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NOTICE OF ENTITLEMENT

I, **MAX REINHARD** of Kirschblutenweg 7, D-6380 Bad Homburg, Germany state the following in connection with Australian Application No. 26981/92:

1. I am the nominated person.

2. The nominated person is the assigee of the actual inventor.

3. The actual inventor is the applicant of the basic application listed in the declaration under Article 8 of the PCT.

4. The basic application is the application first made in a convention country in respect of the invention.

DATED: 10 June 1993

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.....

To: The Commissioner of Patents

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Our Reference: IRN 327485

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PROCESS AND DEVICE FOR DETERMINING THE HEALTH CONDITION OF A LIVING BEING

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(57) Claim

1. A method of permitting an indication as to the health condition of a living creature on the basis of a comparison of a selected physiological characteristic of the living creature to a corresponding reference characteristic of the healthy condition characterized by said selected physiological characteristic being detected by means of a multi-channel sensor unit having a plurality of sensor elements distributed over a predetermined surface area, at a plurality of measurement points corresponding to said plurality of sensor elements, determining by means of statistical methods the statistical distribution and the logarithmic normal distribution of the signal levels of the signals output by said sensor unit and corresponding to the measurement values of said selected physiological characteristic, performing an establishing of the departures of the statistical distribution from the logarithmic normal distribution of said signal levels, whereby said logarithmic normal distribution being taken as a reference characteristic.

.../2

8. A device for permitting an indication as to the health condition of a living creature according to claim 1 characterized by a multi-channel sensor unit for detecting a selected physiological characteristic of the living creature at a plurality of measurement points distributed over a defined body region and for outputting corresponding signals, a means for processing the signals output by said multi-channel sensor unit, and a means for calculating from the signals output by said signal processing means the actual statistical distribution and the logarithmic normal distribution of the signal-related measured values of the physiological characteristic obtained.

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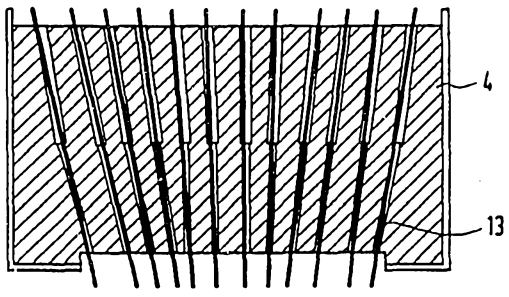
(54) Title: PROCESS AND DEVICE FOR DETERMINING THE HEALTH CONDITION OF A LIVING BEING

(54) Bezeichnung: VERFAHREN UND VORRICHTUNG ZUR BESTIMMUNG DES GESUNDHEITSZUSTANDES EINES LEBEWESENS

(57) Abstract

A process and device are disclosed for determining the health condition of a living being. A selected physiological parameter of the living being, for example the conductivity of the skin, is detected at a statistically significant number of measurement spots distributed over a defined area of the body of the living being, and the frequency distribution of the detected measurement values is determined and compared with a reference frequency distribution of the selected physiological parameters. The reference frequency distribution is a logarithmic distribution that may be derived by statistical methods directly from the measurement values resulting from the examination of each subject. The whole health condition of the subject can thus be reliably ascertained.



(57) Zusammenfassung

Die Erfindung betrifft ein Verfahren und eine Vorrichtung zur Bestimmung des Gesundheitszustandes eines Lebewesens. Die Erfindung sieht vor, dass man eine ausgewählte physiologische Kenngrösse des Lebewesens, z.B. die Leitfähigkeit der Haut, an einer statistisch signifikanten Vielzahl von Messstellen erfasst, die über einen definierten Körperbereich des Lebewesens verteilt sind, die Häufigkeitsverteilung der erfassten Messwerte bestimmt und diese mit einer Referenz-Häufigkeitsverteilung der ausgewählten physiologischen Kenngrösse vergleicht. Die Referenz-Häufigkeitsverteilung ist eine logarithmische Verteilung, die nach Methoden der Statistik unmittelbar aus den Messwerten ermittelt werden kann, die sich beim jeweiligen untersuchten Probanden ergeben. Die Erfindung erlaubt eine zuverlässsige Aussage über den ganzheitlichen Gesundheitszustand des Probanden.

