(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 1 849 934 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
31.10.2007 Bulletin 2007/44

(51) Int Cl.:
E04H 4/16 *(2006.01)*

(21) Application number: **06008847.3**

(22) Date of filing: **27.04.2006**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI SK TR
Designated Extension States:
AL BA HR MK YU

(71) Applicant: **Tianjin Wangyuan Environmental Protection &
Technology Co., Ltd.
Tianjin, Post Code : 300385 (CN)**

(72) Inventor: **Fu, Guilan
c/o Tianjin Wangyuan Env. Prot. & Tech. Park (XiQing),TEDA, Tianjin (CN)**

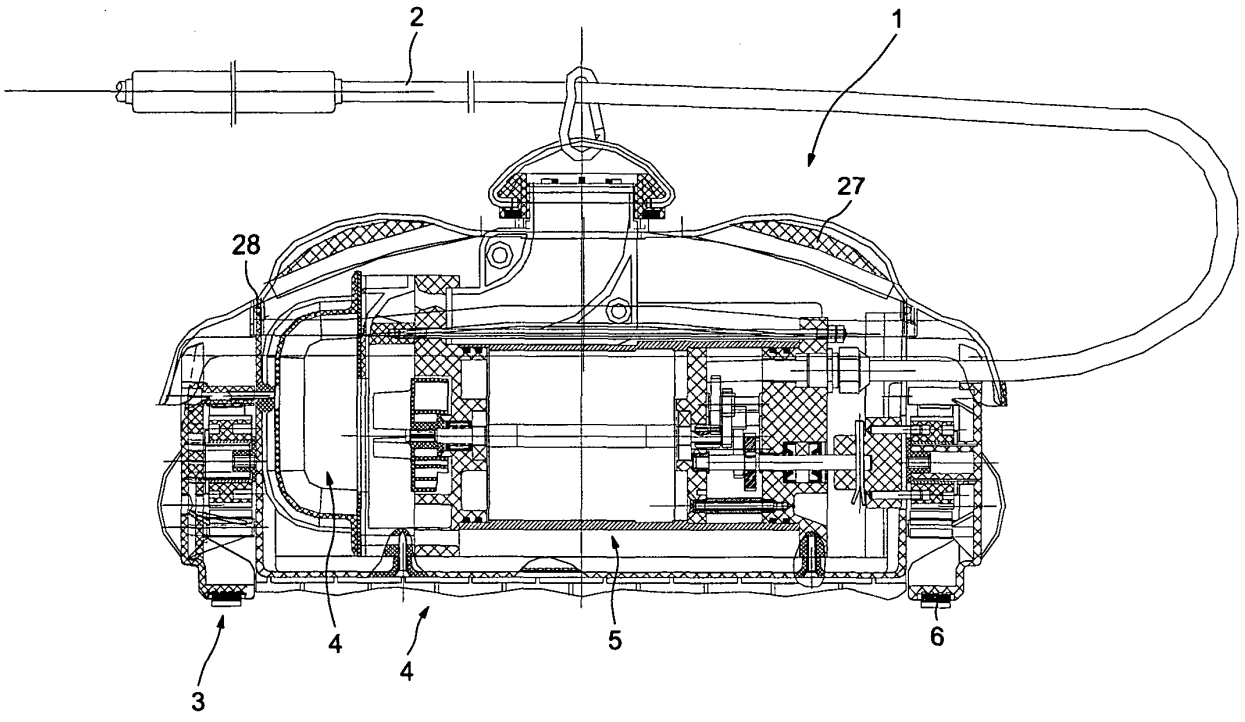
(74) Representative: **Casalonga, Axel et al
Bureau Casalonga & Josse
Bayerstrasse 71/73
80335 München (DE)**

(54) **Automatic pool cleaner**

(57) This pool cleaner comprising a self-propelled cleaner (1) intended to be immerged in the pool and to be moved over surfaces of the pool to be cleaned and electric power supply means for powering the cleaner, said self-propelled cleaner having propelling means (3) for propelling the cleaner, cleaning means (4) and motor means (5) to drive the propelling means and clean means.

The motor means comprise one direct-current motor only, said power supply means comprising a direct-current supply source.

FIG.1



EP 1 849 934 A1

Description

[0001] The invention generally relates to an automatic pool cleaner and, in particular, to an automatic pool cleaner for cleaning pool floor and pool walls.

[0002] Such a pool cleaner is essentially intended to clean swimming pools.

[0003] Pool cleaners according to the state of the art are generally provided with a self-propelled cleaner intended to be dived into the pool and adapted to be moved over the surface to be cleaned. For that purpose, the cleaner comprises rotating clean bands intended to clean the pool floor and the pool wall as well as to propel the cleaner, and filtering means used to filter the water.

[0004] These cleaners are usually moved randomly on the pool floor and are caused to creep on the pool wall by the rotating of the clean bands to reach to the purpose of cleaning pool floor and pool wall, meanwhile water moves in and out of this cleaner makes dirt and suspended debris filtered mechanically by the filtering means.

[0005] Reference can be made to the documents US-A- 168 557 and EP-A-1 122 382 which disclose automatic pool cleaners having clean bands and filtering means used to propel the cleaner and to filter the water.

[0006] In the cleaner disclosed in these references, the filtering means are provided with a pump impeller used to force water within the filtering means as well as to thrust the cleaner against the pool walls, such that the pool cleaner is capable of climbing up vertical walls. However, two motors are used to drive the clean bands and the pump impeller, respectively.

[0007] It is no doubt that such an arrangement renders the cleaner heavy in terms of weight, and more larger in terms of volume, as well as costly.

[0008] Moreover, this arrangement creates some difficulties, in particular as concerns designing the control circuit used to control the motors and as concerns operating of such cleaner. In addition, it renders the use and the manipulation of the cleaner troublesome.

[0009] Document FR 2 729 995 discloses a pool cleaner intended to alleviate some of these drawbacks by providing one motor only to drive the clean bands and the filtering means. Although this single motor design overcomes the drawbacks linked to the use of two motors, the motor used in this device is an alternating current motor (AC motor).

