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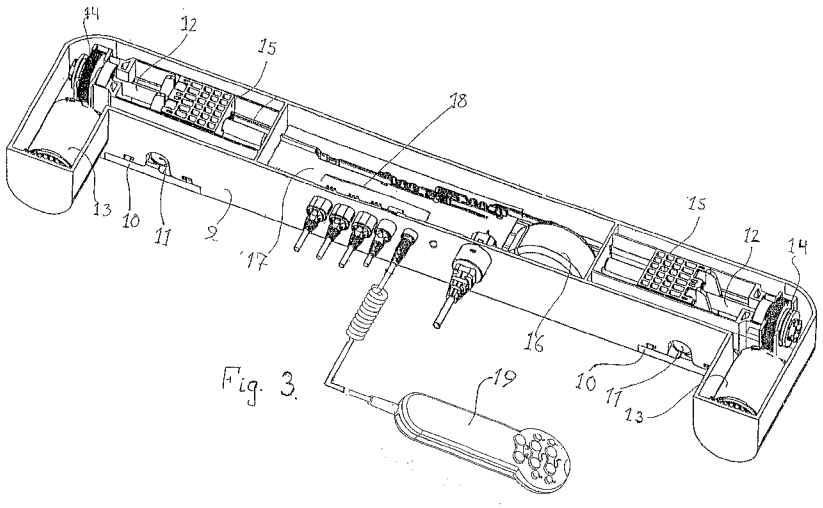

Fig. 3.

(57) Abstract: Actuator system comprising at least one electrically driven linear actuator (12, 13, 14, 15) and an electrical control device with an operation device, where the control device in the actuator system is connected to a socket (18) for a plug device located accessible on the outer side of the housing. The control device is adapted for connecting equipment inserted into the socket (18) and for using and utilizing the functions of the equipment. The control device particularly uses equipment in the form of a cable (23) having at least one outlet (25) for connection with a energy saving socket (30), so that e.g. a lamp (31) inserted in the energy saving socket may be switched on by means of the operating device (19) for the actuator system.

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Actuator system

The invention relates to an actuator system comprising at least one housing, at least one electrically driven actuator having an electric motor, a transmission, a spindle connected to the electric motor through the transmission. On said spindle is mounted a spindle nut, and an electric control device with an operation device, where the control device in the actuator system is connected to a socket for a plug device located accessible on the outer side of the housing.

Actuator systems with electrically driven linear actuators are commonly used within the field of adjustable articles of furniture, such as e.g. adjustable tables, adjustable beds and chairs.

In an adjustable bed actuators are inter alia used for adjusting the lying surface of the bed, said lying surface comprising at least one adjustable back rest section and typically also an adjustable leg section. Thus, an actuator for adjusting a back rest section and another actuator for adjusting the leg section may be provided. An actuator system in which the two actuators are incorporated in one mutual housing is e.g. known from WO 89/10715 (Dewert Antriebs und Systemtechnik GmbH) and DE 38 42 078 (Niko Gesellschaft für Antriebstechnik mbH). These actuators are based on two individual drive mechanisms driven by an electric motor each and separately embedded at opposite ends of the mutual housing.

In case it, in connection with an actuator system, is desired to use the same hand control for remotely operating and activating other functions, e.g. a night

light or a reading light, is it not realizable as the power supply for the actuator system would become voluminous if it also should be able to supply other functions, such as lamps, with power. Further, it is not ideal to furnish a housing in the actuator system with mains voltage power outlets for lamps, as this would require a special approval from the authorities and create a possibility of error in that the supply for the actuator system could be overloaded.

The purpose of the invention is to provide a solution to the outlined problem, i.e. to enable control of the activation of equipment from an actuator system, without the supply of the equipment occurring through the actuator system or noticeably burdening the power supply of the actuator system. Further, a solution is desired where the actuator system does not directly manage the mains supply for the equipment.

This is achieved according to the invention by designing the actuator as stated in claim 1, where the control device is adapted for connecting equipment connected to the control device by means of a plug device inserted into the socket, and for using and utilizing the functions of the equipment.

This embodiment is expedient as the control device is thus fitted with an appropriate interface for connecting different types of equipment, which may be used in connection with an actuator system. Here, reference is particularly made to the fact that the control device may switch a supply voltage on and off by means of terminals in the socket intended for that purpose. This means that the equipment may be supplied with an operating voltage,

which activates or supplies the equipment with a power-limited low voltage.

