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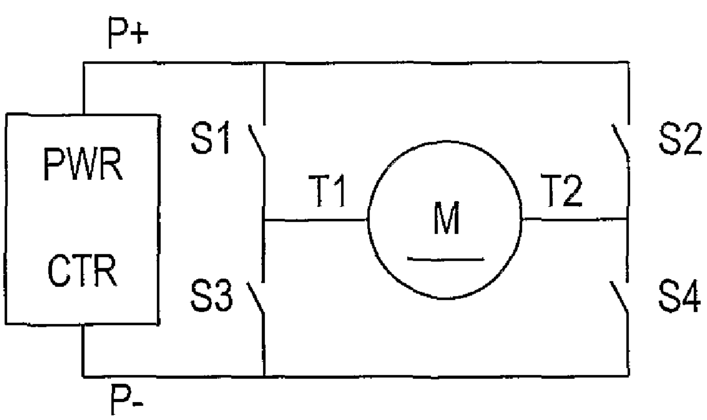
(54) **Title:** A DRIVE MECHANISM FOR ELEVATING AND LOWERING A TABLETOP



(57) Abstract: A drive mechanism has a reversible electric motor, which can be short-circuited to stop the rotation of the motor. Hereby higher precision can be achieved. A magnetic brake has a rotor, which has one or more neutral angular positions relative to the stator. A controller controls the motor and calculates the height of the tabletop based on the rotation of the rotor, and a sensor gives a signal when the rotor is in a predetermined angular position different from the neutral position. The magnetic forces between the stator and the rotor prevent the rotor from reaching the predetermined angular position, when the tabletop is loaded with a load that does not exceed a nominal table-to load. Such a brake exerts a torque that is independent of motor speed and is particularly suited for preventing the tabletop from being lowered due to either its own weight or to a load on the tabletop.

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A drive mechanism for elevating and lowering a tabletop

Field of the invention

The invention relates to tables and work desks having a drive mechanism for elevating and lowering the tabletop.

Background of the invention

Such tables and work desks are known. Typically, the drive mechanism for elevating and lowering the tabletop relative to the legs comprises one or more electric motors, which via a reduction gear such as a worm gear drive a rack in each leg. Such mechanisms are usually not self-arresting and do not prevent the tabletop from being unintentionally lowered due to the load. A permanent friction brake can be used, but this results in a considerable friction loss, which makes it necessary to use high power and a more powerful motor to elevate the tabletop.

Due to inertia in the moving parts including the tabletop and the drive mechanism the tabletop may move up to several cm after the current to the motor has been cut off. This makes fine adjustment of the height of the tabletop very difficult.

The drive mechanism can have a shaft encoder, which in response to the rotation of the motor shaft gives signals to a controller with a microprocessor. The microprocessor thereby keeps track on the position of the tabletop and the height of each leg. Thereby the tabletop can be prevented from being driven to its extremes, and the legs are synchronised. The shaft encoders can be magnetic, such as Hall effect sensors, or optical sensors.

If the motor stops at or near the angular position where the sensor gives a signal, or possibly moves or "oscillates" several times about that position, this will be interpreted by the microprocessor as a continued movement, and the calculated position of the tabletop will be wrong. Furthermore, such errors can accumulate.

Summary of the invention

The invention solves these problems and will be explained in connection with a drive mechanism having a controller with switching elements for selectively establishing first and second sets of connections, where the power supply terminals are connected to the motor terminals with opposite polarities, whereby the motor has opposite directions of rotation; and for selectively establishing a third set of connections where the motor terminals are connected to each other, i.e. the motor is short-circuited, whereby the rotation of the motor is retarded with a torque that is proportional to the motor speed and is particularly suited for stopping the motor.

According to the invention the drive mechanism has a magnetic brake for retarding the rotation of the motor. The magnetic brake comprises a stator and a rotor both of a magnetizable material, and the stator and/or the rotor are so magnetised that the rotor has one or more neutral angular positions relative to the stator to which the rotor is attracted due to magnetic forces between the stator and the rotor. A controller controls the motor and calculates the height of the tabletop based on the rotation of the rotor, and a sensor senses the rotation of the rotor and gives a signal when the rotor is in a predetermined angular position different from the neutral angular position. The magnetic forces between the stator and the rotor prevent the rotor from reaching the predetermined angular position, when the tabletop is loaded with a load that does not exceed a nominal tabletop load. Such a magnetic brake gives a braking torque that is independent of motor speed and is particularly suited for use as a static brake for preventing the tabletop from being lowered due to either its own weight or to a load on the tabletop.

Preferably, both embodiments are used together, whereby a simple mechanism provides both static and dynamic braking of the motor and the tabletop movements.

Brief description of the drawings

Figure 1 shows schematically a drive mechanism;

Figure 2 shows the drive mechanism in figure 1 with a first set of connections;

Figure 3 shows the drive mechanism in figure 1 with a second set of connections;

Figure 4 shows the drive mechanism in figure 1 with a third set of connections;

Figures 5 and 6 show an embodiment of a magnetic brake according to the invention;

Figure 7 shows a table with a tabletop that can be elevated;

Figure 8 is a perspective view of a frame structure for at table;

Figure 9 is a sectional view of the frame structure, seen from above;

Figure 10 shows a coupling for connecting a drive cable;

Figure 11, shows an alternative frame structure for a table; and

Figure 12 shows an exemplary drive mechanism 60 with a rotatable drive intake.

