(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
17 August 2006 (17.08.2006)

PCT

(10) International Publication Number
WO 2006/085204 A1

(51) International Patent Classification:
A61M 5/24 (2006.01) *A61M 5/145* (2006.01)

(21) International Application Number:
PCT/IB2006/000262

(22) International Filing Date: 23 January 2006 (23.01.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
05003110.3 14 February 2005 (14.02.2005) EP

(71) Applicant *(for all designated States except US)*: **ARES TRADING S.A.** [CH/CH]; Zone Industrielle de l'Ouriettaz, CH-1170 Aubonne (CH).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **CHAVEZ, Enrico** [CH/CH]; 69, rue Louis de Savoie, CH-1110 Morges (CH). **PIOTELAT, Sandrine** [FR/FR]; Chez Favre, F-74130 Faucigny (FR). **PONGPAIROCHANA, Vincent** [CH/CH]; Route de Belmont 47, CH-1093 LA CONVERSION (CH).

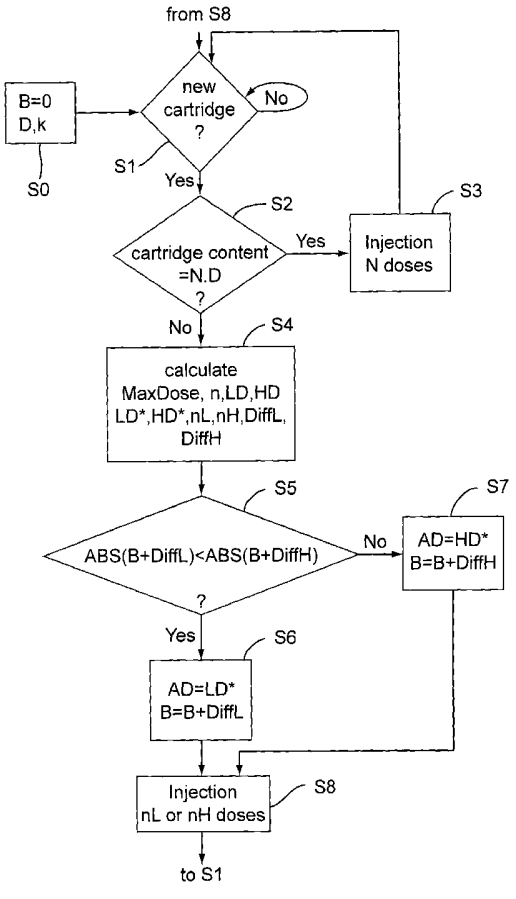
(74) Agent: **MICHELI, &, CIE, SA**; 122, rue de Genève, CP 61, CH-1226 Thônex (CH).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, LY, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: MEDICATION DELIVERY DEVICE



(57) Abstract: The medication delivery device is designed to receive a replaceable medication container (5) and to determine an adjusted medication dose AD for each medication container (5) received if the amount of medication contained in the medication container (5) is not a multiple of a prescribed dose D. The adjusted medication dose is the dose to be delivered instead of the prescribed dose at each use of the medication delivery device with the medication container (5) received. The adjusted dose is determined by selecting one of a first dose, that is higher than the prescribed dose, and of a second dose, that is lower than the prescribed dose, as a function of a variable B that cumulates the values nAD . (AD - D), where nAD is equal to INT (Cont / AD) and Cont is the amount of medication in the medication container received.

WO 2006/085204 A1

Published:
— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Medication delivery device

The present invention relates to a medication delivery device, in particular to an injection device for injecting medication through the skin of a patient.

More specifically, the present invention relates to a device comprising means for receiving a replaceable medication container, such as a cartridge, a control unit and means, controlled by the control unit, for delivering at least one dose of the medication contained in the medication container to a patient. Such a device is disclosed, for example, in US patent application No. 2002/0133113.

A problem with such a known device resides in that the content of the medication container is rarely a multiple of the dose prescribed to the patient, as the dose generally varies from one patient to another and medication containers are standard components. Thus, after all the full doses contained in the medication container have been delivered, there is generally some medication left in the said container. This medication remainder cannot be used and, therefore, is thrown away by the patient with the medication container. This implies that medication is wasted. Over a high number of medication containers used, such a waste may be considerable.

The present invention aims at reducing this medication waste and provides, to this end, a medication delivery device as defined in enclosed claim 1, a method for determining medication doses as defined in enclosed claim 8, and a computer program as defined in enclosed claim 15.

Other features and advantages of the present invention will be apparent from the reading of the following detailed description of preferred embodiments made with reference to the annexed drawings in which:

Figure 1 is a section view of an electronic medication injection device according to the present invention;

Figure 2 is a block-diagram showing operation of a control unit for controlling the device of Figure 1;

Figure 3 shows an algorithm performed by the control unit of Figure 2; and

Figures 4 and 5 respectively show exemplary curves of a balance B and of an average of adjusted doses AD calculated by the algorithm of Figure 3 versus a number of cartridges received in the device of Figure 1.