[0010] It is known that the safety voltage standard used under water for alternating current specified by European Union is 12V. However, the output power of such cleaner is required larger. Considering the relation between voltage, current and power, as voltage is rated and fixed, the more power is, the more current is.

[0011] A large current requires an increased section area of the cable used to connect the power supply to the cleaner. That is to say the cable is much thicker. Accordingly, such a cable of larger section area will increase the load and the burden of the cleaner, which is prejudicial to the climbing efficiency of the cleaner and causes creeping on the floor and wall uneasy.

[0012] Presently, AC motor power used in this kind of cleaners is of about 150 watt which is not strong enough to drive the filtering means and the clean bands and reduces the working efficiency. But if the single AC motor were increased up to 300 watt, then the volume and weight would be largely increased.

[0013] Besides, using AC motor causes several difficulties in terms of the design of switch power supply and of three phase transformer provided between the power supply source and the motor.

[0014] In view of the foregoing, the aim of the invention is to provide a totally different solution to the problem of powering the cleaner bands and the filtering means.

[0015] In other words, an aim of the invention is overcome the drawbacks of the pool cleaners according to the state of the art and to provide a pool cleaner easy to control and to manipulate, which can be configured in a relatively small arrangement, and having improved climbing capacities.

[0016] Accordingly, the invention relates to a pool cleaner, comprising a self-propelled cleaner intended to be immerged in the pool and to be moved over surfaces of the pool to be cleaned and electric power supply means for powering the cleaner, said self-propelled cleaner having propelling means for propelling the cleaner, cleaning means and motor means to drive the propelling means and clean means.

[0017] According to a general feature of the pool cleaner according to the invention, the motor means comprise one motor only, said motor consisting in a direct-current motor, the power supply means comprising a direct-current supply source.

[0018] Using a single motor overcomes the drawbacks of the two motors arrangements in terms of weight and volume, as well as simplifies the design of control circuit. It further renders the cleaner more easy to operate and to maintain and manipulate due to its simplest structure.

[0019] According to another feature of the invention, the power supply source comprises an alternating current cable intended to be connected to a 220V 50Hz city power socket, a converter used to convert power delivered by the city power socket into DC power, and a DC cable linking the power supply source and said self-propelled cleaner.

[0020] Preferably, the direct-current motor is a 24V direct-current motor. However, a maximum output power of 480 watt can be used, which could satisfy the requirement of the cleaner.

[0021] DC 24V is in compliance with the safety voltage standard concerning under-water devices specified by European Union. DC 24V motor doesn't need large section area cable to link motor with power supply, which would otherwise make cleaner moving and creeping uneasy.

[0022] According to another feature of the invention, the cleaning means comprise a clean band arranged as a loop and filtering means intended to filter pool water.

[0023] In such a case, the single motor may be located in the middle of said self-propelled cleaner and may comprise a shaft having a first end used to rotate said clean band through reducer, and a second end used to drive the filtering means.

[0024] According to yet another feature of the invention, the filtering means comprise an impeller to form function of centrifugal pump and make pool water moving in and out of cleaner for filtering dirt and suspended debris.

[0025] As concerns the propelling means, according to a preferred embodiment of the invention, the pool cleaner comprises a serrated belt used to propel the cleaner and rotated by said motor by means of gears, said belt being arranged as a loop mounted around holding wheels.

[0026] According to the invention, the pool cleaner further comprises an elastic back plate lying under the belt, said back plate being such that when the belt looses and touches said elastic back plate, the plate stops the belt from loosing, and keeps the normal running between the belt and gears.

[0027] According to this aspect of the invention, a solution is given to the problem of belt loosening; said belt becoming larger and loosened due to long time pull strength force applied by tensile wheels. Generally speaking, the synchronous serrated belt as the driving function tends to become longer and loosened due to the pulling force applied such that sliding from gear happens. Tension is always indirect proportional to driving force, such that when the driving force increases, the tension of the belt increases accordingly. That is to say due to the existing of tension, the stretching stress of the serrated belt is increased, which reduces its ability to endure the driving forces. Due to the stretching, the synchronous serrated belt becomes longer, which leads to a state in which the holder of driving system becomes out of shape and the belt tension is reduced.

[0028] Therefore, in order to have enough tension for the reliable meshing between driving wheel and synchronous serrated belt, higher requirement should be met as concerns the performances of the synchronous serrated belt, its material and the stiffness of the driving system holder.

[0029] Conversely according the invention, in which a back plate is used to avoid loosening of the belt a simple solution to the problem of belt loosening is provided.

[0030] For example, the serrated belt is a durable fibre skeleton synchronous serrated belt.

[0031] Accordingly, regardless of the using of a single motor, the synchronous serrated belt is able to meet the request of long time using. Thus, this belt does not need to be often changed. It is also clear that tensile wheels will not need much space in the device.

[0032] Usually, in the state of the art, the skeleton material used for the driving system belt is steel wire that is poor in fatigue, strength resistance and bending resistance, and is not suitable for long time using.

[0033] According to this aspect of the invention, the skeleton of the synchronous serrated belt is of high strength synthetic fibre which is characterized by its high strength, high modulus, high temperature resistance, and resistance to etching by most of acid and alkali or organic solvents. Its' specified strength is 5~6 times higher than steel wire, and specified modulus is 2 times higher than steel wire. Such features render the pulling strength and bending resistance of such skeleton belt improved.

[0034] Another advantage of such a skeleton belt concerns its good stability. When the temperature reaches to 180°C, the belt keeps its' mechanical performance. When temperature reaches 500°C, the fibre will not melt and burn. Conversely, when temperature is lower than -196°C, the belt will have no crack.

[0035] In addition, according to a further feature of the invention, elliptic ball bearings are used.

[0036] According to this aspect of the invention, for example, inside left and right holder holes, the bearing sleeve is of elliptic ball shape with stainless steel bearing inlaid. The distance between the two centres of elliptic sphere is 0.8mm. Elliptic ball bearing sleeves are mounted inside left and right holder holes, and screws are fastened to prevent the sleeves from moving in axial direction. There is a spacing protruding which limits the bearing moving up and down. This structure has good radial direction positioning which ensures the parallelism and central positioning of the belt and clean bands.