Detailed description of the invention

In figure 1 is shown a drive mechanism for use with a table or a work desk having a tabletop that can be elevated and lowered. The drive mechanism comprises an electric motor M, preferably a DC motor, with first and second motor terminals T1 and T2. A power supply PWR has first and second power supply terminals P+ and P- for supplying electric power to the motor M through switching elements S1, S2, S3 and S4 that are individually controllable by a controller CTR. The power supply and the controller are preferably enclosed in a common housing as indicated.

In figure 7 is shown a table or work desk 10 with a tabletop 11 supported by legs 12. Below the tabletop is a motor housing 13 with a drive mechanism as in figure 1 for elevating and lowering the tabletop 11.

In figure 2 is shown the drive mechanism of figure 1 with the switching elements S1, S2, S3 and S4 controlled by the controller CTR to establish a first set of connections, where the switching elements S2 and S3 are open and the switching elements S1 and S4 are closed so that the first power supply terminal P+ is connected through the switching element S1 to the first motor terminal T1 and the second power supply terminal P- is connected through the switching element S4 to the second motor terminal T2, whereby the motor has a first direction of rotation as indicated by the arrow. Through a (not shown) reduction gear such as a worm gear the motor elevates the tabletop.

In figure 3 is shown the drive mechanism with the switching elements S1, S2, S3 and S4 controlled by the controller CTR to establish a second set of connections, where the switching elements S2 and S3 are closed and the switching elements S1 and S4 are open so that the first power supply terminal P+ is connected through the switching element S2 to the second motor terminal T2 and the second power supply terminal P- is connected through the switching element S3 to the second motor terminal T2, whereby the motor has a second direction of rotation opposite the first direction as indicated by the arrow. With this set of connections the motor lowers the tabletop.

In figure 4 is shown the drive mechanism with the switching elements S1, S2, S3 and S4 controlled by the controller CTR to establish a third set of connections, where the switching elements S1 and S2 are closed and the switching elements S3 and S4 are open. The first and second motor terminals T1 and T2 are hereby connected to each other. It is a well-known fact that an electric motor, which in this way has its terminals, short-circuited will exert a torque that resists rotation of the motor, and the torque will be proportional to the speed of the motor. In this configuration the drive mechanism will be used to stop the rotation of the motor after the tabletop has been elevated or lowered.

The switching elements S1, S2, S3 and S4 can be solenoid operated electromechanical switches or solid-state switches such as switching transistors.

In figure 5 is shown an embodiment of a magnetic brake 20 according to the invention with a stator 21 and a rotor 22 within the stator 21. The magnetic brake 20 is connected to the motor M with the rotor 22 driven by the motor M. Preferably, the rotor 22 of the magnetic brake is mounted on the shaft of the motor M so that the rotor 22 rotates with the motor shaft. The stator 21 is of a magnetizable material such as iron or ferrite and has been magnetised in any suitable manner such as by magnetising the stator it self or by placing magnets at the position of the poles. The stator is shown with two magnetic poles N and S, but it can have any suitable number of poles. The rotor may also be magnetised.

The rotor 22 is also of a magnetizable material such as iron or ferrite and has a cruciform cross section with four protruding arms. There is an air gap between the outer ends of the arms and the inner surface of the stator 21. The magnetic forces between the stator and the rotor will attract the rotor to assume the angular position shown in figure 5, where the arms of the rotor are closest to the magnetic poled N and S of the stator, which is a neutral angular position relative to the stator.

In figure 6 the rotor 22 is shown in an angular position different from the neutral angular position in figure 5, and in any such position the magnetic forces between the stator and the rotor will exert a torque on the rotor directed to the nearest neutral angular position.

A sensor 24 is arranged to sense the passage of an arm of the rotor at an angular position different from the neutral angular position relative to the stator. The sensor 24 can be a magnetic field sensor such as a Hall effect sensor, an optical sensor or a mechanical sensor suitable for the purpose. The sensor 24 gives an output signal each time an arm of the rotor passes the sensor, and the output signals are counted by the controller CTR in the drive mechanism and used for calculating or estimating the position of the tabletop.

The motor M is sufficiently powerful to provide a torque that is greater than the maximum torque due to the magnetic forces between the stator and the rotor of the magnetic brake 20, and when the drive mechanism is operated to elevate or lower the tabletop, the magnetic brake will exert an oscillating torque on the motor shaft.

When the tabletop is at rest at any height, the weight of the tabletop and a possible load on the tabletop will be transmitted through the reduction gear, and a torque will be transmitted to the motor shaft. This torque will rotate the motor shaft and the rotor 22 of the magnetic brake away from the neutral angular position in figure 5, but the mechanism is so dimensioned that when the load on the tabletop does not exceed a nominal load, the torque due to the load will be counterbalanced by the torque due to the magnetic forces between the stator and the rotor, so that the load will not drive the rotor to an angular position, where the sensor is activated or triggered to give an output signal.

A simple static brake is hereby provided which ensures a stable position of the tabletop, and erroneous sensor signals are avoided. Hereby correct sensor signals are obtained that ensure reliable and repeatable tabletop positions.

In Figure 8, reference numeral 1 is used to designate a frame structure intended for supporting a not shown tabletop for providing a table, such as a work desk, which allows for low manufacturing costs and which allows for a synchronized raising and lowering of the tabletop. The frame structure 1 comprises legs 5, 5' with feet 6 and a carrier beam 30 that may, as shown, have a U-shaped cross-section. The carrier beam 30 combines with two transverse elements 35, 35' to support the tabletop. Moreover, the carrier beam may conveniently serve to receive and hide a drive motor 40 and wires 50, the object of which will be subject to further detail below.