The connection of equipment in the form of a cable having a termination consisting of at least one electrical socket, preferably of the type universal serial bus (USB), is particularly expedient as there is already a large number of electrical apparatus in existence having a USB plug, however without supporting the underlying communication standard (Universal Serial Bus). The equipment is solely supplied by the electrical power-limited low voltage with which a USB-connection according to the USB standard should be supplied on conductors in the connection intended for that purpose. As examples of equipment which may be supplied or charged through an USB connection, can thus be mentioned lamps, heating apparatus, vibrators, motors, media players, mobile phones, energy saving sockets etc. It is particularly ideal to be able to control an energy saving socket from the actuator system, as the actuator system may thus be used to switch electrical apparatus being supplied from the mains supply on and off, without directly managing the mains supply in the housing of the actuator system. The utilization is attractive in connection with adjustable beds in which an actuator system is incorporated, but also in connection with other types of adjustable furniture such as tables. In that the actuator system from an operation device can control the connection of the mains supply to e.g. a lamp, it is achieved that more units in connection with the table may be operated from the same operation panel without directly managing the mains supply in the actuator system.

The voltage being controlled by the hand control and delivered from the control device is a power-limited low-voltage which is not suitable for operating energy intensive equipment. Lighting in the form of an orientation light, a so-called under bed light, may expediently be connected, as such a light due to the wish for dimmed lighting has a limited power consumption.

In a particular embodiment the equipment is furnished with both USB sockets and integrated under bed light. Thus, a possibility for e.g. connecting an energy saving socket in one unit is achieved, where the equipment further has an integrated lighting for an orientation lighting in the form of an under bed light. It is possible to adapt the control so that the hand control either separately or collectively may activate the orientation lighting and the units connected in the USB socket(s).

Equipment, which may be connected in the socket in the housing for the actuator system, may expediently be a junction device with at least two sockets, preferably USB sockets, for connecting several pieces of equipment in one port in the actuator system. The junction device may with an electric plug be connected in a socket in the housing of the actuator system, where the electrical control signals in the socket may be transferred to one or more USB socket(s) on the junction device. Thus, the junction device may simultaneously connect several pieces of equipment to one socket in the housing for the actuator system. As there is often more than one control signal in a socket in the actuator system, it may be chosen to equip the USB sockets with the same control signals from the socket in the housing of the actuator system, or with different control signals depending on

whether or not various multiple control options from the same socket in the housing of the actuator system is desired or if it is only desired to be able to parallel control more pieces of equipment from the same socket in the housing of the actuator system.

In another embodiment the USB socket is directly integrated into the housing for the actuator system and connected internally in the housing. Thus, a simpler solution is provided in that the cable with the termination in a USB socket is avoided and a USB energy saving socket may e.g. be mounted directly connected to the USB socket in the actuator system. In the same manner, a lamp, preferably for an orientation light under a bed, may be directly incorporated into the housing and be directly electrically connected to the control device.

In yet another embodiment of the invention, the actuator system is designed to receive equipment in the form of a power supply. In the simplest embodiment, the control device has means for detecting whether a power supply is connected in the socket. This may be done in that the power supply impresses a voltage on terminals in the socket dedicated for that purpose. Alternatively, the control device is designed to detect that a supply is connected to the terminals which are otherwise used for supplying connected equipment, at which the control device automatically adapts the port to receive the supply. The connected supply can supply the actuator system with power. In a particular embodiment, the control device is furnished with a rechargeable battery package for back-up of the control, said battery package may be recharged by means of the standard power supply or a power supply connected through a USB socket. It is preferred that other power supplies, e.g. a solar cell

panel with or without a USB interface in a similar manner may be connected and completely or partially constitute a power supply for the actuator system.

As it appears, the invention provides a solution, which in a simple and fast manner enables connection of extra equipment for an actuator in that the extra equipment is connected by means of a cable connection in a socket in the housing of the actuator system intended for that purpose, whereupon the control device immediately may utilize the equipment. The solution is simple in that a standard actuator system may be extended just by connecting the new equipment, which then subsequently may be controlled by the control device and operated by the central operating device of the control.