[0037] This structure has seldom shock and pulling force applied to synchronous serrated belt which ensure the belt stability in operating and improve the longevity

[0038] In addition, this structure could keep synchronous serrated belt is always within the efficient width of terminal wheels.

[0039] At last, this structure will stop the abrasion between terminal wheel cover with synchronous serrated belt.

[0040] Besides, the pool cleaner may comprise means to control the cleaner such that there is automatically power off after cleaner is off water.

[0041] According to yet another feature of the invention, said means are adapted to power off automatically said cleaner within 10 seconds in case of the cleaner is turn-on on land or creep out of water without turning back to water.

[0042] As a matter of fact, apart from the using of a single motor, the protection of the motor is a key point of the pool cleaner and is of great importance. Due to the fact that the device is intended to be used under water, the motor elements may be damaged if the cleaner is used on land, namely at higher temperature. Programming the cleaner such that it is automatically stopped in such a case permits to overcome such a drawback.

[0043] Other advantages and features of the invention will appear on examining the detailed description of embodiments, these being in no way limiting, and of the appended drawings in which:

- Figure 1 is a cross sectional view of a pool cleaner according to the invention;
- Figure 2 is a top view of the cleaner of figure 1;
- Figure 3 illustrates the driving system of the pool cleaner according to the invention;
- Figure 4 illustrates the clean bands of the pool cleaner;
- Figure 5 illustrates the filtering means;
- Figure 6 illustrates the elliptic ball bearing sleeve;
- Figure 7 is a schematic view of a control circuitry of the pool cleaner according to the invention; and
- Figure 8 illustrates a diagram of PCB board of a pool cleaner according to the invention.

[0044] The invention will now be described with reference to the drawings.

[0045] As depicted in figure 1, the pool cleaner according to the invention comprises a self-propelled cleaner 1 intended to be immersed in a swimming pool for cleaning the pool floor and walls as well as to filter the pool water, and electric power supply means for powering the cleaner.

[0046] The cleaner 1 and the power supply means are linked using a cable 2.

[0047] As disclosed later in the description, the cleaner 1 is provided with propeller means 3 dully programmed and configured to cause the cleaner to circulate onto the pool floor and to climb the pool walls, by circulating forwards and backwards, turning right and left hand according to programmed sequences of movements, in order to cover all the surface of the floor and of the walls.

[0048] For cleaning the pool, the cleaner 1 comprises cleaning means 4 which are driven by motor means 5.

[0049] As shown in figures 1 and 3, the propeller means essentially comprise durable fibre skeleton synchronous serrated belt 6 forming a loop mounted around holding wheels 7, one of which, denoted by numeral reference 7', is used to apply tensile force onto the belt 6.

[0050] As illustrated in figure 1, the cleaner lies onto the horizontal or vertical walls of the pool by the serrated belt 6.

[0051] At least one of the holding wheels is rotated by the motor means 5.

[0052] As concerns the cleaning means, the cleaner is provided with filtering means 8 having water inlet and outlet 9, 9' and a filter net 10 around a filter box 12.

[0053] As shown, the filter box in mounted within a body 13 secured onto the cleaner frame 14.

[0054] In addition, the cleaning means comprise an impeller forcing water through the filtering means 8 and creating simultaneously a thrust allowing the cleaner to climb up vertical walls.

[0055] According to a feature of the invention, the cleaning means, and in particular the impeller, and the propeller means, in particular the serrated belt is rotated using one DC motor only. Preferably, the motor is a 24V DC motor.

[0056] The DC 24V motor permits to generate large power and large torque in comparison with an AC motor having the same weight. Large power and torque makes water flow larger, as well as improves the ability of cleaner's creeping on pool wall.

[0057] In addition, a DC 24V motor is easy to be controlled to do the function of commutating, stopping and time setting, which could make the intervals among the functions changing shorter and smooth.

[0058] According to a feature of the invention, the motor comprises a drive shaft, on end of which is used to propel the cleaner by means of the serrated belt. Another end of the drive shaft is used to rotate the impeller to force water within the filtering means and to create the above-mentioned thrust.

[0059] In other words, the single motor is located in the middle of robot. One of its terminal axis drives the rotating of clean bands moving through retardars or reducers and the other terminal axis drives the impeller to form the function of centrifugal pump and make pool water moving in and out of cleaner for filtering dirt and suspended debris.

[0060] A further feature of this invention is the design and using of an elastic back plate 15 to avoid loosening of the serrated belt. This plate is arranged in the form of an elastic concave metal plate under the synchronous serrated belt 6. There is a gap between them. In normal operation, the elastic back plate will not touch belt, as well as no any influence to the running of the belt. When the synchronous serrated belt becomes longer and loosened due to a long time pulling force applied thereto, a sliding occurs between the belt 6 and the driving gear (ungeared). In other words, in such a case, sliding occurs between the belt and the rotated holding wheel 7.

[0061] When the belt touches elastic back plate, the plate then stops the belt from loosing, and keeps the normal running or cooperation between the belt and gear. That is to say, when the belt begins to slide and reaches the elastic back plate, the plate starts to play its role.

[0062] The purpose of the elastic back plate is not only to avoid the requirement of more space in the device, but also to avoid the necessity to apply an extra tension to the belt, which makes the belt using longer. Meanwhile, using the elastic back plate does not need high requirement to the performance of the synchronous serrated belt, material and stiffness of the driving system holder. The driving system holder can thus have a simple structure and a small size, which make it easy to install.

[0063] Besides, referring now to figure 4, the cleaning means further comprise a clean band 16 arranged in the form of a loop lying from the front end of the cleaner to the rear end. As shown, the clean band is mounted around front and rear rotary drums 17 fixed onto rotary drum wheels 18 mounted on rotary drum wheel sleeve 19. In addition each rotary drum is mounted around a buoy 20.

[0064] According to a feature of the invention, each rotary drum wheel sleeve rotates within support holes 21 of holder arms 23 (figure 3) using elliptic ball bearing

sleeves 24 (figure 6).

[0065] One of the main features of the cleaning means is that the band 16 is made of a long tooth band made of a PVC which is not easy to break, and makes cleaning in all directions in the pool.