The table provided by means of the frame structure 1 is more specifically of the type where the tabletop can be elevated and lowered as needed. To this end, the legs 5, 5' of the frame structure 1 is composed of two tubular profile elements, of which one outer tubular profile element is designated by reference numeral 15, whereas an inner tubular profile element connected to the carrier beam 30 is shown by reference numeral 20'. By means of a drive mechanism 60 with a rotatable drive intake, the inner tubular profiled element 20' may, as needed, be shifted upwards and downwards relative to the outer tubular profiled element 15, whereby the tabletop can be brought to the desired height. Drive mechanism 60 has a driven part in the form of a drive intake, and a driving part, said driving part cooperating with eg a toothed element journalled interiorly of the tubular profile element 15 for bringing about said shifting of the interior tubular profiled element 20' and hence of the tabletop.

The frame structure 1 is, as shown, provided with a motor 40 journalled in the carrier beam 30 at a distance from each leg 5, 5'. The motor 40 has a rotating shaft, the ends of which preferably form a respective drive outtake 41, 41' as shown in Figure 9, and from each drive outtake a respective wire 50, 50' extends that is, at its opposite end, connected to a respective drive mechanism 60, 60'. The wire 50, 50' is flexible, meaning that it may assume any randomly curving course without an ensuing need for performing an initial adaptation of the shape of the wire 50. Thereby the wire 50 is able to travel past obstacles, such as bolts and reinforcement ribs arranged within the carrier beam 30, said carrier beam 30 being optionally provided with eyelets through which the wire 50 may extend and serving to keep up the curved course of the wire 50.

The transmission of forces between the motor 40 and the drive mechanism 60 is accomplished by the wire 50 rotating about itself; and that may occur essentially independently of the course of the wire 50. Preferably the wire 50, 50' is torsionally rigid, meaning that the wire 50, 50' is not significantly deformed torsionally about its longitudinal axis during transmission of the forces required to operate the drive mechanism 60. Preferably the wire 50, 50' is a steel wire with threads wound so as to enable the wire to pull both when the drive outtake 41 of the motor 40 turns the one way and also the other way and thereby it operates the drive mechanism 30 to cause the table to be elevated or lowered.

It will be understood that the wire 50, 50' will also be able to travel 90° around corners and hence it is able to reach the ends of transverse elements 35, 35' in case the legs 5, 5' and their associated drive mechanisms 60 were alternatively to be arranged there.

Figure 10 shows the end of a wire 50 and the drive intake 65 of the drive mechanism 60. In the figure, a coupling 66 is shown by which the wire 50 can readily be connected to the drive intake 65. More specifically the wire 50 comprises a cylindrical male coupling part 52 configured for being received in a hollow cylindrical female coupling part 66. At its end the female coupling part 66 comprises opposite flexible portions 67 that delimit mutually opposite introduction slots 64 for receiving mutually opposite complementary protruding parts 54 on the male coupling part 52. The introduction slots 64 form a releasable lock 68 for protruding elements 54, the male coupling part 52 pressing, during its introduction into the female coupling part 66, portions 67 apart, and said portions 67 snapping back to their starting position at a time when the lock 68 is able to secure a shoulder 58 on protruding elements 54. Transmission of force between wire 50 and drive mechanism 60 may take place via cooperation between protrusions 54 and the wall of the female coupling parts 66 alone, or via further engagement.

It will be understood that the invention enables a reduction in the number of motors compared to prior art tables. In case the table comprises more than two legs, one or more of drive mechanisms 60 may optionally be provided with a rotating drive outtake 69 coupled to the drive intake 65 and intended for interconnection of a further wire 50" connected to the further leg 5" as shown in Figure 11. Alternatively the motor 40 may be provided with more than two rotating drive outtakes.

An exemplary drive mechanism 60 with a rotatable drive intake 65 is shown in Figure 12.

The principles of the table discussed with reference to figs. 8-12 may be summarised as follows:

According to a first aspect, a table is provided that has a tabletop and a frame structure 1 for supporting the tabletop, wherein said frame structure 1 comprises at least one leg 5, the length of which can be varied for setting of the height of the tabletop, a drive mechanism 60 with a drive intake and coupled to the leg 5 to vary said length upon activation of said drive mechanism 60, and a motor 40 coupled to the drive mechanism 60. The table is peculiar in that the drive intake 65 of the drive mechanism is connected to a drive outtake on the motor 40 via an elongate and flexible wire 50.

According to a further aspect of the table according to the above, the wire assumes a curved course.

According to yet an aspect, a table is provided in accordance with the above, wherein the wire 50 is torsionally rigid, meaning that the wire 50 is not significantly deformed about its longitudinal axis during transmission of force between the motor 40 and the drive mechanism 60.

According to yet a further aspect, a table is provided in accordance with the above, wherein the wire 50 is a steel wire.

According to yet a further aspect, a table is provided in accordance with the above, wherein the steel wire has threads wound such that the wire 50 is able to operate the drive mechanism 60 in essentially the same way or in the same way when the drive outtake 41 of the motor 40 turns the one way or the other.

According to yet a further aspect, a table is provided in accordance with the above, wherein the frame structure comprises two legs (5, 5') with respective drive mechanisms 60; and wherein each drive mechanism 60, 60' is connected to the same motor 40 via a respective wire (50, 50').

According to yet a further aspect, a table is provided in accordance with the above, wherein each leg 5, 5' can be shifted telescopically.

According to yet a further aspect, a table is provided in accordance with the above and comprising a releasable snap-coupling 52, 66 between the wire 50 and the drive intake 65 of the drive mechanism 60.