A linear actuator according to the invention will be explained more fully below with reference to the accompanying drawing, in which

Fig. 1, shows a slatted frame with raised back rest and leg rest section,

Fig. 2, shows a perspective view of a first embodiment of the actuator system according to the invention,

Fig. 3, shows another embodiment of the actuator system, where the bottom cover has been removed,

Fig. 4, shows a slatted frame for an adjustable bed with four separate adjustable parts,

Fig. 5, shows an actuator system for adjusting two sections in a bed with an extension in the form of actuators for adjusting further subsections in the bed, and

Fig. 6, shows equipment in the form of a cable, terminated in a USB socket for connecting standard USB equipment.

As it appears from Fig. 1 of the drawing, showing a slatted frame for an adjustable bed, the slatted frame comprises a frame 1, in which a back rest section 2 and an articulated leg rest section 3 is embedded. In the frame, a transverse shaft 4 is embedded for the back rest section, on said shaft is mounted a short arm 5. At each end of the shaft 4 a rod 6 connected to the back rest section 2 is mounted. Correspondingly, the leg rest section 3 may be adjusted by rotating a shaft 7 via a short arm 8 secured thereto. The movement of the back and leg rest section 2,3 is carried out with a dual actuator as shown in Fig. 2. The actuator comprises a mutual housing 9 with an opening cover 10 at each end, which provides access to a transverse shaft opening 11 through which the shafts 4,6 may be led.

Further, it appears from Fig. 3 that drive units in the form of linear actuators are positioned at each end of the housing 9. The actuators comprise a spindle 12 driven by a low voltage DC-motor 13 through a worm drive 14. A spindle nut 15, designed with a rectangular block-shape, functions as a sliding element and is located on the spindle 12 and guided in the housing 9 of the actuator, so that it is prevented from rotating and may be slid back and forth on the spindle 12 depending on the direction of rotation thereof. In the apparatus, which in this case is an adjustable bed, the spindle nut 15 may thus be brought to move the shafts 4, 7 and adjust e.g. the back or leg rest section 2, 3 in the bed.

In the middle of the housing 9 is mounted a power supply based on a toroidal transformer 16 and a printed circuit board 17, containing the electronics for both the power supply and the control device. In connection with the printed circuit board 17, plug device s in the form of sockets 18 are mounted, into which plugs may by inserted in that they are led through openings in the housing 9 for that purpose. The sockets 18 comprise sockets for connection of equipment and a socket for supply from the mains power supply and a socket for connecting a wired operating device 19.

Fig. 4 shows the profile of a slatted frame for an adjustable bed, where the back rest section 2 is separated into two adjustable sections 2a, 2b, which thus comprise a separate adjustment possibility for a head section 2b. Correspondingly, the leg rest section 3 is separated into two adjustable sections 3a, 3b, which enables the bend in the area where the person's knee is typically situated to be adjusted. This means that a person with an injured knee e.g. may raise the leg rest section 3 without being forced to bend the knee. The adjustments of the two sections are, as shown in Fig. 5, carried out by the actuators 20, 21 connected in one of the sockets 18 in the actuator system. The connection of actuators to the actuators system is however not limited to adjusting the lying surface in an adjustable bed. As it appears, a further actuator 22 is connected, which is not shown incorporated in a structure. By means of this actuator 22 an adjustment of the position of a table top or a display in connection with the bed may e.g. be performed. The possibility of connecting an extra actuator aims directly targeted at an article of furniture for a flat screen, where the actuator may move the flat screen between a first position, where the

screen is hidden in the article of furniture and a second position, where the screen is raised out of the protecting article of furniture.

When the actuators 20, 21, 22 are connected to dedicated sockets 18 in the actuator system, the control device can ensure that dedicated keys on the operation device 19 may be used for controlling the function in question. In the same manner other equipment for use in a bed, e.g. massage motors, may be connected and surveyed on the operation device after the same model. The operation of massage motors is a continuous operation, which is switched on and off by activating the function on the operation device. Thus, there is a control voltage for the motor present in the socket 18 for that purpose, when it is desired to activate the motor.