[0066] Elliptic ball bearing sleeve 24 provides good positioning, and good running concentricity. At last, terminal wheel sleeve 19 is made of stainless steel without lubrication, with long time using.

[0067] It should also be noted that, preferably, the driving system part of the cleaner, in particular the bearing sleeves 24 and the holes 21, are all of stainless steel without lubrication permitting easy rotating and particularly suitable for long using under water.

[0068] Another feature of this invention relates to the function of automatically powering off of the cleaner in case of the cleaner is off water for 10 seconds. This invention uses a single DC 24V motor. Protection of the motor is of great importance. The cleaner in this invention is intended to be used under water, but not on land. It is much easy to cause damages to the motor due to an improper use of the cleaner on land by end user, or a creeping of the cleaner out of water without turning back. Accordingly the cleaner is dully controlled and programmed in order to be powered off automatically within 10 seconds in case of the cleaner is turned-on on land or crept out of water without returning back to water. If cleaner returns to water within 10 seconds, then cleaner recovers the status of normal operating.

[0069] For that purpose, the cleaner is provided with a current inspection sensor installed in the input terminal of the power supply source. The current value data thus obtained is sent to a central process chip for analysis to control the status of cleaner.

[0070] Another feature of the invention concerns the part of elbow of water consists of lock nut and suspension ring. Its' main characteristics is the ring angle is smaller than 90°, to prevent it from disconnecting and dropping down. It's structure is simple and easy to install. According to a further aspect of the invention, the pool cleaner 1 comprises a cover 25 consisting in an upper cover 26, a floating block 27 and sealing strap 28. Its' main characteristic is the unique configuration of the cover 25and its fabrication in poly-foam plastic.

[0071] As concerns the filtering means, all the elements of the filter are mounted on a chassis body 13. This body comprises a water inlet cover plate 29, a press plate 30 and a floating block 31. It's main characteristic is that the water inlet cover plate 19 is made from silicon rubber. There are holes on the surface which ensures that the water inside the cleaner could drain out quickly and reduces the weight when the cleaner is lifted out of water.

[0072] It should also be noted that, as already mentioned, the power supply means consists of low safety voltage DC switch power supply. In addition, the power supply means comprise an alternating current cable intended to be connected to a 220V 50Hz city power socket, a converter used to convert power delivered by the city power socket into DC power, and a DC cable linking the power supply source and the self-propelled cleaner. The power supply means further comprise a control circuit board, commutating relay, operating control board used to control the DC motor.

[0073] Among them, the control circuit board comprises a monolithic processor dully programmed to carry out the functions of precision timing control, time sequence optimizing, start/stop control, operating mode control, direction control, abnormal operation protection, and status display. The input terminal of the control circuit board is connected to the low voltage DC switch power supply and to the operating control board. The command from the operating control board combined with the automatically detected input current of the cleaner are processed by the monolithic processor in the circuit board to detect the status of cleaner, and then output to the commutate relay which insert the switch power to the motor and drive the motor in order to reach to the purpose of cleaning.

[0074] The working procedures of this invention cleaner is: The alternating current cable of power supply box connects to 22V 50Hz city power socket, press on/off button on control penal to power on cleaner, and make power supply modulor PSP-600 working and output 24V power which is either the power of control panel, or the power of DC motor, and transfer to motor by 20 meters cable. DC motor controlled by program could finish two functions: one is to control the moving of cleaner under water, in which moving route, distance, direction are programmed; the other is to moving water in & out for filtering dirt and suspended debris on filtering bags to realize the purpose of water filtering.

[0075] At last, referring to figures 7 and 8, a man skilled in the art will notice that, according to the invention, which uses one single motor only to drive the propelling means of the cleaner and the cleaning means, the control means used to control the functioning of the cleaner can be realized using a simple circuitry having a reduced number of components and of small size since it is not necessary to control two motors simultaneously.

Claims

1. Pool cleaner, comprising a self-propelled cleaner (1) intended to be immerged in the pool and to be moved over surfaces of the pool to be cleaned and electric power supply means for powering the cleaner, said self-propelled cleaner having propelling means (3) for propelling the cleaner, cleaning means (4) and motor means (5) to drive the propelling means and cleaning means, **characterized in that** the motor means comprise one single motor (5) only, said motor consisting in a direct-current motor, and **in that** the power supply means comprise a direct-current supply source.

2. Pool cleaner according to claim 1, **characterized in that** the power supply source comprises an alternating current cable intended to be connected to a 220V 50Hz city power socket, a converter used to convert power delivered by the city power socket into DC power, and a DC cable linking the power supply source and said self-propelled cleaner.

3. Pool cleaner according to claims 1 or 2, **characterized in that** the direct-current motor (5) is a 24V direct-current motor.

4. Pool cleaner according to any of claims 1 to 3, **characterized in that** the cleaning means (4) comprise a clean band (16) arranged as a loop and filtering means (8) intended to filter pool water.

5. Pool cleaner according to claims 4, **characterized in that** the single motor is located in the middle of said self-propelled cleaner and comprises a shaft having a first end used to rotate said clean band (16) through a reducer, and a second end used to drive the filtering means (8).

6. Pool cleaner according to claim 5, **characterized in that** the filtering means comprise an impeller to form function of centrifugal pump and make pool water moving in and out of cleaner for filtering dirt and suspended debris.

7. Pool cleaner according to any of claims 1 to 6, **characterised in that** said propelling means comprise a serrated belt (6) used to propel the cleaner and rotated by said motor by means of gears, said belt being arranged as a loop mounted around holding wheels.

8. Pool cleaner according to claim 7, **characterized in that** it further comprises an elastic back plate (15) lying under the belt, said back plate being such that when the belt looses and touches said elastic back plate, the plate stops the belt from loosing, and keeps the normal running between the belt and gears.

9. Pool cleaner according to claim 8, **characterized in that** the serrated belt (15) is a durable fibre skeleton synchronous serrated belt.

10. Pool cleaner according to any of claims 1 to 9, **characterized in that** elliptic ball bearings are used.

11. Pool cleaner according to any of claims 1 to 10, **characterized in that** it comprises means to control the cleaner such that there is automatically power off after cleaner is off water.