According to yet a further aspect, a table with a frame structure 1 for supporting the tabletop is provided, wherein the frame structure 1 comprises two legs 5, 5', the length of which can be varied for setting of the height of the tabletop, characterised in it comprises two drive mechanisms 60, 60', each of which has a drive intake; in that each leg 5 is coupled to a respective one of drive mechanisms 60, 60', whereby said length is varied by activation of the respective drive mechanism 60, 60' of each leg 5, 5'; in that one and the same motor 40 is coupled to the two drive mechanisms 60, 60', the rotating drive intake 65 of the drive mechanism 60, 60' being connected to a respective, rotating drive outtake on the motor 40 via an elongate and flexible force-transmitting element which is torsionally rigid, meaning that the force-transmitting element is not significantly deformed about its longitudinal axis during transmission of forces between the motor 40 and the drive mechanism.

According to yet a last aspect, a table is provided in accordance with the above, wherein the force-transmitting element is a rod.

The table discussed with reference to figs. 8-12 may be used without the claimed drive mechanism discussed with reference to figs. 1-7.

Claims:

1. A drive mechanism for elevating and lowering a tabletop relative to legs supporting the tabletop, the drive mechanism comprising
- an electric motor (M) for operating the drive mechanism,
- a power supply for supplying electric power to the motor (M),
- a magnetic brake for retarding the rotation of the motor (M),

the magnetic brake comprising
- a stator of a magnetizable material,
- a rotor of a magnetizable material and rotatably arranged relative to the stator and rotatable together with the motor (M),

the stator and/or the rotor being so magnetised that the rotor has at least one neutral angular position relative to the stator to which the rotor is attracted due to magnetic forces between the stator and the rotor,

the drive mechanism further comprising
- a controller (CTR) for controlling the motor (M) and for calculating the height of the tabletop based on the rotation of the rotor,
- a sensor adapted to sense the rotation of the rotor and to give a signal in response to the rotor being in a predetermined angular position different from the neutral angular position,

wherein the magnetic forces between the stator and the rotor prevent the rotor from reaching the predetermined angular position, when the tabletop is loaded with a load not exceeding a nominal tabletop load.

2. A drive mechanism according to claim 1 wherein a reduction gear is arranged between the motor and the legs.

3. A drive mechanism according to claim 1 or 2 wherein the sensor is a magnetic sensor such as a Hall effect.

4. A drive mechanism according to claim 1 or 2 wherein the sensor is an optical sensor.

5. A drive mechanism according to any one of claims 1-4 wherein the a controller (CTR) comprises switching elements (S1, S2, S3, S4) for selectively establishing a first set of connections, where a first power supply terminal (P+) is connected to a first motor terminal (T1) and a second power supply terminal (P-) is connected to a second motor terminal (T2), whereby the motor has a first direction of rotation; and for selectively establishing a second set of connections, where the first power supply terminal (P+) is connected to the second motor terminal (T2) and the second power supply terminal (P-) is connected to the first motor terminal (T1), whereby the motor has a second direction of rotation; and for selectively establishing a third set of connections where the first motor terminal (T1) is connected to the second motor terminal (T2), whereby the rotation of the motor is retarded.

6. A drive mechanism according to any one of claims 1-5 wherein the switching elements (S1, S2, S3, S4) are semiconductor components.

7. A drive mechanism according to any one of claims 1-5 wherein the switching elements (S1, S2, S3, S4) are electromechanical switches.

8. A drive mechanism according to any one of claims 1-7 wherein the power supply is controllable to supply different power levels.

9. A drive mechanism according to claim 8 wherein the power supply is adapted to control its power level by pulse width modulation.

10. A drive mechanism according to any one of claims 1-9 wherein the electric motor (M) is a DC motor.

11. A table with a tabletop and legs supporting the tabletop, the table comprising a drive mechanism according to any one of claims 1-10 for elevating and lowering the tabletop relative to the legs.