Referring to Figures 1 and 2, a hand-held electronic injection device according to the invention, for injecting liquid medication through the skin of a patient, comprises a hand-held housing 1 which accommodates a cartridge holder 2, an electromechanical actuating unit 3 and an electronic control unit 4. The cartridge holder 2 is designed to receive a replaceable cartridge 5 containing the liquid medication. The actuating unit 3 comprises an electric motor 6 and a piston rod 7 actuated by the motor 6. The piston rod 7 is in the form of an axially incompressible but laterally elastically deformable tube passing through a curved housing 8 and terminated by a pushing plate 9. After a cartridge 5 has been inserted into the cartridge holder 2 and a needle 10 has been attached to a lower end of the cartridge holder 2 so as to pierce the corresponding end of the cartridge 5, the piston rod 7 is axially displaced by the motor 6 so that the pushing plate 9 comes into contact with a piston 11 in the cartridge 5. Then, if predefined conditions are fulfilled, such as contact of the patient's skin with a bottom surface 12 of housing 1, the piston rod 7 will push the piston 11 to deliver one dose of medication through the needle 10 each time an injection start button 13 is pressed. Once the cartridge 5 is empty, or is considered to be empty, the piston rod 7 is retracted to allow replacement of the cartridge 5.

Referring to Figure 2, the control unit 4, typically a microprocessor having an internal memory, receives signals from various sensors and buttons on the injection device, and controls the actuating unit 3 according to a program stored in the control unit 4. The sensors may include, in particular, a sensor 14 for detecting the presence of a cartridge 5 in the device and for reading information, such as a bar code, provided on the external wall of cartridge 5, and a sensor 15 for detecting a proximity or a contact of the patient's skin with the bottom surface 12.

The buttons include the injection start button 13 and set-up buttons 16. The control unit 4 may also control the display of information for the patient or the physician on a display screen 17 provided on the injection device.

The construction of this medication injection device, in itself, is not part of the invention and, therefore, will not be described in further detail.

In accordance with the present invention, the program stored in the control unit 4 includes a subprogram for adjusting the medication dose to be delivered to the patient in order to reduce medication waste. The algorithm performed by this subprogram is shown in Figure 3.

This algorithm starts by a step S0 in which a variable B is reset (the function of this variable will be explained later on) and a prescribed dose D, expressed for example in mg, and a predefined constant k, comprised between 0 and 1 and representing a dose accuracy, are stored in the control unit 4. The prescribed dose D and the dose accuracy k are typically provided to the control unit 4 by a physician via the set-up buttons 16.

In a following step S1, it is checked whether a cartridge 5 is inserted in the injection device. If no cartridge is present in the device, the algorithm waits until a cartridge is inserted and then goes to a step S2.

In step S2, it is determined whether the content of the cartridge 5 received in the device, i.e. the initial amount of medication contained in the said cartridge, is a multiple of the prescribed dose, i.e. is equal to the prescribed dose multiplied by an integer number N. The cartridge content is, for example, pre-stored in the control unit 4, provided to the control unit 4 by the patient or the physician via the set-up buttons 16 or read by the sensor 14 on cartridge 5. Alternatively, the cartridge content may be determined by the injection device itself in the following manner: the piston rod 7 is brought into contact with the cartridge piston 11 from its known, retracted position; such a contact, which causes the amperage of motor 6 to increase, is detected by an amperage monitoring circuit 18; a counter circuit 19 counts the number of revolutions of the motor 6 to determine the distance

covered by the piston rod 7 from its retracted position up to its contact with the cartridge piston 11, and thus the initial position of the cartridge piston 11 in the cartridge 5; from this initial position and the known dimensions of the cartridge 5, the cartridge content is then determined.

If the answer is yes in step S2, the medication injection can be performed (step S3). The patient will make N injection(s) of the prescribed dose, according to an injection timing prescribed by the physician, and thereafter the control unit 4 will inform the patient, via the display screen 17, that the cartridge 5 is empty and must be replaced. The algorithm will then return to step S1. If the answer is no in step S2, the algorithm goes to a step S4.

In step S4, the following variables are calculated:

MaxDose = Conc . MaxInjVol

n = INT (Cont / D)

LD = Cont / (n+1)

HD = Cont / n

LD* = max (LD, (D - k.D))

HD* = min (HD, MaxDose, (D + k.D))

nL = INT (Cont / LD*)

nH = INT (Cont / HD*)

DiffL = nL . (LD* - D)

DiffH = nH . (HD* - D)

where Conc is the concentration, in mg/ml, of the medication in the cartridge, MaxInjVol is a predetermined constant, expressed in ml, corresponding to the maximum volume that the injection device can inject in one injection, Cont is the aforementioned content, in mg, of the cartridge, INT is the integer part, max is the maximum value and min is the minimum value. The value Conc is for example pre-stored in the control unit 4, provided to the control unit 4 by the patient or the physician via the set-up buttons 16, or read by the sensor 14 on the cartridge 5.

The variables LD and HD represent, respectively, a lower dose and a higher dose than the prescribed dose. Unlike the prescribed dose, these lower and higher doses are dividers of the cartridge content Cont. LD* is a lower dose that is equal to LD if LD is greater than a bottom value (D - k.D) and that is equal to (D - k.D) otherwise. HD* is a higher dose that is equal to HD if HD is smaller than two ceiling values, (D + k.D) and MaxDose, and that is equal to (D + k.D) or MaxDose otherwise. The dose accuracy k is selected by the physician as a function of the disease from which the patient suffers and of the patient himself. The ceiling value MaxDose is a technical restriction of the device.

