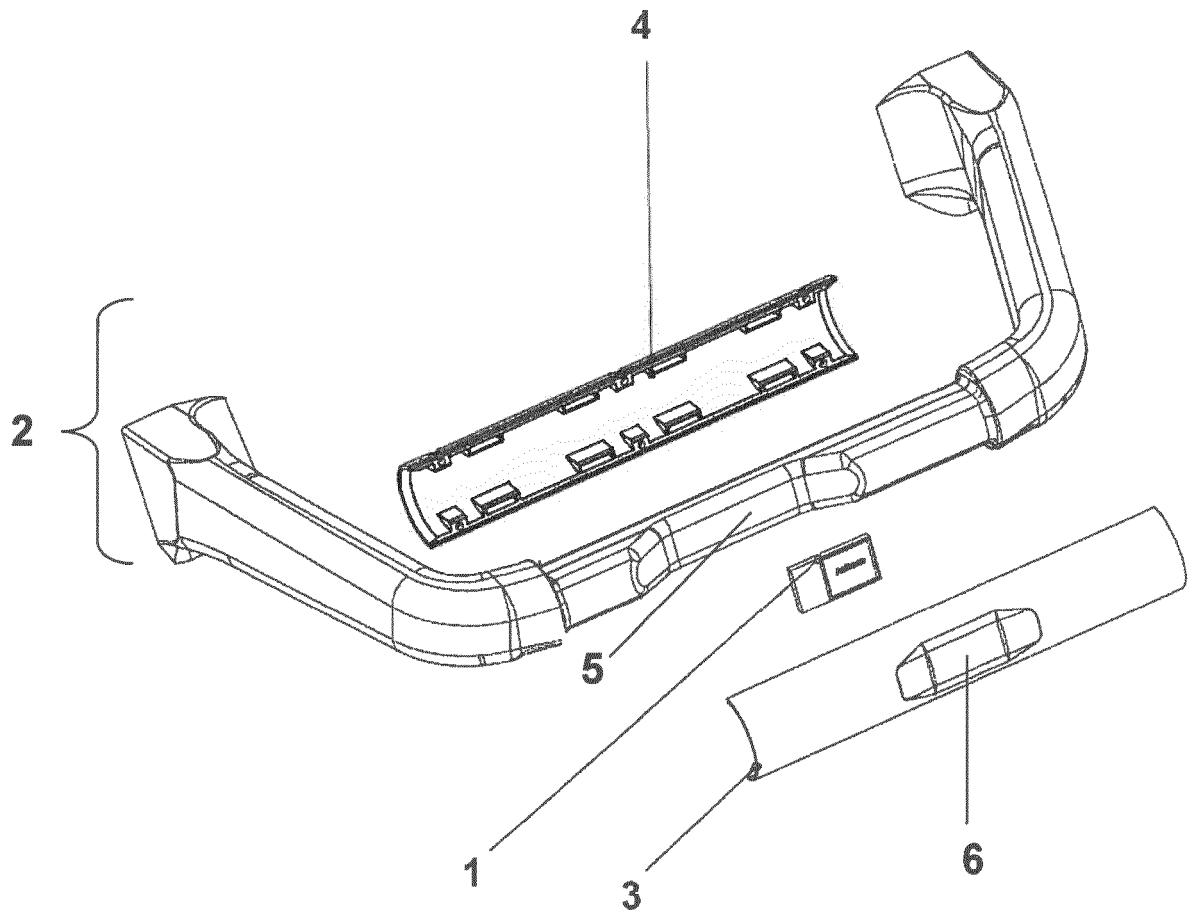


Fig. 2

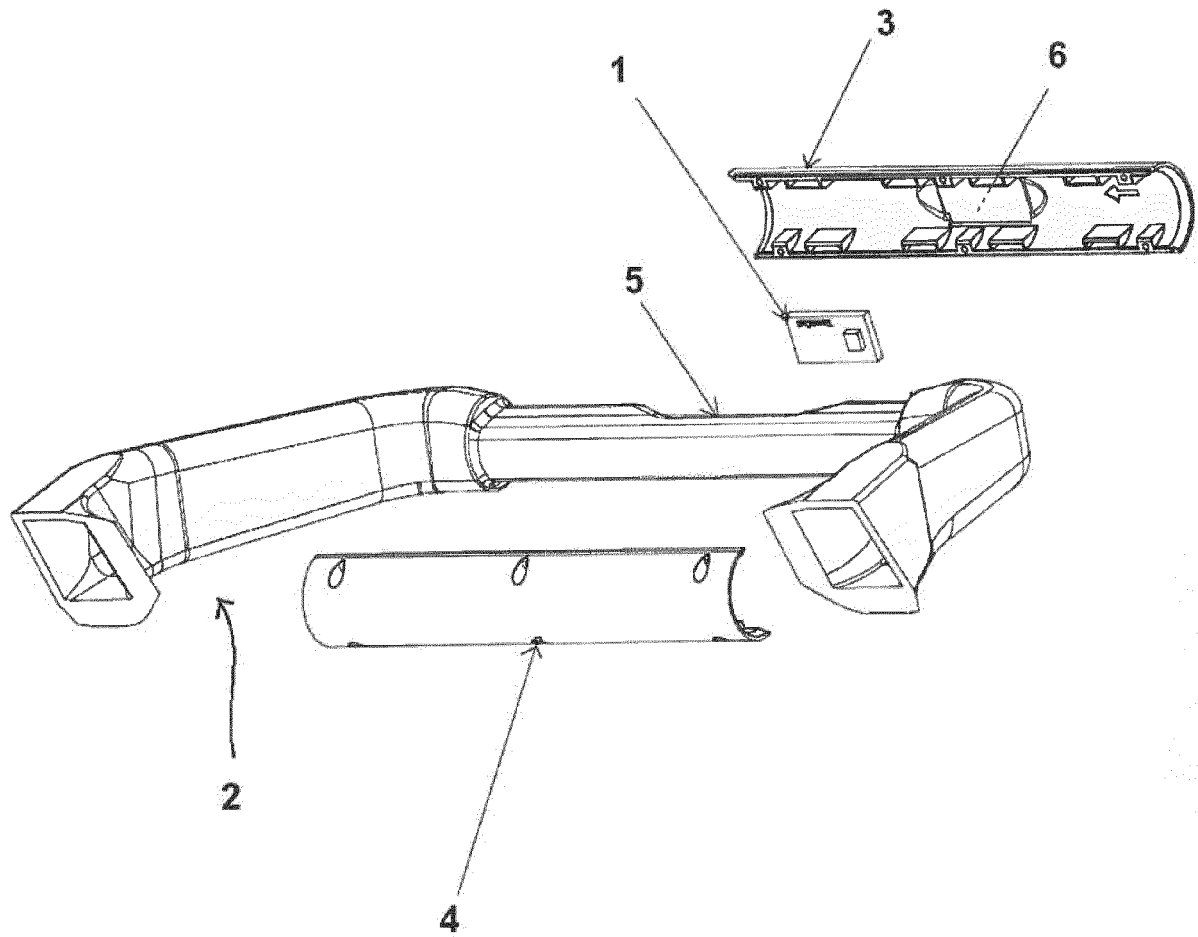


Fig. 3

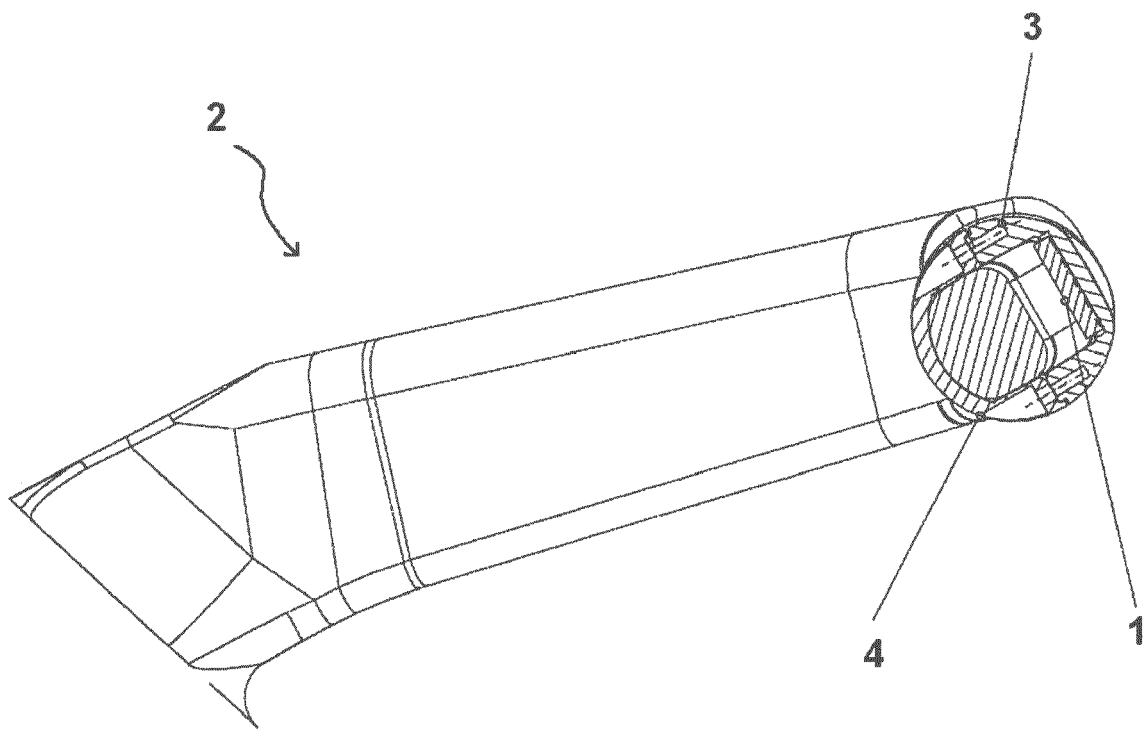


Fig. 4

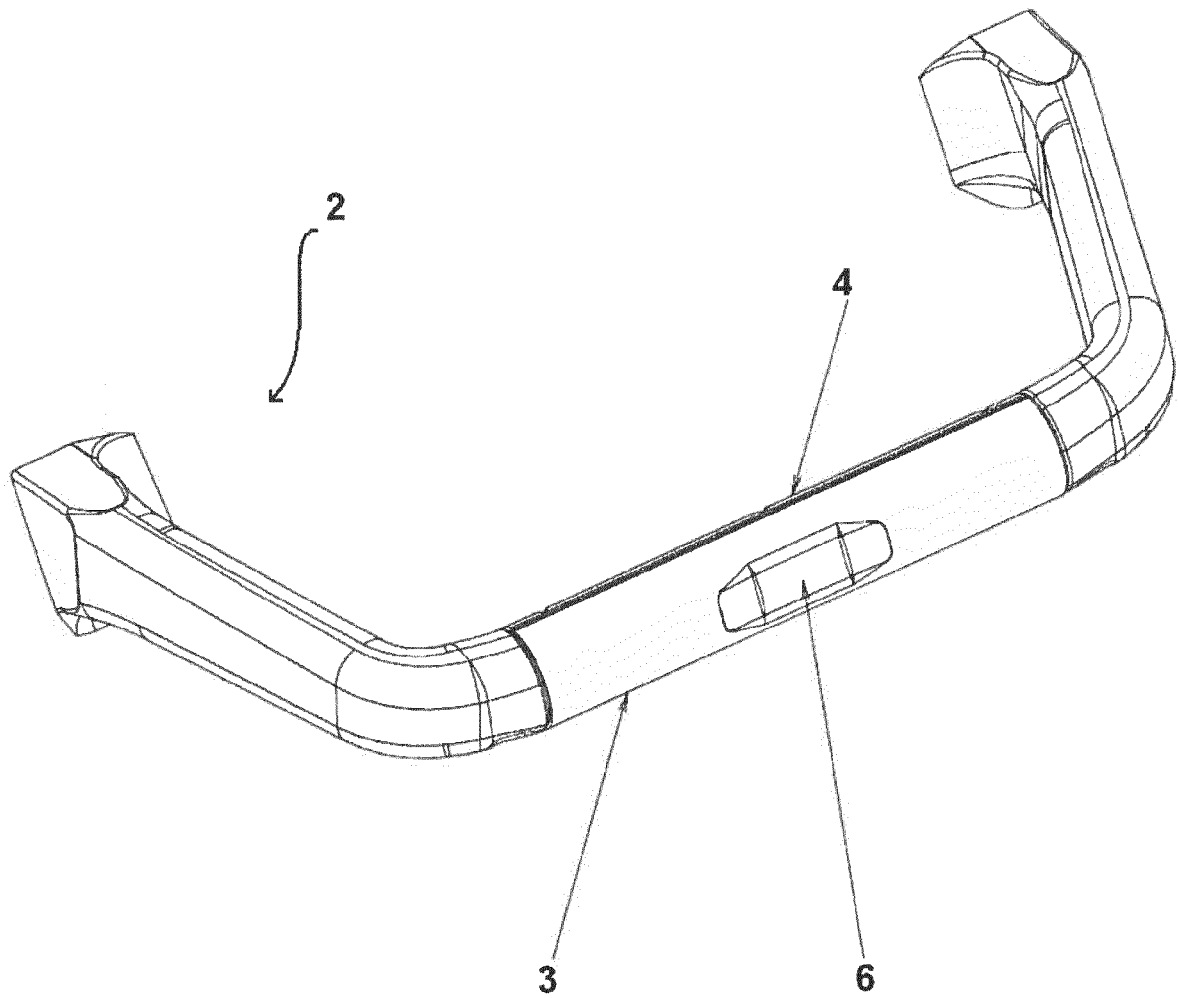


Fig. 5



EUROPEAN SEARCH REPORT

Application Number
EP 15 07 5015

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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 2005/029971 A1 (COATES DONALD A [US] ET AL) 10 February 2005 (2005-02-10) * figure 9 *	1-8	INV. A47L11/28 A47L11/40