In order for the actuator system to be flexible with regard to connections, a piece of equipment in the shape of a cable 23 with a plug 24 for inserting into the socket 18 in the actuator system and at least one power outlet 25 is constructed. When a control voltage is present in the socket, a corresponding control voltage is present on the power outlet, so that it may be used for managing an on-off function of a piece of equipment connected in the cable 23. The power outlet 25, with which the cable 23 is equipped, is adapted to receive a plug 26, which is in electrical connection with the equipment connected to the cable. More types of power outlets may be used, but in a particularly expedient embodiment the housing comprises a USB socket, where to a number of existing electrical apparatus and equipment may be directly connected. Such electrical apparatus could be lamps 27, acoustic sound generators 28 and apparatus, which may use a voltage specified by the USB standard for

recharging, which is e.g. the case by mobile phones 29, media players etc. The voltage being transferred to the USB socket is thus a low voltage and power-limited supply which may be switched on and off by means of the operating device 19. This construction is attractive as a so-called "energy saving socket" 30 may also be connected and function as a relay for large-scale power consumers, e.g. a lamp 31, which is thus supplied from the mains supply through the mains plug 32 of the energy saving socket. Thus, is elegantly avoided that the mains supply for the equipment is fed through the actuator system and is directly managed there from, at which the disadvantages described in the preamble is avoided. Examples of electrical equipment which expediently could be connected to an energy saving socket in connection with an adjustable bed could be lamps 31, especially bed lights for reading lights or orientation lights under the bed for use during the night, but since the equipment may be supplied from the mains supply, there are countless possibilities. This also applies in case of an adjustable table. Here the equipment in the form of a cable having an energy saving socket connected, may likewise be used to switch desk lamps, calculators etc. on and off by means of the control panel for the desk, and thus in a simple manner gather all functions in connection with the table in one and the same control panel. It is thus easier to save energy when the workstation is not being used, possibly improved with intelligent functions implemented directly in the control for the adjustable table.

In case of the cable 23 which functions as a converter from a proprietary plug device to one or more sockets, preferably USB sockets, it will in another embodiment be possible to arrange the components of the cable

internally in the housing for the actuator or in a control box for an actuator system where the USB socket is located directly in an accessible position in the housing.

Further, it is noted that there in the cable 23, in case this is terminated with a USB socket, should be incorporated a regulation of the voltage and a power-limitation, corresponding to the standards in the USB specification unless the control device itself has limited its voltage and current to these standards. In this case it is a low voltage of five volts, which e.g. is power-limited to five hundred milliamperes, but may be larger.

Patent claims:

1. Actuator system comprising:
at least one housing (9),
at least one electrically driven actuator with an electric motor (13), a transmission (14), a spindle (12) in driven connection with the electric motor through the transmission, a spindle nut (15) mounted on said spindle, and an electrical control device with an operation device (19), where the control device in the actuator system is connected to a socket (18) located accessible on the outer side of the housing (9) for connecting equipment
c h a r a c t e r i z e d in
that the control device is adapted for connecting equipment, the equipment being connected to the control device by means of a plug device inserted into the socket (18), and the control device using and utilizing the functions of the equipment.

2. Actuator system according to claim 1 c h a r a c t e r i z e d in that the control device may switch a supply voltage on and off by means of the terminals in the socket (18).

3. Actuator system according to claim 1 c h a r a c t e r i z e d in that the equipment connected in the socket is a cable (23) having at least one termination in an outlet (25) in the form of a USB socket for connecting equipment having a USB plug (26).

4. Actuator system according to claim 1 c h a r a c t e r i z e d in that the equipment connected in the socket is a lampe, preferably for orientation light under a bed.

5. Actuator system according to claim 1 c h a r a c t e r i z e d in that the equipment connected in the socket is a cable (23) having at least one termination in an outlet (25) in the form of a USB socket for connecting equipment having a USB plug (26) where the cable (23) further is designed with a lamp, preferably for orientation light under a bed.

6. Actuator system according to claim 1 c h a r a c t e r i z e d in that the equipment connected in the socket is a junction device for connecting several pieces of equipment in one port.

7. Actuator system according to claim 1 c h a r a c t e r i z e d in that at least one USB socket is incorporated directly into the housing (9) and is electrically connected to the control device.

8. Actuator system according to claim 1 c h a r a c t e r i z e d in that a lamp, preferably for orientation light under a bed, is directly incorporated into the housing (9) and is electrically connected to the control device.

9. Actuator system according to claim 1 c h a r a c t e r i z e d in that the control device when connecting equipment (29) has means for supplying the equipment with power.

10. Actuator system according to claim 1 c h a r a c t e r i z e d in that the control device when connecting equipment which impresses a voltage on the supply conductors in the cable, regards the equipment as a power supply which completely or partially can supply the actuator system with power.