In a following step S5, it is determined whether the absolute value of (B + DiffL) is smaller than the absolute value of (B + DiffH). If the answer is yes, an adjusted dose AD corresponding to the cartridge 5 inserted in the injection device is equal to the lower dose LD*, and the variable B is given the new value (B + DiffL) (step S6). If the answer is no, the adjusted dose AD is equal to the higher dose HD*, and the variable B is given the new value (B + DiffH) (step S7). This adjusted dose AD will be the dose to be injected into the patient instead of the prescribed dose D at each injection with the cartridge 5 inserted in the device.

The medication injection can then be performed (step S8). The patient will make nL (if LD* is selected as the adjusted dose) or nH (if HD* is selected as the adjusted dose) injections of the adjusted dose according to the injection timing prescribed by the physician. After these nL or nH injections, the patient will be informed by the display screen 17 that the cartridge must be replaced and the algorithm will return to step S1.

Steps S1 to S8 are carried out for each cartridge inserted in the injection device. So long as the prescribed dose remains unchanged, the variable B is not reset, even if the injection device is switched off between two injections. If, at any moment, the prescribed dose stored in the device is changed, the algorithm goes to step S0 where the variable B is reset.

The variable B represents a balance that cumulates the values nAD . (AD - D), where nAD is equal to INT (Cont / AD), as different cartridges are successively used in the device. In other words, the variable B represents the difference, at a given instant, between the amount of medication administered to the patient and the amount of medication that would have been administered if the dose had not been changed with respect to that prescribed. Such a difference may be positive or negative.

It can be readily derived from the above that if, for each cartridge used, the adjusted dose is equal to LD or HD, medication waste is eliminated. If, on the other hand, the adjusted dose is equal to a ceiling value, (D + k.D) or MaxDose, or to the bottom value (D - k.D) for at least one of the cartridges used, with k being different from zero and MaxDose being different from HD, then medication waste is not eliminated but is at least statistically reduced, i.e. reduced over a large number of cartridges used, as will be explained later on.

One will further note that the decision rule used in step S5, involving the variable B, guarantees that the average of the adjusted doses as a function of the number of cartridges used converges to the prescribed dose, i.e. that after a certain number of cartridges have been used, the average of the adjusted doses delivered to the patient is substantially equal to the prescribed dose. In many medical treatments indeed, such as the treatment of growth deficiency, the dose administered at each injection need not accurately correspond to that prescribed by the physician, provided that the average of the administered doses over a certain period, typically one or several weeks, is substantially equal to the prescribed dose. The present invention uses this medical tolerance to reduce medication waste.

Although the decision rule used in step S5 is considered by the present inventors as being optimal for the rate of convergence of the average adjusted dose to the prescribed dose, it must be noted that other decision rules involving the variable B could be chosen. In a variant of the present invention, the lower

dose LD* is selected as the adjusted dose if the value of variable B is positive and the higher dose HD* is selected as the adjusted dose if the value of variable B is negative or zero.

Another property of the above algorithm is that the absolute value of the variable B is never greater than 50% of the prescribed dose. Thus, the variation between the amount of medication received by the patient and the amount of medication that he/she should have received according to his/her medical prescription remains at any time limited.

As already mentioned, with the algorithm according to the present invention, medication waste is at least statistically reduced. Simulations carried out by the present inventors, by varying the prescribed dose from 0.01 to MaxDose and the dose accuracy from 0 to 0.5, have revealed, in particular, that as of 24 cartridges used:

- the medication waste W(AD) obtained when the doses administered are adjusted doses each equal to one of the aforementioned ceiling and bottom values, is, in more than 90% of the cases, lower than the medication waste W(D) obtained when the dose administered is constantly equal to the prescribed dose,
- the medication waste W(AD) is always lower than W(D) + 1%, and
- the absolute value of the difference between the average adjusted dose and the prescribed dose is not greater than 2% of the prescribed dose,

it being specified that the medication waste is defined as follows:

$$W = \frac{\sum_i r_i}{\sum_i Cont_i}$$

where r_i is the medication remainder in a given cartridge i after all full doses contained in this cartridge have been injected, and $Cont_i$ is the content of cartridge i. Other results of the above-mentioned simulations are that, as of 100 cartridges used, the medication waste W(AD) is always lower than W(D) + 0.2%,

and that, as of 200 cartridges used, the medication waste W(AD) is always lower than W(D) + 0.1%.

In a variant of the present invention, which may be applied to cases where the physician allows a larger variation between the injected doses and the prescribed dose, and where no technical restriction exists as to the volume of medication that can be injected by the device in one injection, the ceiling variable MaxDose and the dose accuracy k are suppressed from the algorithm. Medication waste is, in this variant, always zero.