12. Pool cleaner according to claim 11, **characterized in that** said means to control the cleaner are adapted to power off automatically said cleaner within 10 seconds in case of the cleaner is turn-on on land or creep out of water without turning back to water.

FIG.1

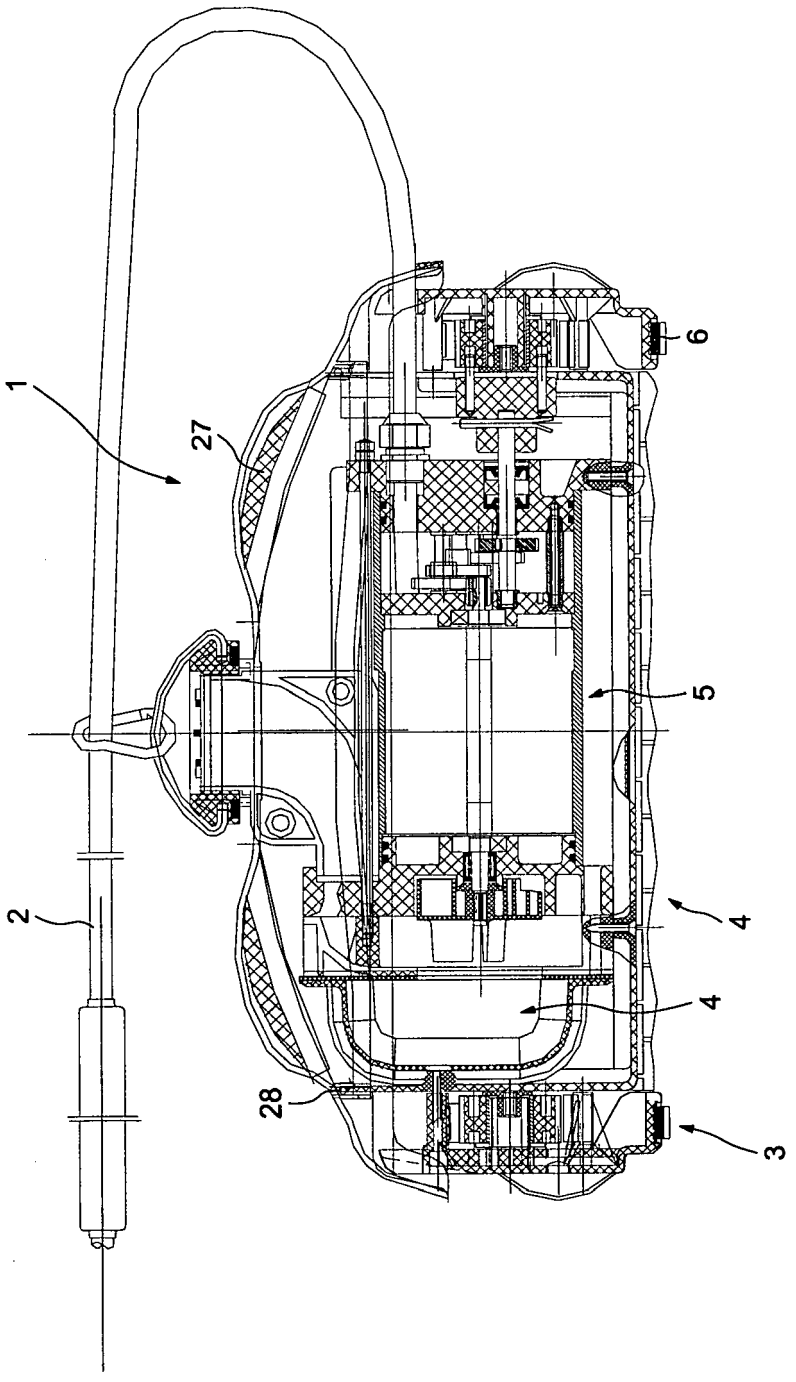


FIG.2

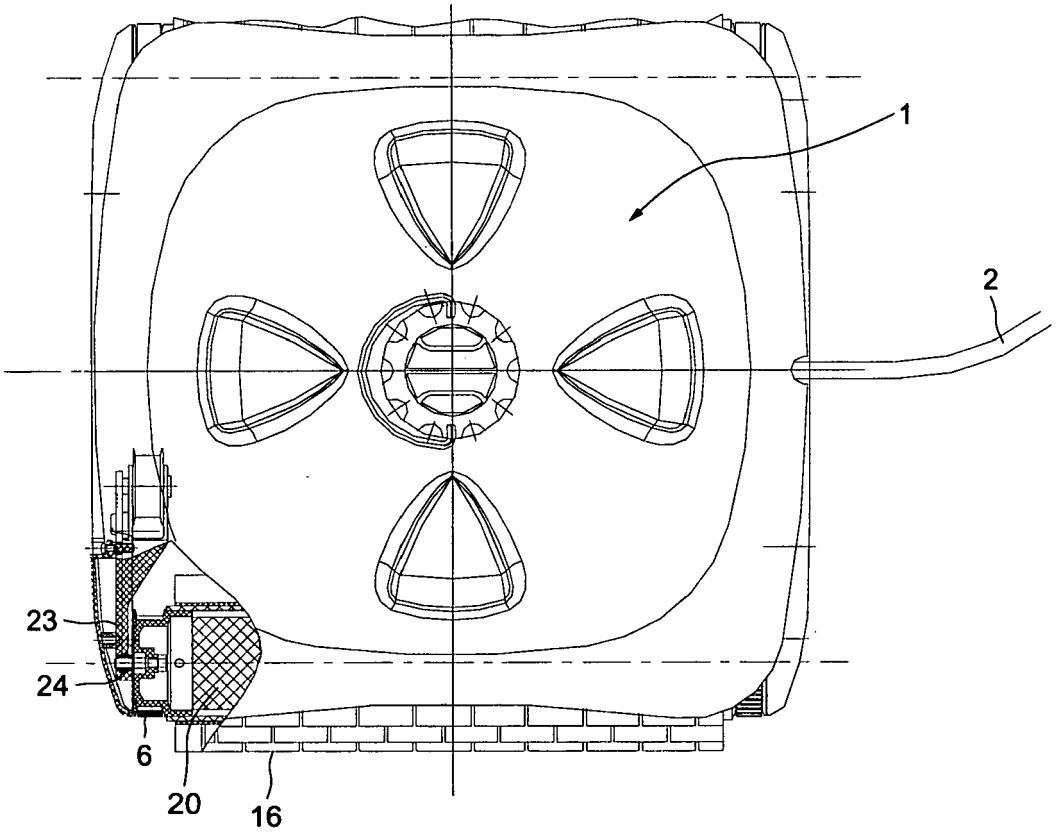


FIG.3

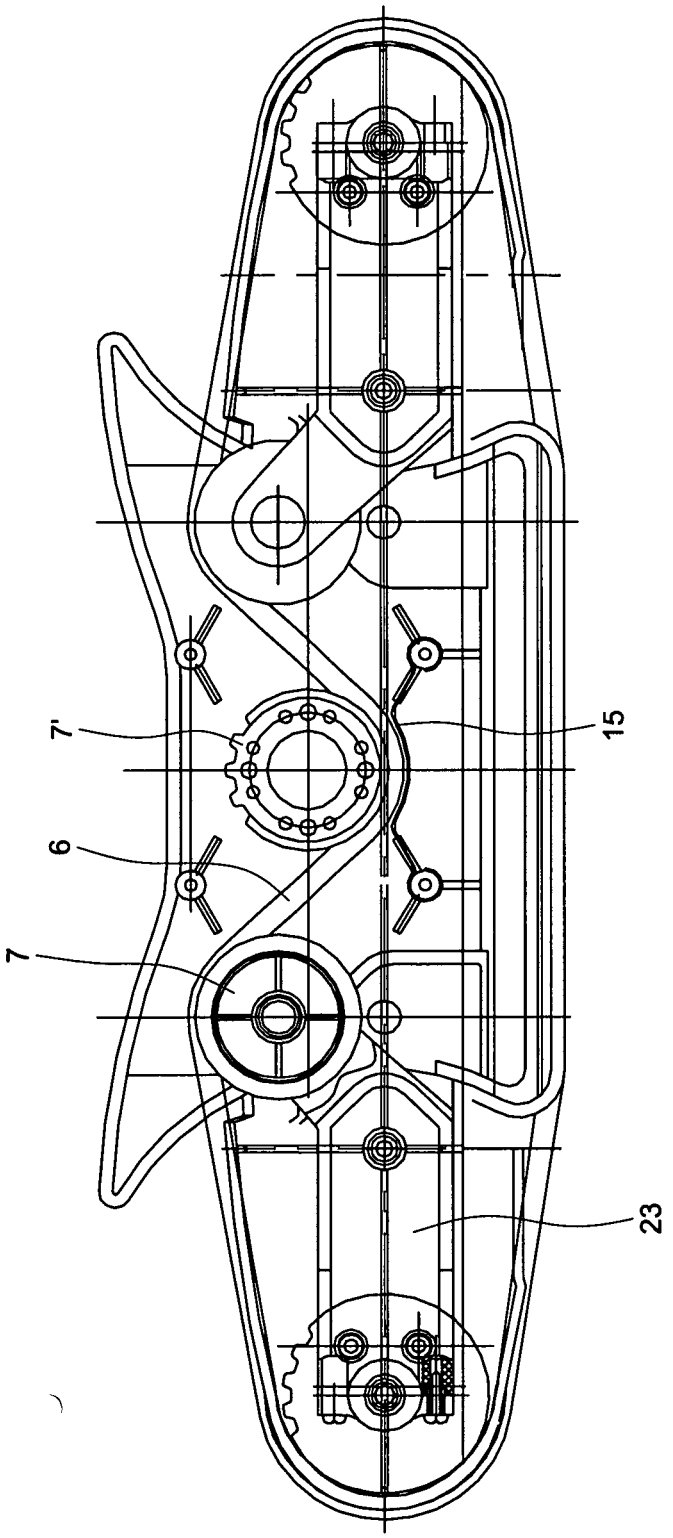