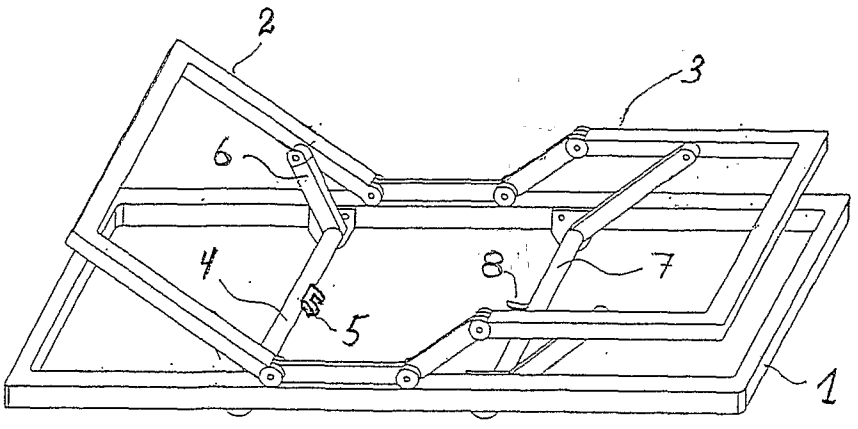

Fig. 1

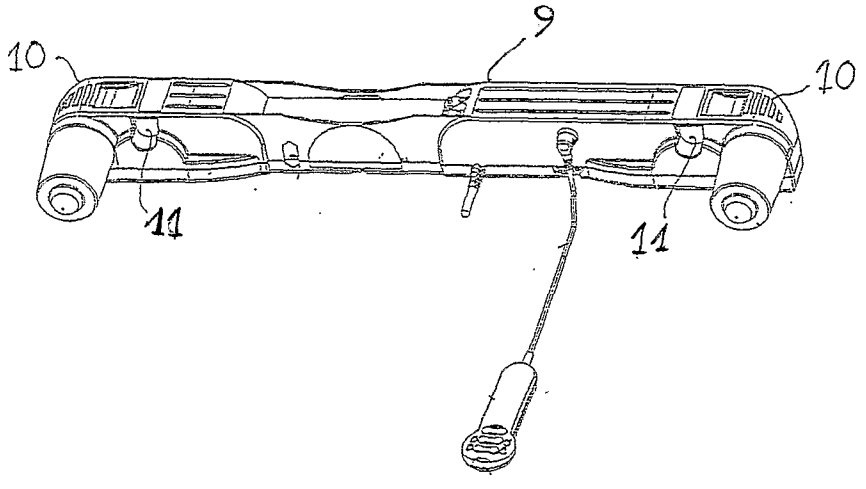

Fig. 2