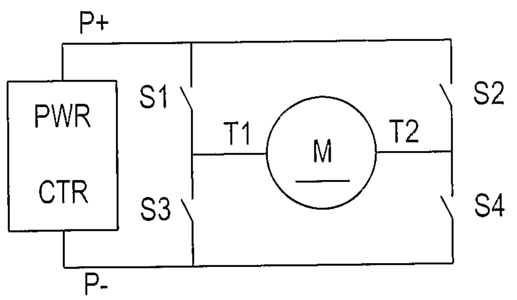

Fig. 1

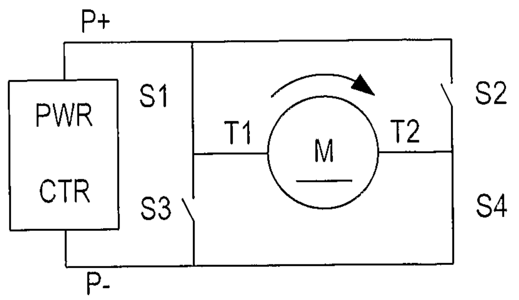

Fig. 2

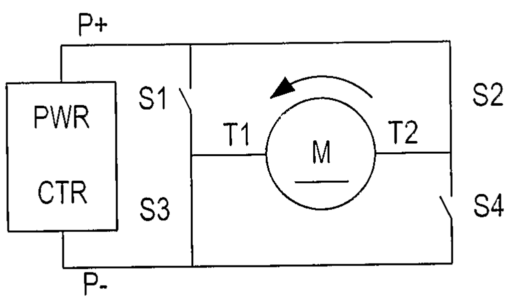

Fig. 3

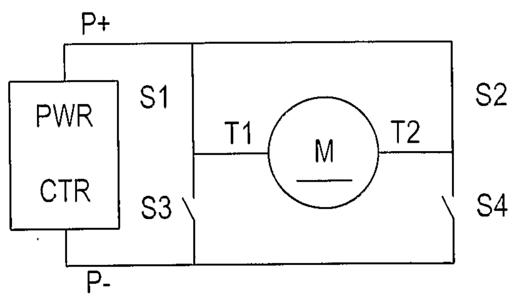

Fig. 4

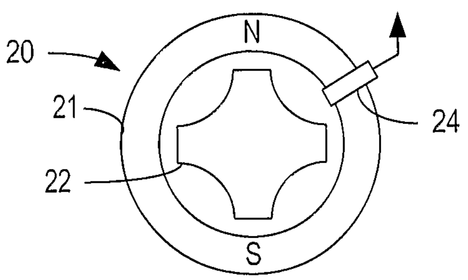

Fig. 5

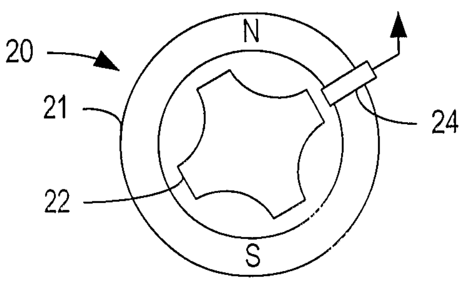

Fig. 6

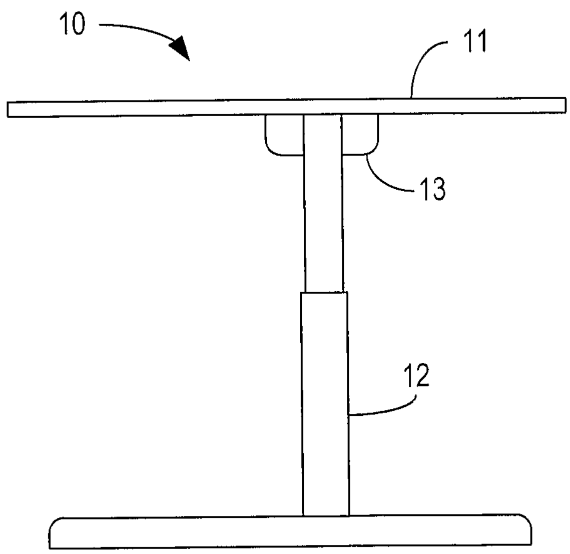

Fig. 7

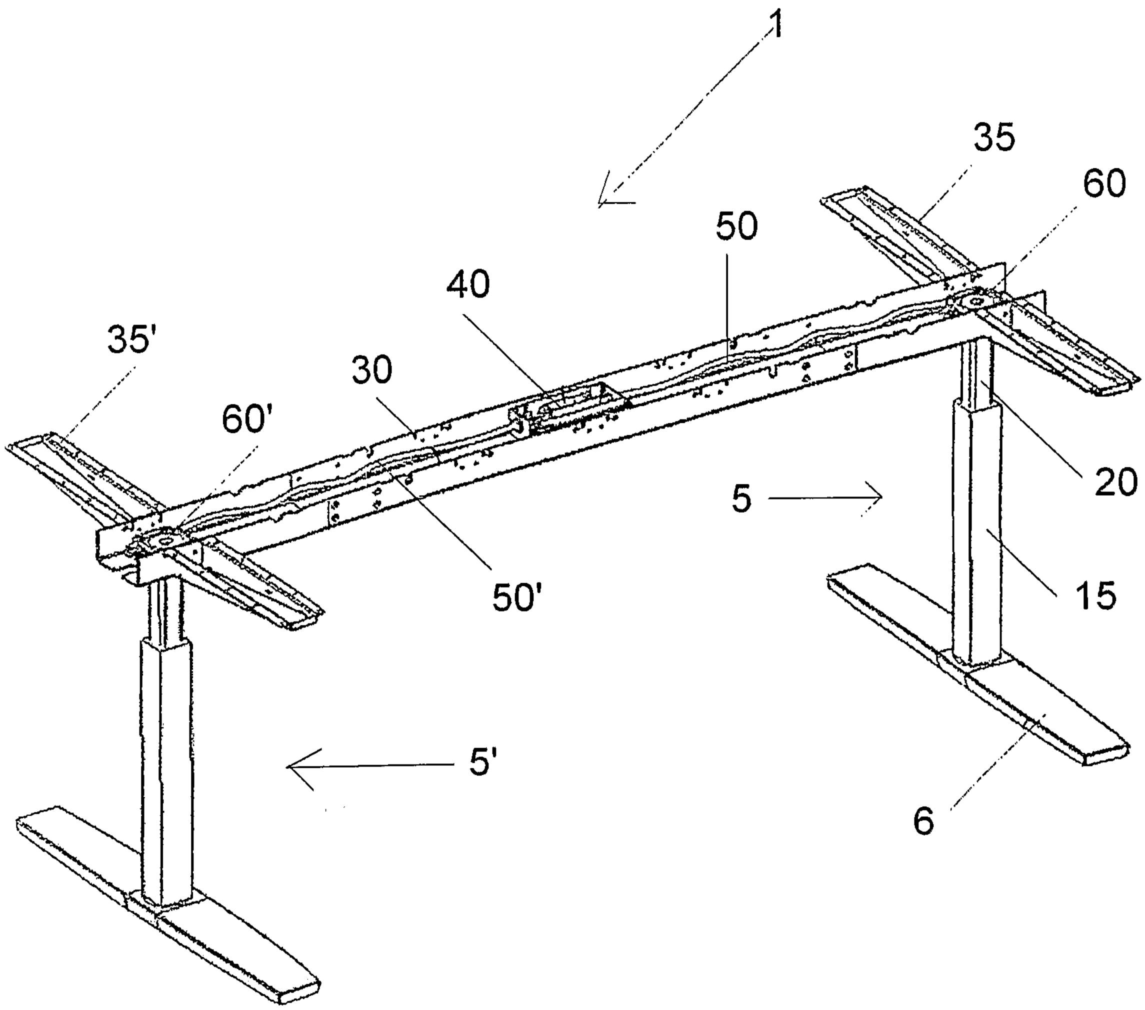

Fig. 8

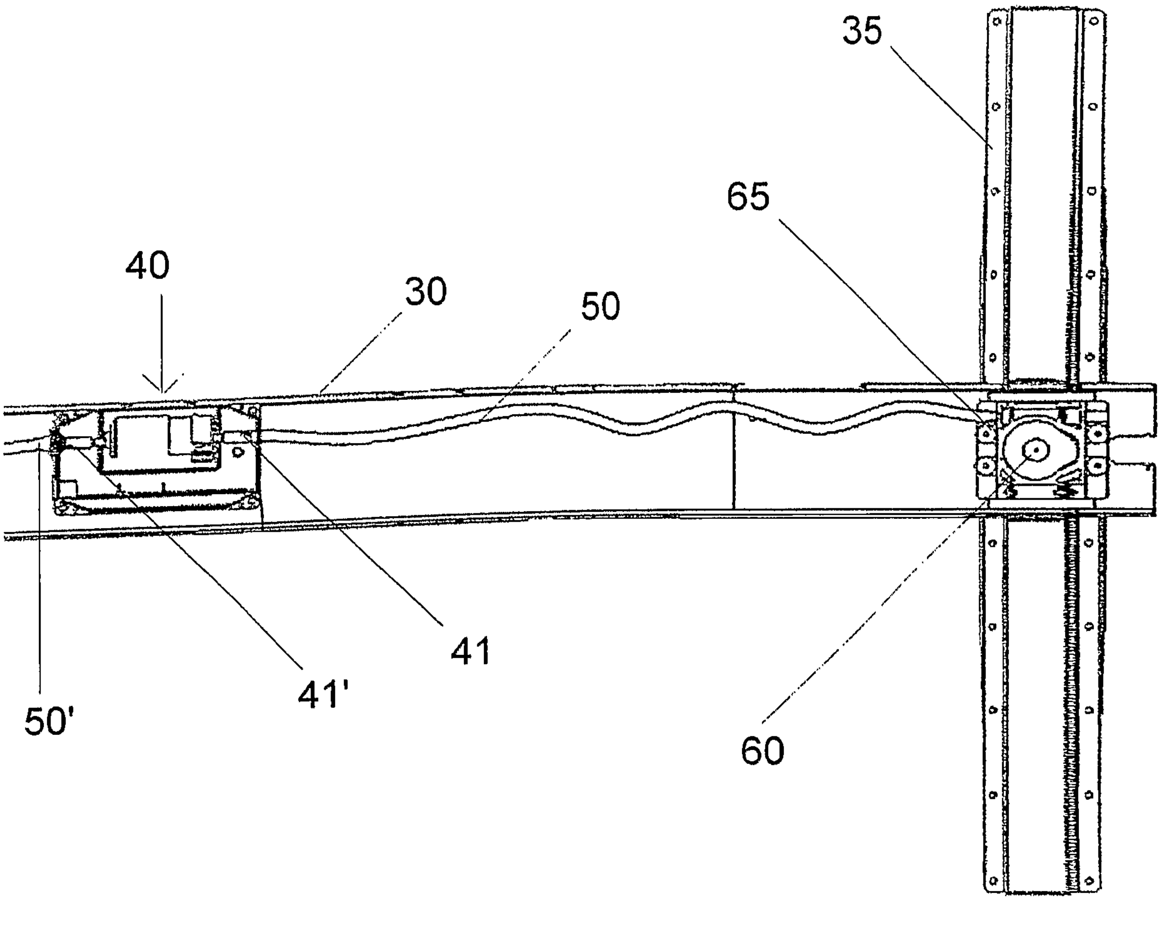

Fig. 9

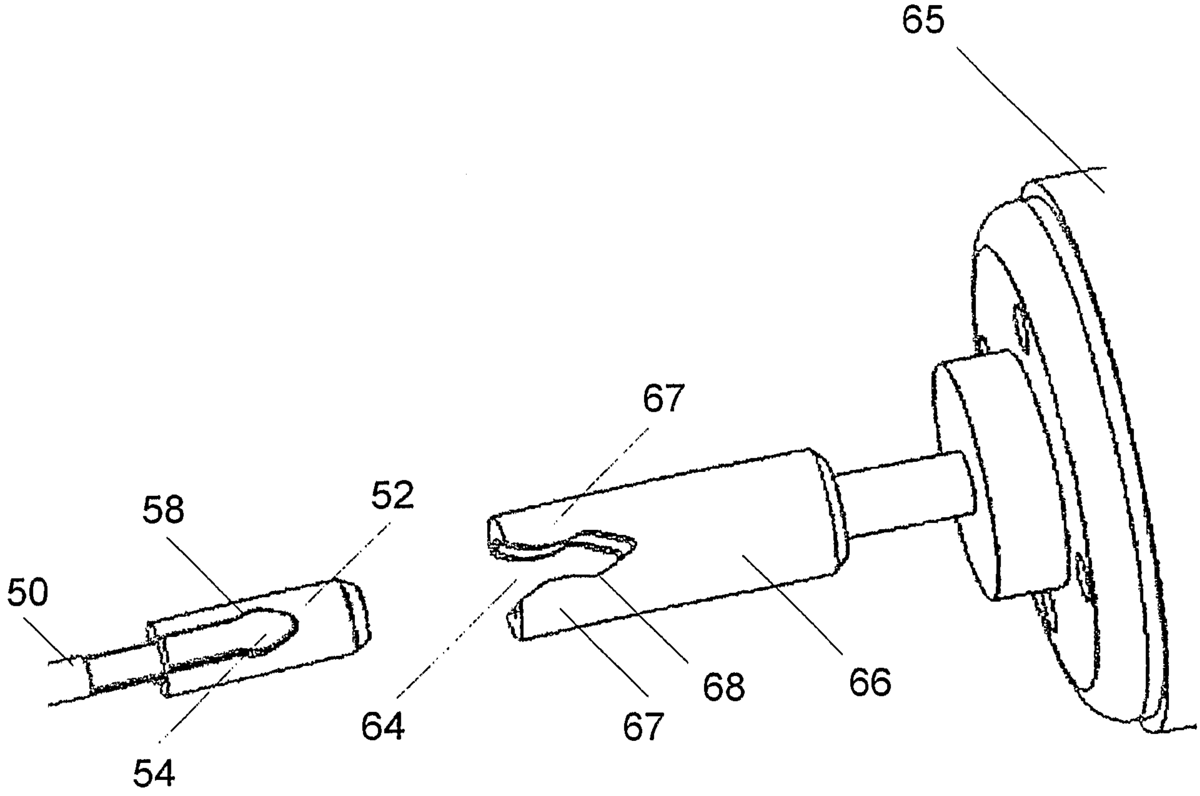

Fig. 10

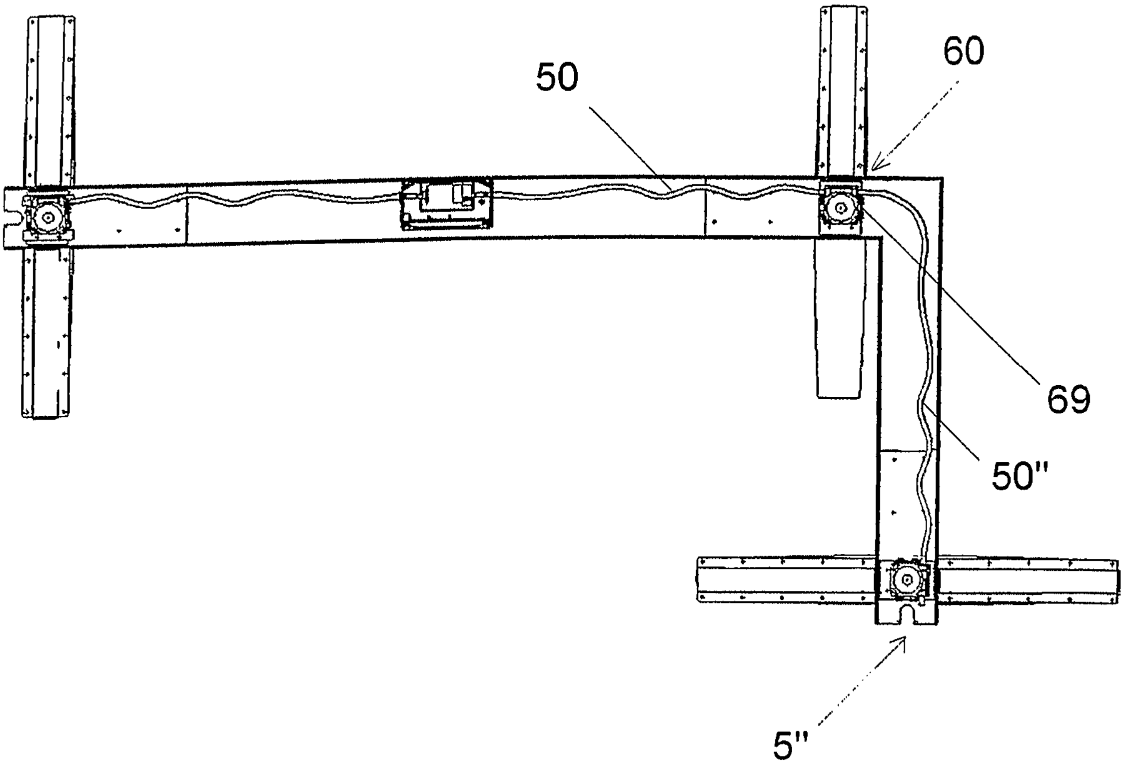

Fig. 11

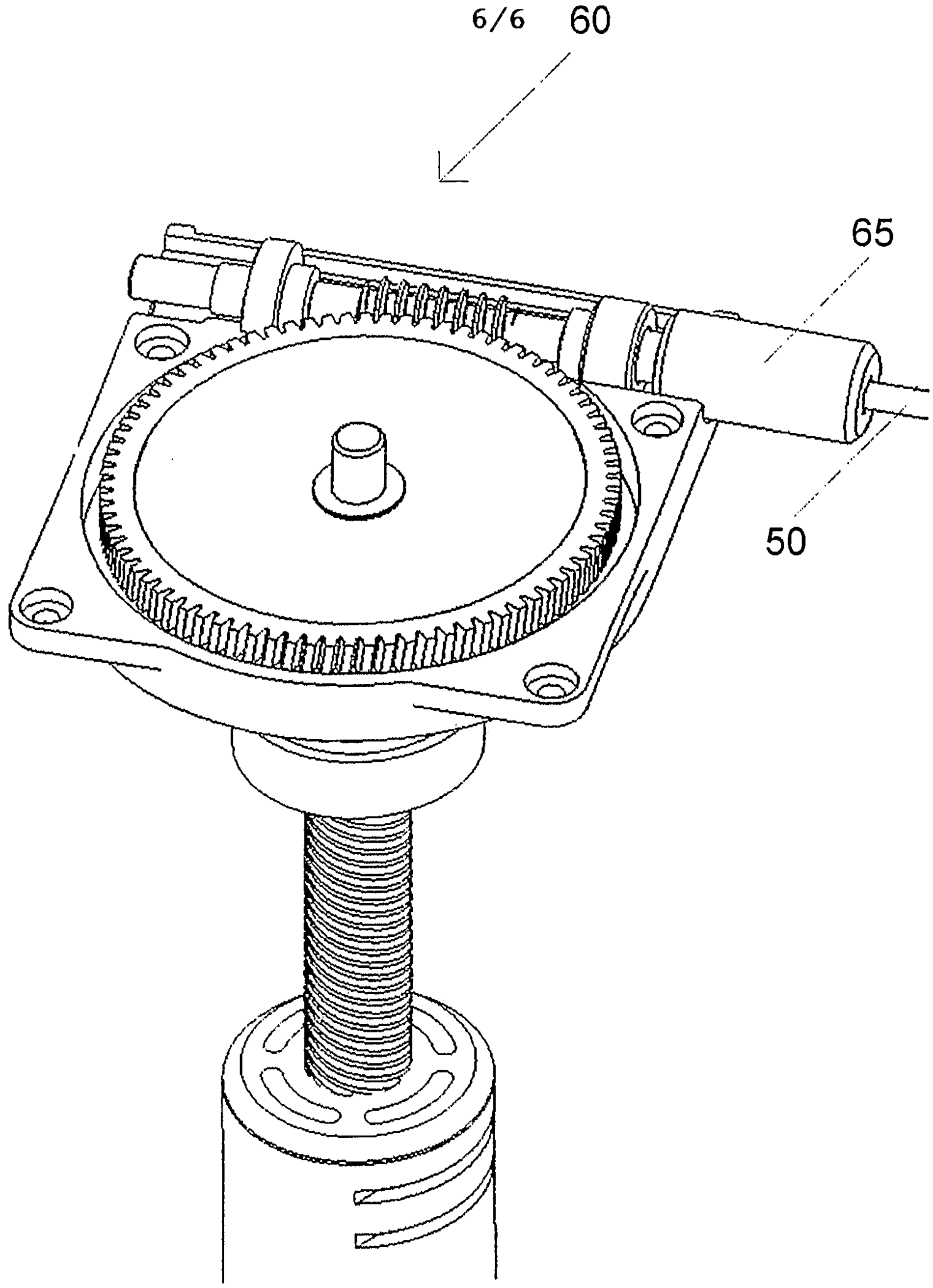

Fig. 12

INTERNATIONAL SEARCH REPORT

International application No