FIG.4

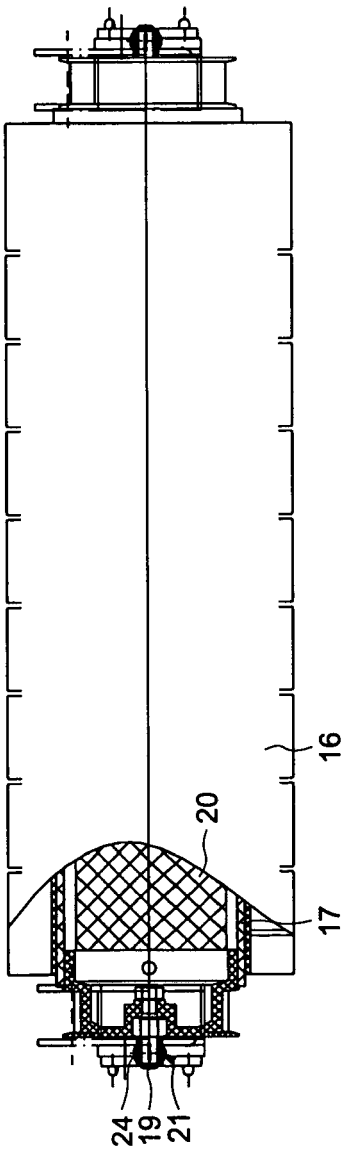


FIG.5

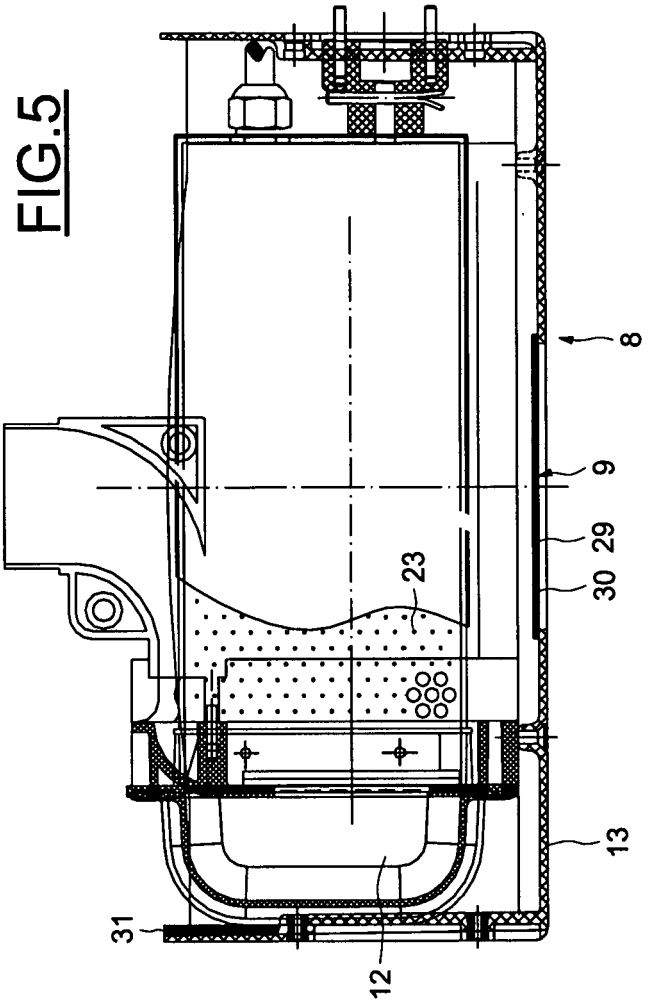


FIG.6

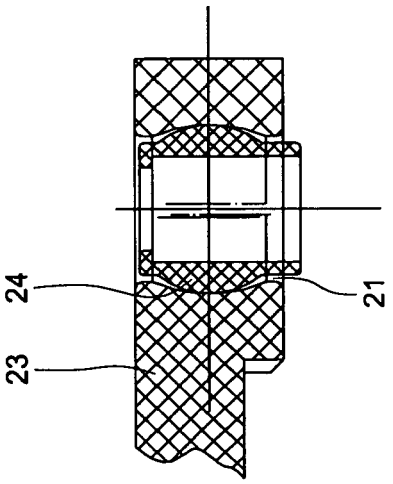
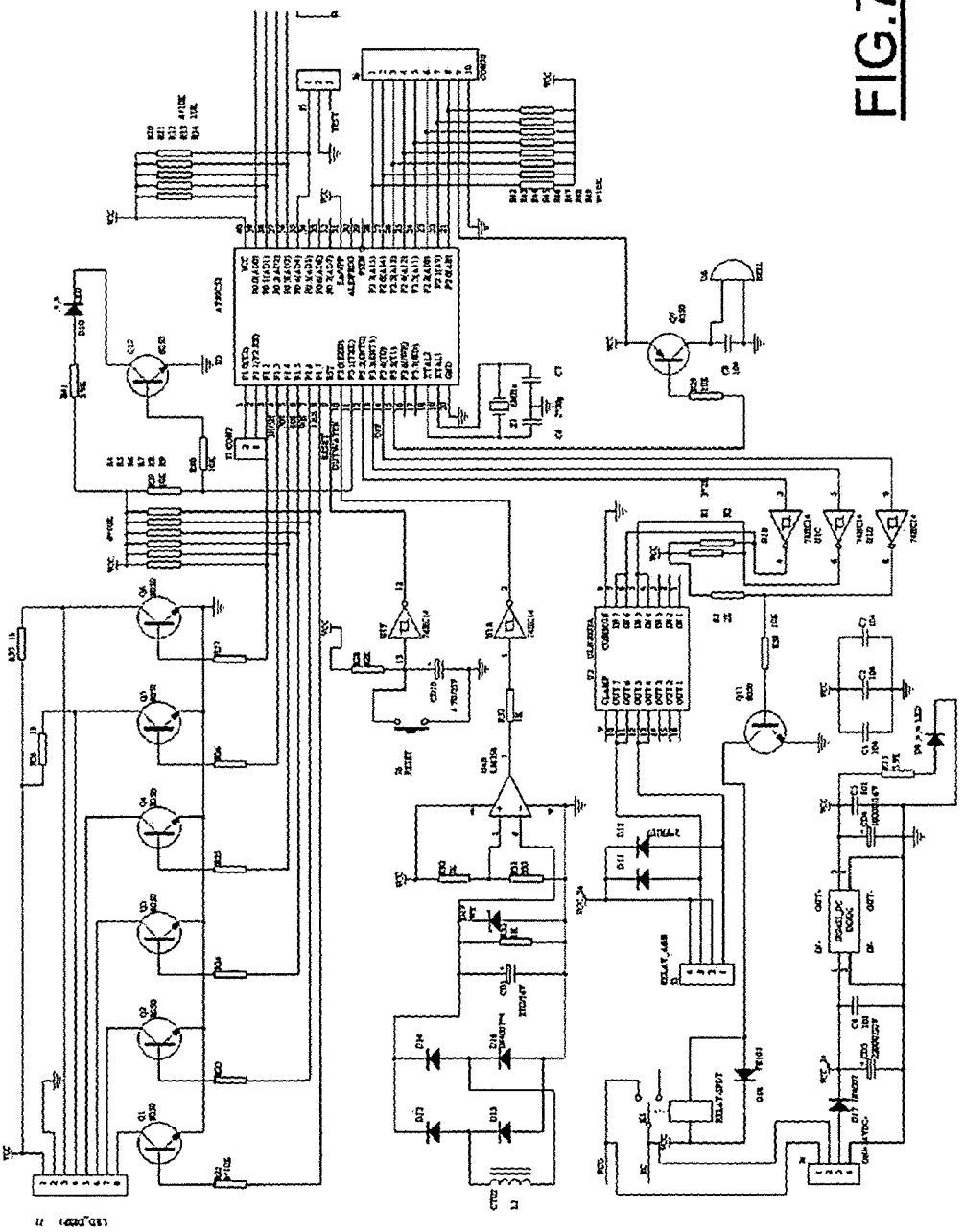