By way of illustration of the present invention, a numerical example of performing the algorithm shown in Figure 3 is given herebelow:

Content of each cartridge (Cont) = 7.9 mg

Prescribed dose (D) = 4 mg

Dose accuracy (k) = 0.1 (10%)

Number (n) of full doses (D) in each cartridge = INT (Cont / D) = 1

MaxDose = 5.8 mg/ml x 0.8 ml = 4.6 mg

LD = Cont / (n+1) = 3.95 mg

D - k.D = 4 - 0.4 = 3.6 mg

LD* = LD = 3.95 mg

HD = Cont / n = 7.9 mg

HD* = D + k.D = 4.4 mg

Figures 4 and 5 respectively show the curves of the balance B and the average of the adjusted doses as a function of the number of cartridges used.

The present invention has been described above in the context of an injection device for injecting medication through the skin of a patient. However, it is clearly apparent that the invention may apply to other medication delivery devices, for example to devices which provide the patient with appropriate doses of medication to be administered orally.

CLAIMS

1. A medication delivery device comprising means (2) for receiving a replaceable medication container (5), a control unit (4) and means (3; 6, 7), controlled by said control unit (4), for delivering at least one dose of the medication contained in said medication container (5) to a patient, characterised in that said control unit (4) comprises means for determining an adjusted medication dose AD for each medication container (5) received in the medication delivery device if the amount of medication contained in said medication container (5) received is not a multiple of a prescribed dose D, said adjusted medication dose being the dose to be delivered by said delivering means (3; 6, 7) instead of the prescribed dose at each use of the medication delivery device with said medication container (5) received, said adjusted dose being determined by selecting one of a first dose, that is higher than the prescribed dose, and of a second dose, that is lower than the prescribed dose, as a function of a variable B that cumulates the values nAD . (AD - D), where nAD is equal to INT (Cont / AD) and Cont is the amount of medication in said medication container received.

2. A medication delivery device according to claim 1, characterised in that the adjusted dose is the one, among the first and second doses, for which the absolute value of the variable B is lower.

3. A medication delivery device according to claim 1, characterised in that the adjusted dose is equal to the first dose if the variable B is negative and is equal to the second dose if the variable B is positive.

4. A medication delivery device according to any one of claims 1 to 3, characterised in that the first dose is equal to (Cont / n) and the second dose is equal to (Cont / (n+1)), where n is equal to INT (Cont / D).

5. A medication delivery device according to any one of claims 1 to 3, characterised in that the first dose is equal to the minimum of (Cont / n) and at least one ceiling value and the second dose is equal to the maximum of (Cont / (n+1)) and at least one bottom value.

6. A medication delivery device according to claim 5, characterised in that said at least one ceiling value includes the value (D + k.D) and said at least one bottom value includes the value (D - k.D), where k is a predefined constant between 0 and 1.

7. A medication delivery device according to any one of claims 1 to 6, characterised in that it consists of an electronic injection device designed to inject medication through the skin of a patient.

8. A method for determining medication doses, said method being performed by a control unit (4) in a medication delivery device also comprising means (2) for receiving a replaceable medication container (5) and means (3; 6, 7), controlled by said control unit (4), for delivering at least one dose of medication contained in said medication container (5) to a patient, characterised by determining an adjusted medication dose AD for each medication container (5) received in the medication delivery device if the amount of medication contained in said medication container (5) received is not a multiple of a prescribed dose D, said adjusted medication dose being the dose to be delivered by said delivering means instead of the prescribed dose at each use of the

medication delivery device with said medication container (5) received, said adjusted dose being determined by selecting one of a first dose, that is higher than the prescribed dose, and of a second dose, that is lower than the prescribed dose, as a function of a variable B that cumulates the values nAD . (AD - D), where nAD is equal to INT (Cont / AD) and Cont is the amount of medication in said medication container received.

9. A method according to claim 8, characterised in that the adjusted dose is the one, among the first and second doses, for which the absolute value of the variable B is lower.

10. A method according to claim 8, characterised in that the adjusted dose is equal to the first dose if the variable B is negative and is equal to the second dose if the variable B is positive.

11. A method according to any one of claims 8 to 10, characterised in that the first dose is equal to (Cont / n) and the second dose is equal to (Cont / (n+1)), where n is equal to INT (Cont / D).

12. A method according to any one of claims 8 to 10, characterised in that the first dose is equal to the minimum of (Cont / n) and at least one ceiling value and the second dose is equal to the maximum of (Cont / (n+1)) and at least one bottom value.

13. A method according to claim 12, characterised in that said at least one ceiling value includes the value (D + k.D) and said at least one bottom value includes the value (D - k.D), where k is a predefined constant between 0 and 1.

14. A method according to any one of claims 8 to 13, characterised in that the amount of medication contained in said medication container (5) is determined by bringing a piston rod (7) of said delivering means (3, 6, 7) into contact with a piston (11) of said medication container (5) from a known, retracted position; detecting said contact by monitoring the amperage of an electric motor (6) of said delivering means (3, 6, 7) which drives said piston rod (7); counting the number of revolutions of said electric motor (6) to determine the distance covered by said piston rod (7) from its retracted position up to its contact with said piston (11), and thus the position of said piston (11) in said medication container (5); and determining the amount of medication contained in said medication container (5) from said position of said piston (11).

15. A computer program executable by a control unit (4) in a medication delivery device also comprising means (2) for receiving a replaceable medication container (5) and means (3; 6, 7), controlled by said control unit (4), for delivering at least one dose of medication contained in said medication container (5) to a patient, characterised by comprising an instructions code for performing the method defined in any one of claims 8 to 14.