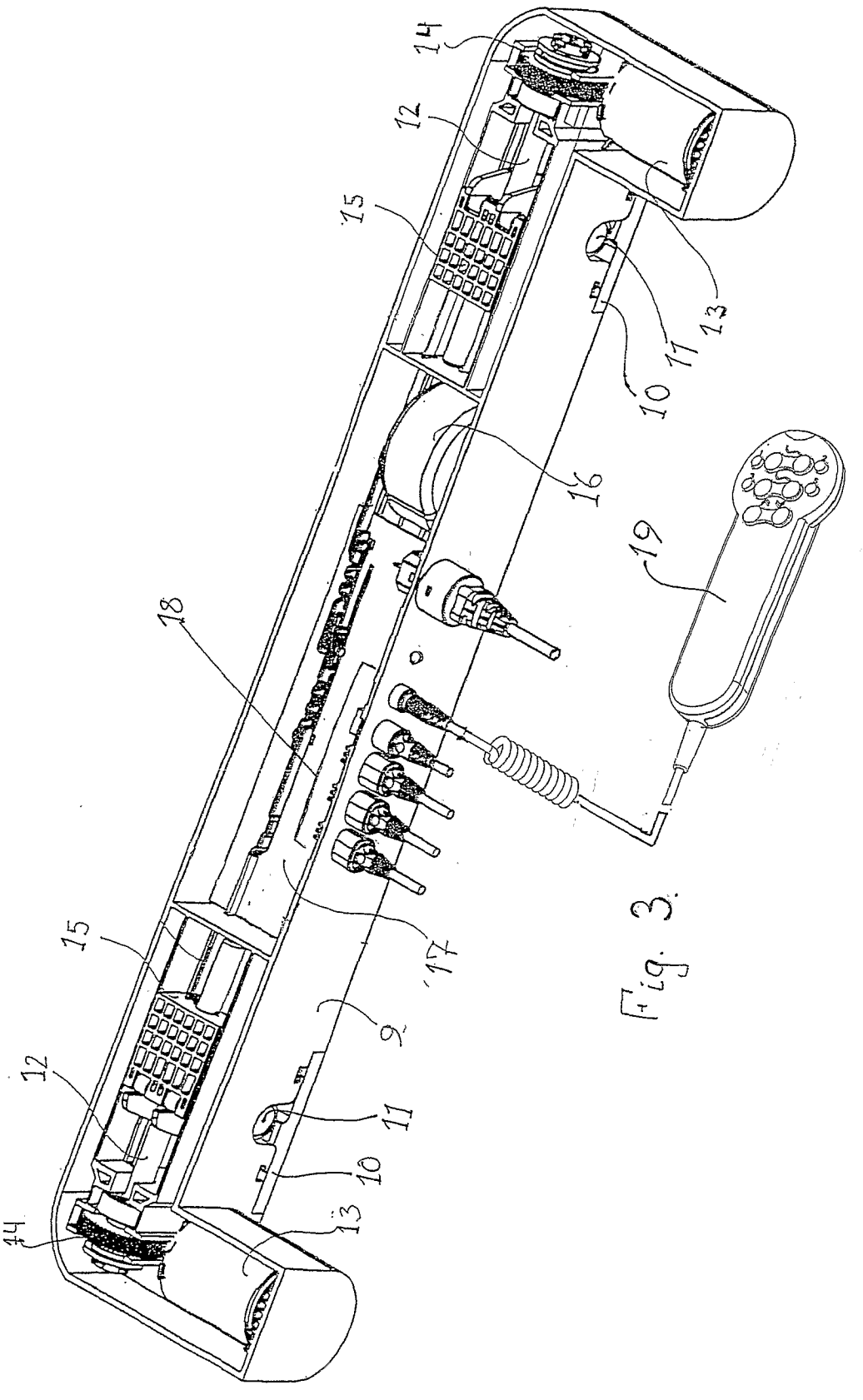

Fig. 3.

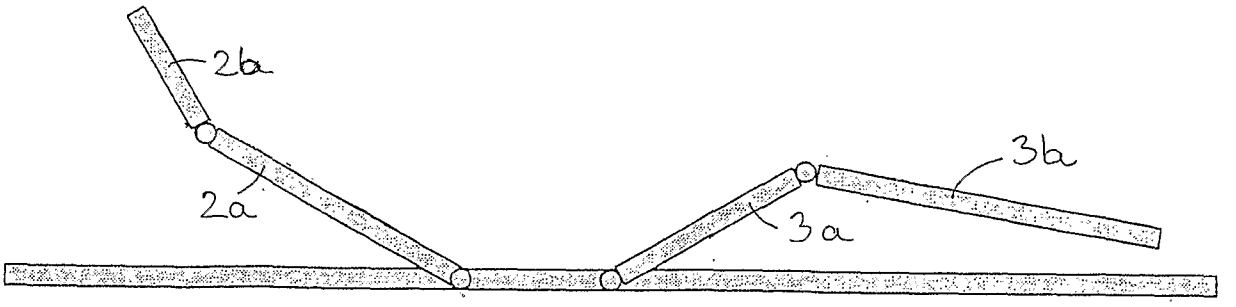

Fig 4.