X	US 2012/152280 A1 (BOSSES MARK D [US] ET AL) 21 June 2012 (2012-06-21) * paragraph [0031] - paragraph [0032]; figure 5 *	1-8	
X	US 8 595 892 B1 (EVERETTE JR WILSON E [US]) 3 December 2013 (2013-12-03) * figure 5 *	1-8	
A	WO 03/041554 A1 (TENNANT CO [US]) 22 May 2003 (2003-05-22) * page 6 - page 8; figures 1,3 *	1-8	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			A47L
Place of search		Date of completion of the search	Examiner
Munich		3 September 2015	Trimarchi, Roberto
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			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 15 07 5015

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
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03-09-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2005029971 A1	10-02-2005	CA 2386877 A1	21-11-2002
		CN 1387818 A	01-01-2003
		GB 2376624 A	24-12-2002
		US 2005029971 A1	10-02-2005

US 2012152280 A1	21-06-2012	NONE	

US 8595892 B1	03-12-2013	NONE	

WO 03041554 A1	22-05-2003	EP 1446042 A1	18-08-2004
		JP 4020865 B2	12-12-2007
		JP 2005508686 A	07-04-2005
		US 2003093166 A1	15-05-2003
		WO 03041554 A1	22-05-2003

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 2003041554 A1 [0011]