16. A method for determining the amount of medication contained in a medication container (5) inserted in a medication delivery device, said medication delivery device comprising a piston rod (7) and an electric motor (6) for driving said piston rod (7), the method comprising bringing said piston rod (7) into contact with a piston (11) of said medication container (5) from a known, retracted position; detecting said contact by monitoring the amperage of said electric motor (6); counting the number of revolutions of said electric motor (6) to determine the distance covered

by said piston rod (7) from its retracted position up to its contact with said piston (11), and thus the position of said piston (11) in said medication container (5); and determining the amount of medication contained in said medication container (5) from said position of said piston (11).

Fig.1

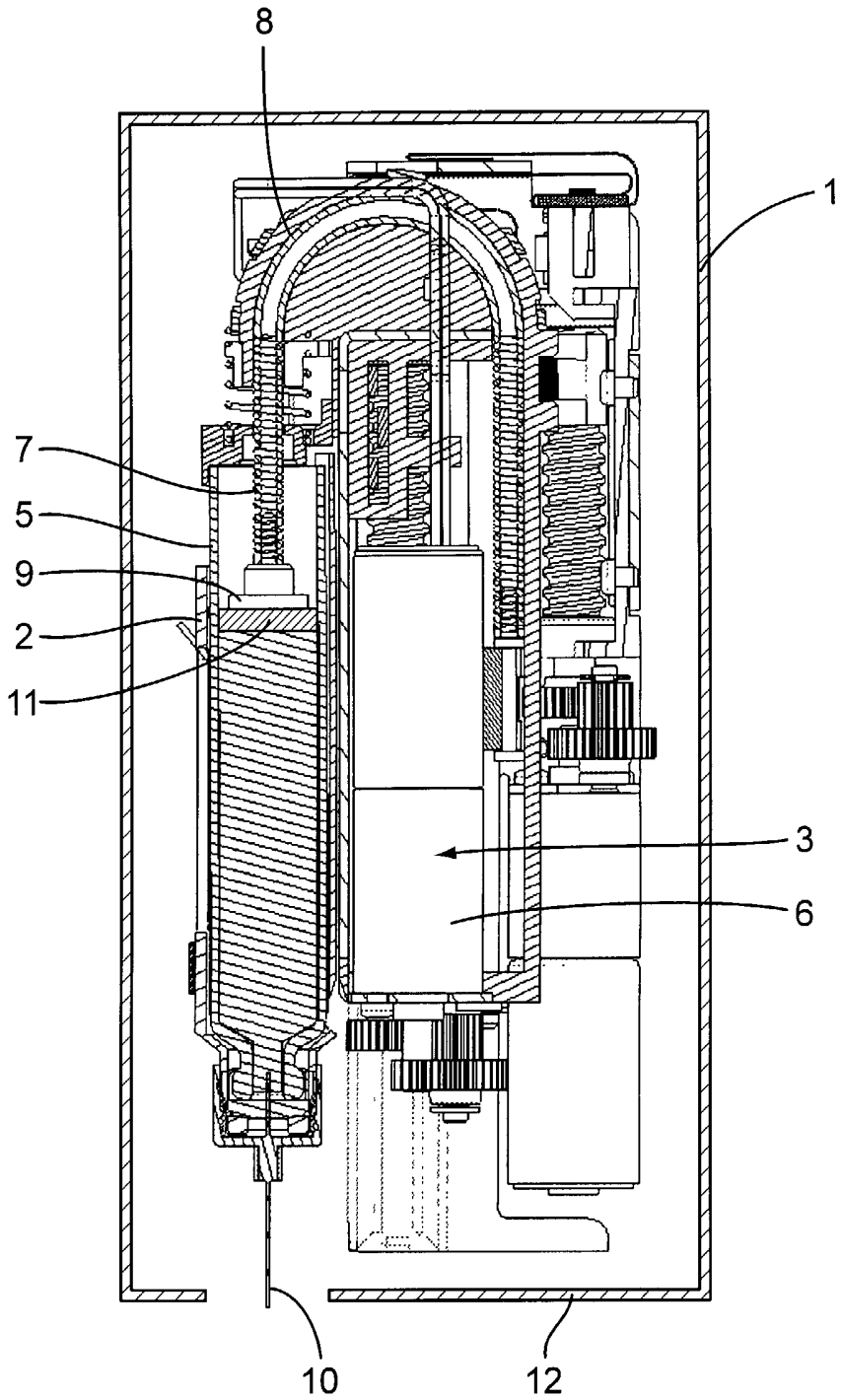


Fig.2

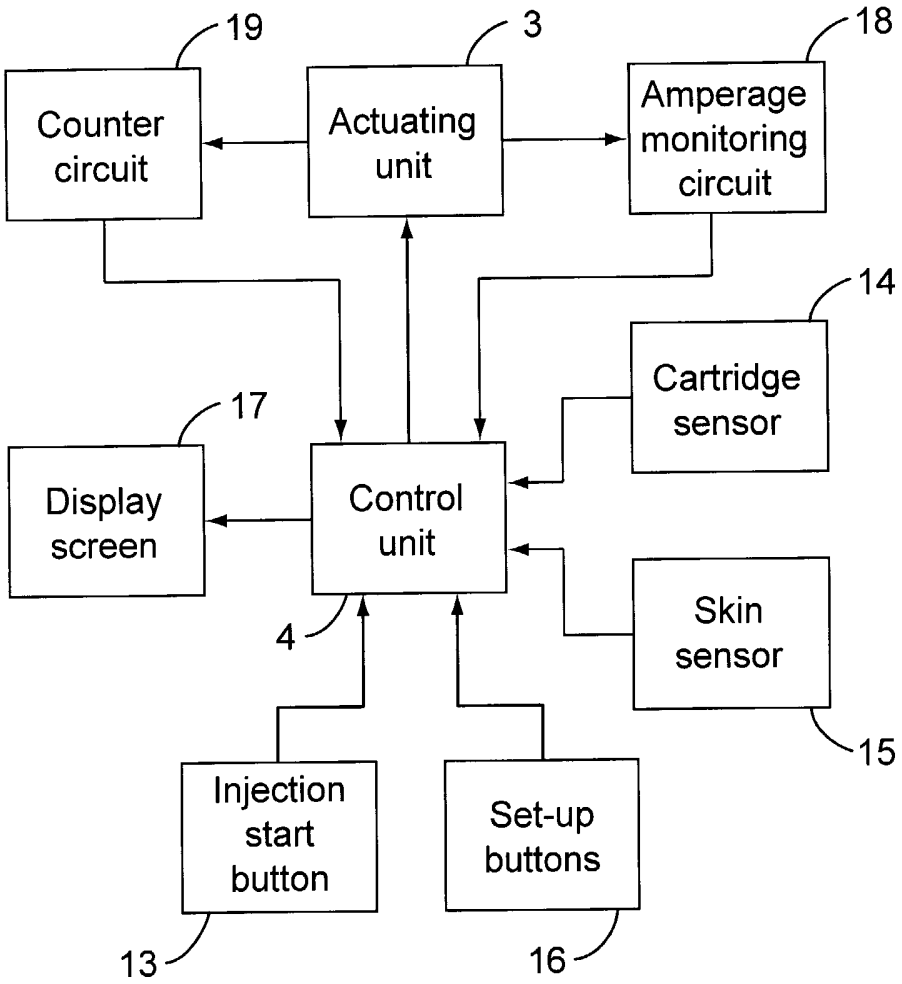
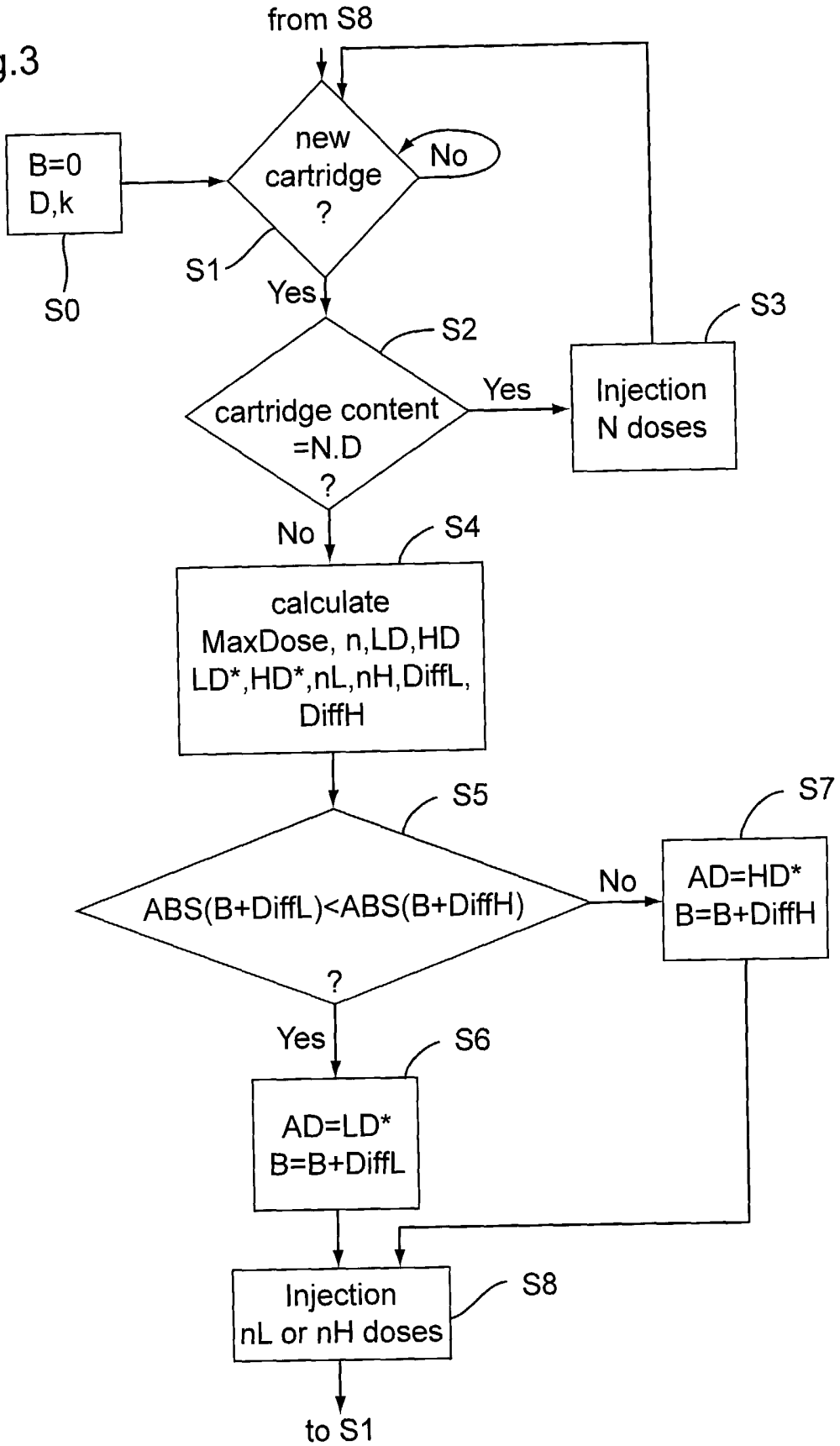