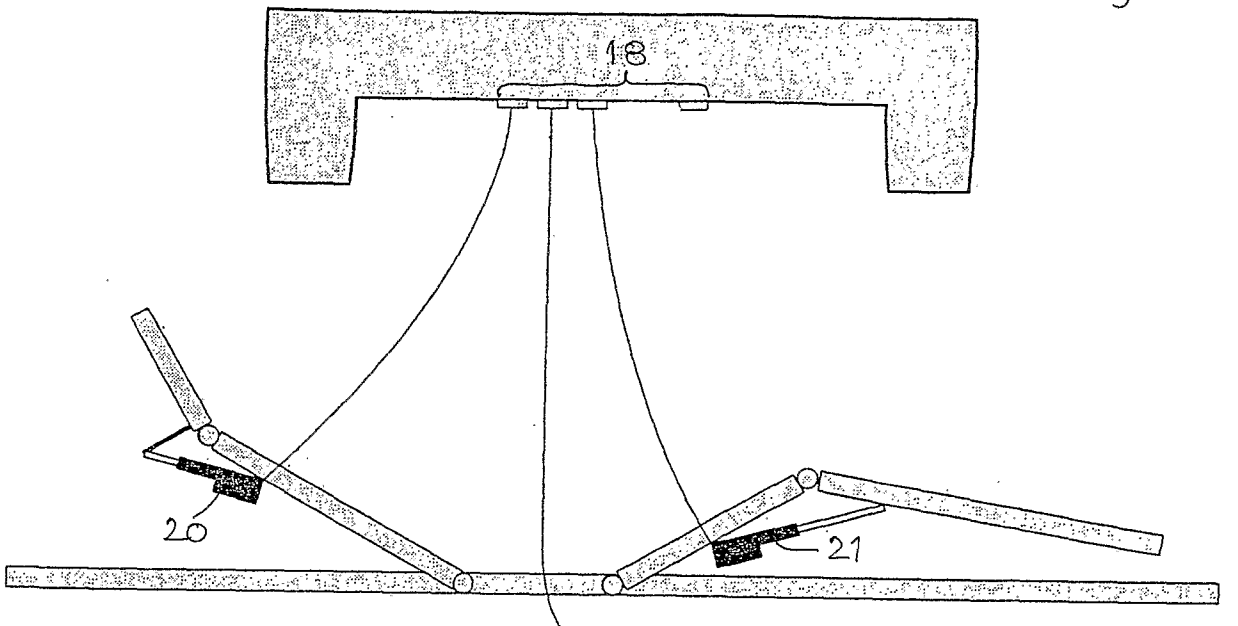

Fig 5.

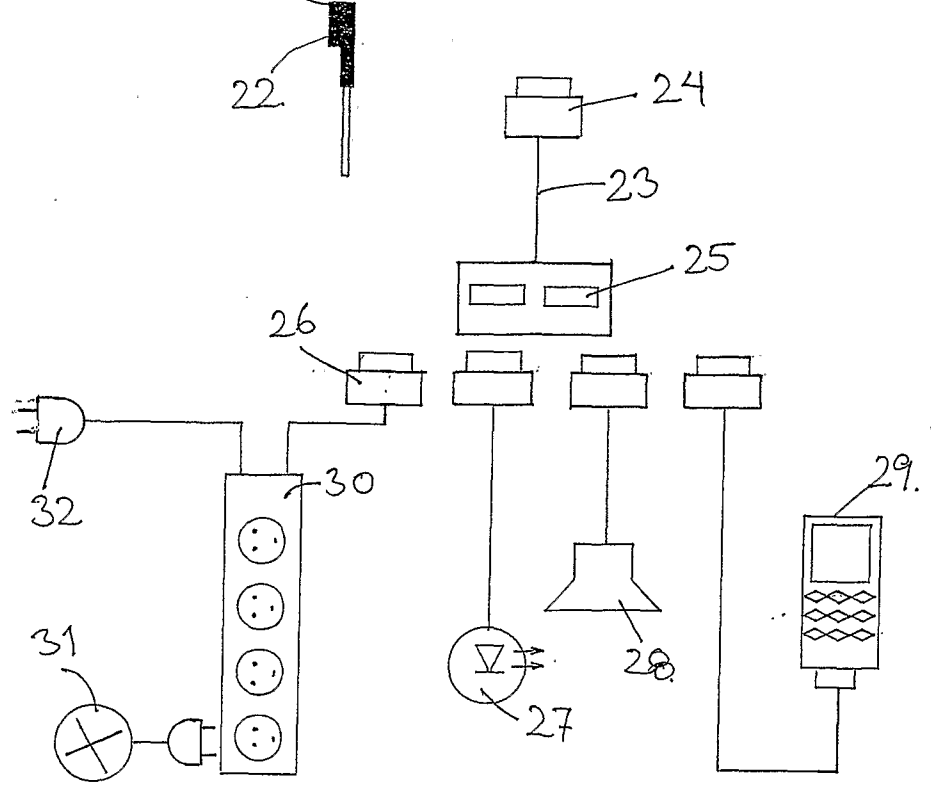

Fig 6.