PCT/DK2005/000709

A. CLASSIFICATION OF SUBJECT MATTER
H02P7/00 H02P3/06 H02P3/22

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)
H02P

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

Electronic data base consulted during the international search (name of data base and, where practical, 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	EP 1 079 511 A (LINAK A/S) 28 February 2001 (2001-02-28) paragraph ‘0030! - paragraph ‘0049!; figures 1-7	1-11
A	US 5 760 555 A (YAMANO ET AL) 2 June 1998 (1998-06-02) column 2, line 8 - column 3, line 23; figures 1-3	1-11
A	DE 33 05 770 A1 (ROBERT BOSCH GMBH) 23 August 1984 (1984-08-23) page 6, line 22 - page 11, line 29	1-11
A	EP 0 651 489 A (SUMITOMO WIRING SYSTEMS, LTD) 3 May 1995 (1995-05-03) column 1, line 13 - column 7, line 24; figures 1-7	1-11

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[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
16 February 2006	27/02/2006

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Davis, A

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PCT/DK2005/000709

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 009, no. 027 (E-294), 6 February 1985 (1985-02-06) -& JP 59 172993 A (HITACHI SEISAKUSHO KK), 29 September 1984 (1984-09-29) abstract -----	1-11
A	EP 0 945 976 A (LINAK A/S) 29 September 1999 (1999-09-29) paragraph '0002! - paragraph '0036!; figure 1 -----	1-11

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/DK2005/000709

Patent document cited in search report		Publication date	Patent family member(s)			Publication date
EP 1079511	A	28-02-2001	US	2002030457	A1	14-03-2002
US 5760555	A	02-06-1998	NONE			
DE 3305770	A1	23-08-1984	NONE			
EP 0651489	A	03-05-1995	DE	69417344	D1	29-04-1999
			DE	69417344	T2	14-10-1999
			JP	2594573	Y2	26-04-1999
			JP	7029732	U	02-06-1995
			US	5568025	A	22-10-1996
JP 59172993	A	29-09-1984	NONE			
EP 0945976	A	29-09-1999	DK	26798	A	28-08-1999
			JP	11289785	A	19-10-1999
			US	6487062	B1	26-11-2002