19
3
18
Counter circuit
Actuating unit
Amperage monitoring circuit
14
Cartridge sensor
17
Display screen
Control unit
4
Skin sensor
15
Injection start button
Set-up buttons
13
16

Fig.3


from S8
B=0
D,k
S0
new
cartridge
?
No
S1
Yes
S2
cartridge content
=N.D
?
Yes
S3
Injection
N doses
No
S4
calculate
MaxDose, n,LD,HD
LD*,HD*,nL,nH,DiffL,
DiffH
S5
ABS(B+DiffL)<ABS(B+DiffH)
?
No
S7
AD=HD*
B=B+DiffH
Yes
S6
AD=LD*
B=B+DiffL
Injection
nL or nH doses
S8
to S1

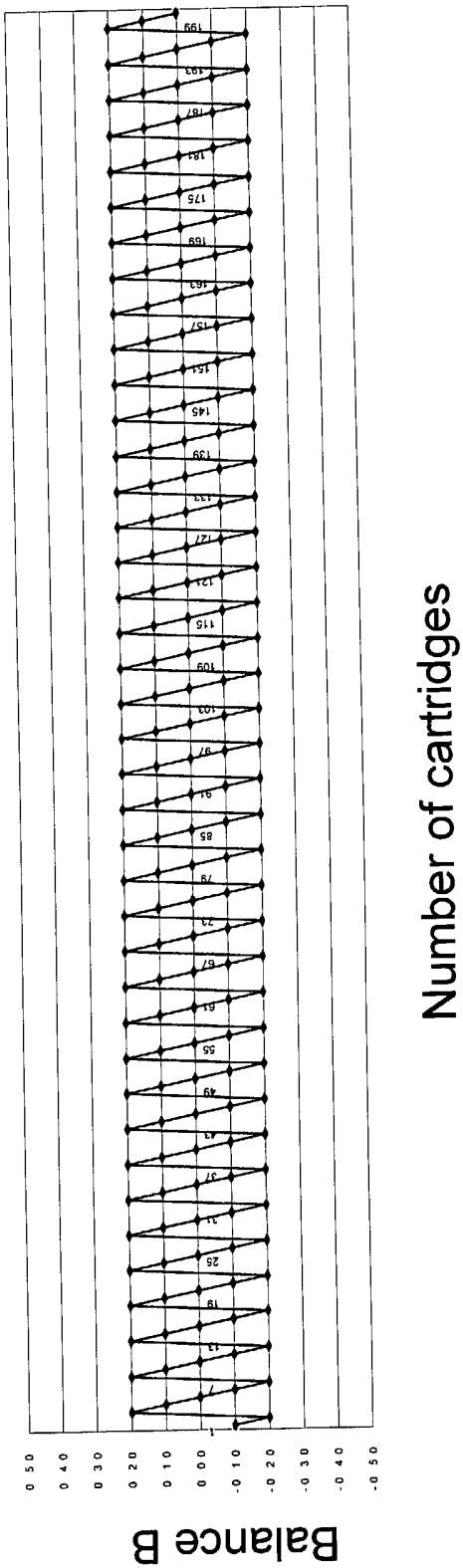

Balance B
0.50
0.40
0.30
0.20
0.10
0.00
-0.10
-0.20
-0.30
-0.40
-0.50
Number of cartridges