FIG.7



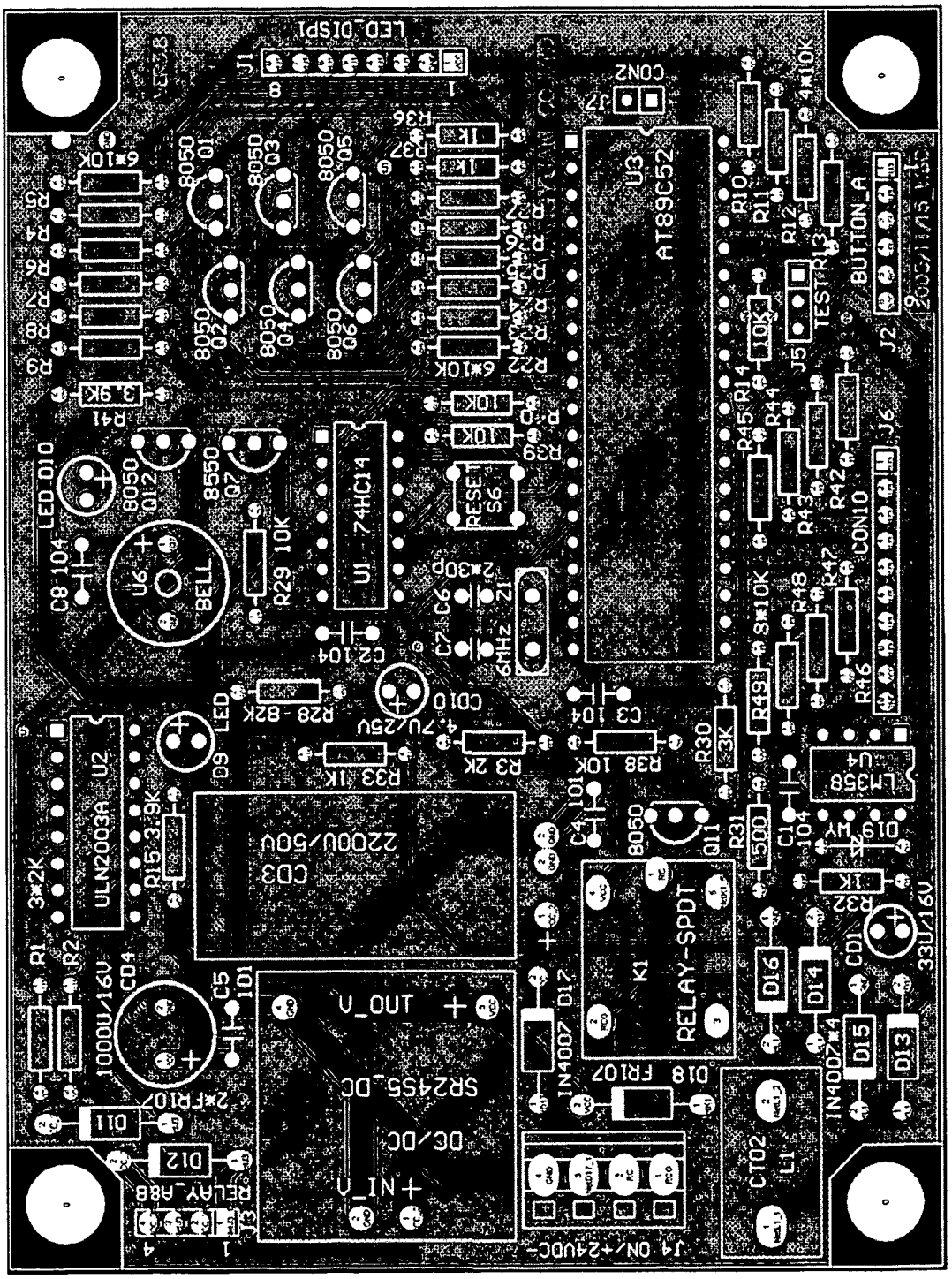

LED_DISPl
J1
CONN2
J7
AT89C52
U3
BUTTON_A
J2
TEST
J5
CON10
J6
LM358
U4
74HC14
U1
RESET
S6
BELL
U6
LED
D9
ULN2003A
U2
2200U/50U
CD3
V_OUT
SR2455_DC
DC/DC
+VIN
RELAY-SPDT
K1
RELAY_A88
J3
J4 ON/+24VDC-
1000U/16V
CD4
33U/16V
CD1
IN4007
FR107
2*FR107
IN4007*4
CT02
L1
LED_D10
8050
8550
R1
R2
R3
R4
R5
R6
R7
R8
R9
R10
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R22
R23
R24
R25
R26
R27
R28
R29
R30
R31
R32
R33
R34
R35
R36
R37
R38
R39
R40
R41
R42
R43
R44
R45
R46
R47
R48
R49
C1
C2
C3
C4
C5
C6
C7
C8
C10
D11
D12
D13
D14
D15
D16
D17
D18
D19
Z1
6MHz
2*30P
4.7U/25V
6*10K
4*10K
8*10K
3*2K
3.9K
82K
2K
1K
500
3K
10K
104
101

FIG.8

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 06 00 8847

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	FR 2 685 374 A (NICOLOFF PIERRE) 25 June 1993 (1993-06-25) * page 4, line 16 - line 24; figures 1,2 *	1-3	INV. E04H4/16
X	WO 90/09498 A (SUENNEN, JEAN, ALBERT, FRANCOIS) 23 August 1990 (1990-08-23) * page 3, line 24 - page 5, line 4; figures 2,3 *	1,3	
A,D	FR 2 729 995 A (SARL VBV) 2 August 1996 (1996-08-02) * page 6, line 20 - line 24; figures 1,2 *	4	

TECHNICAL FIELDS SEARCHED (IPC)

E04H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	6 September 2006	Zuurveld, Gerben

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

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 06 00 8847

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
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

06-09-2006

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
FR 2685374 A	25-06-1993	NONE	
WO 9009498 A	23-08-1990	BE 1002831 A6	25-06-1991
FR 2729995 A	02-08-1996	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- US 168557 A **[0005]**
- EP 1122382 A **[0005]**
- FR 2729995 **[0009]**