Fig.4

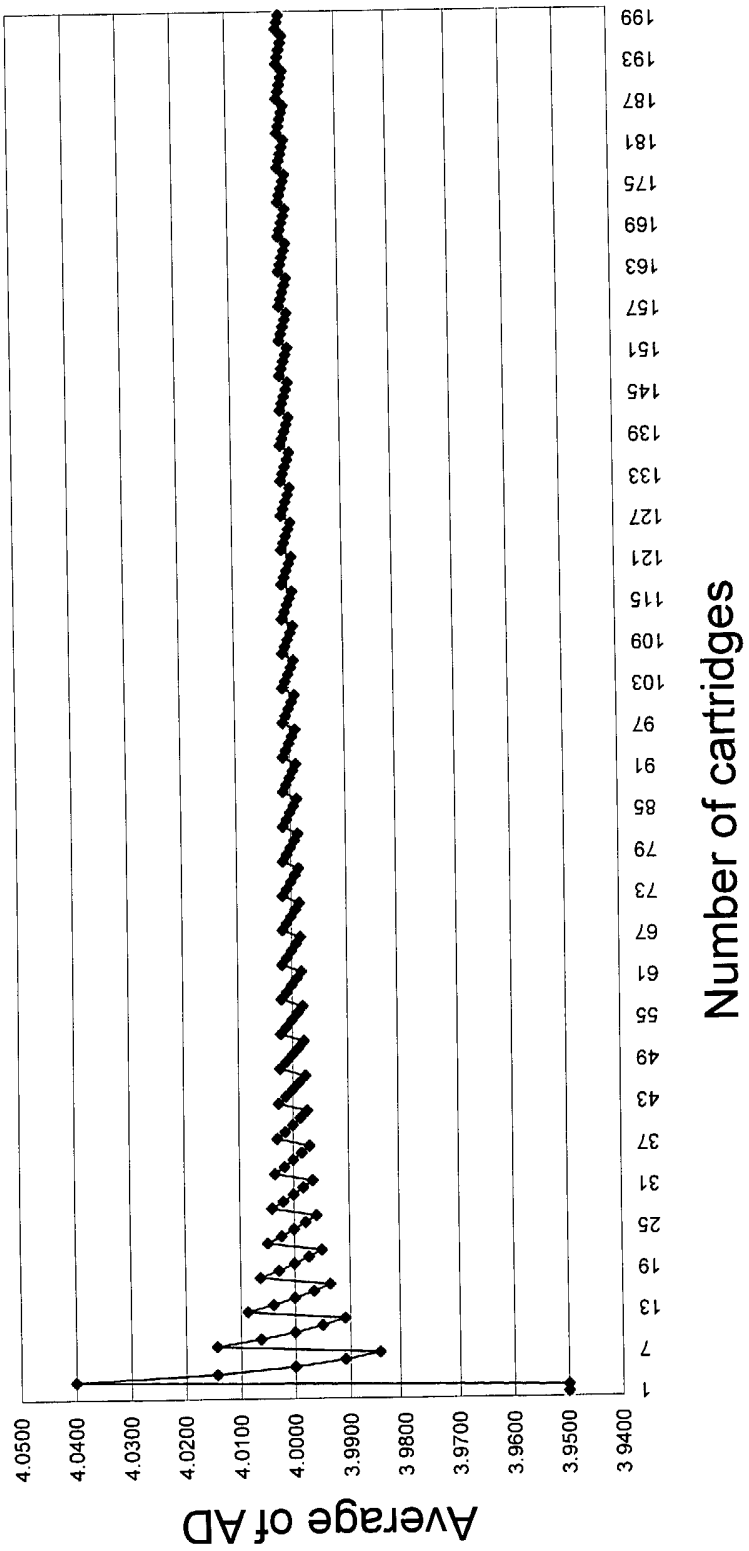

Average of AD
4.0500
4.0400
4.0300
4.0200
4.0100
4.0000
3.9900
3.9800
3.9700
3.9600
3.9500
3.9400
Number of cartridges
1
7
13
19
25
31
37
43
49
55
61
67
73
79
85
91
97
103
109
115
121
127
133
139
145
151
157
163
169
175
181
187
193
199

Fig. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2006/000262

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M5/24 A61M5/145

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)
A61M

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2002/151855 A1 (DOUGLAS JOEL ET AL) 17 October 2002 (2002-10-17) abstract; figure 3	1,8,15, 16
A	US 2004/092877 A1 (LANGLEY CHRISTOPHER NIGEL ET AL) 13 May 2004 (2004-05-13) abstract	1,8,15, 16
A	US 5 928 197 A (NIEHOFF ET AL) 27 July 1999 (1999-07-27) abstract	1,8,15, 16
X	US 6 423 035 B1 (DAS KUSAL K ET AL) 23 July 2002 (2002-07-23) abstract	16
A	column 8, lines 30-48	1,8,15
	-/--	

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

[X] See patent family annex.

* Special categories of cited documents :

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

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

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

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
13 April 2006	25/04/2006

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	Nielsen, M

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2006/000262

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 433 456 A (TERUMO KABUSHIKI KAISHA) 30 June 2004 (2004-06-30) abstract	16
A	paragraph [0062]	1,8,15

Form PCT/ISA/210 (continuation of second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2006/000262

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☒ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-15

Adjusting a dose as a function of a specific algorithm (see claims 1 and 8, last portion).

---

2. claim: 16

Method of determining the amount of medication contained in a medication container.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2006/000262

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002151855 A1	17-10-2002	US 6482186 B1	19-11-2002
US 2004092877 A1	13-05-2004	CA 2439910 A1	03-10-2002
		EP 1372769 A1	02-01-2004
		WO 02076538 A1	03-10-2002
		JP 2004524116 T	12-08-2004
		MX PA03008683 A	20-04-2004
US 5928197 A	27-07-1999	NONE	
US 6423035 B1	23-07-2002	US 2002128594 A1	12-09-2002
EP 1433456 A	30-06-2004	WO 03024385 A1	27-03-2003
		US 2005029277 A1	10-02-2005