A Method and Means of Determining the Health Condition of a Living Creature

The invention relates to a method and a means of determining the health condition of a living creature on the basis of a comparison of a selected measured physiological characteristic of the living creature to a corresponding reference characteristic of the healthy condition.

The invention relates in particular to a method and a means of making possible an indication as to the overall health condition of a human or animal.

All instruments employed in medical diagnosis acquire a specific characteristic or specific parameter of a patient, e.g. pulse frequency, blood pressure, chemical composition of the blood etc. Since the normal ranges are known from the corresponding measured values of a healthy population, a criterion for the nature and severity of an illness can be established from the deviation of the actual values from the standard. The diagnosis is made from a plurality of different characteristics, medical experience being the determining factor in selecting the characteristics in each case. However, until now it has not been achieved to establish explicit and objective criteria for the "overall health" condition of a patient even by means of "alternative" methods.

Accordingly it is an object of th present invention to provide a method and means of the aforementioned kind which permit a reliable indication as to the overall health condition of a test person. In addition, the invention is intended to permit establishing to what degree the condition of the test person deviates overall from an ideal condition. The means are also intended to permit economic examination of a large number of test persons by enabling the examination to be made quickly and cost effectively.

According to one aspect of the invention, there is provided a method of permitting an indication as to the health condition of a living creature on the basis of a comparison of a selected physiological characteristic of the living creature to a corresponding reference characteristic of the healthy condition characterized by said selected physiological characteristic being detected by means of a multi-channel sensor unit having a plurality of sensor elements distributed over a predetermined surface area, at a plurality of measurement points corresponding to said plurality of sensor elements, determining by means of statistical methods the statistical distribution and the logarithmic normal distribution of the signal levels of the signals output by said sensor unit and corresponding to the measurement values of said selected physiological characteristic, performing an establishing of the departures of the statistical distribution from the logarithmic normal distribution of said signal levels, whereby said logarithmic normal distribution being taken as a reference characteristic. It is particularly advantageous and thus preferred to determine the said logarithmic distribution from the measured values obtained for the tested person. Due to it being easily available the skin of the test person is preferably used as the body region in question, the electrical conductivity of the skin or its radiation intensity being taken as the physiological characteristic. However, the invention is restricted neither to such special physiological characteristics nor to the body region "skin". Instead, the method according to the invention is generally applicable also to other characteristics and other suitable internal or external body regions.

The invention makes use of the fact that according to the rules of statistics, parameters irrespective of which kind always

follow a specific statistical distribution (viz. L. Sachs: Statische Auswertungsmethoden, 2nd Edition, Springer Verlag Berlin 1969, pages 105-106), "statistical distribution" being understood to mean the probability function p(x) indicating the probability or frequency of encountering a specific measured value x in an arbitrary test object, whereby x can encompass the total scale of values available.

The physiological characteristics of living creatures such as, for instance, body height, blood pressure, drug tolerance etc. are also always distributed according to a logarithmic normal distribution, the reason for this being assumed a multiplicative configurational principle (viz. e,g, also: H. Gebelein and H.J. Heite, Klin. Wschr. 28 (1959), page 41). Within the framework of tests according to the invention it was further established that the logarithmic normal distribution exists not only for a specific characteristic in measurements made on a plurality of individuals, but also for a single healthy individual when the characteristic concerned is measured on a sufficiently large number of measured values of the individual. "Sufficiently" in this context means no further significant change occuring in the resulting statistical distribution when the number of measured values is further increased.

The ideal log-normal distribution of such measured values obtainable from a single test person exists only when the ideal "multiplicat[illegible] configuration principle" - i.e. the combined effect of all sub-units in space and time in the sense of an ideal organization - is satisfied. Therefore, by comparing the statistical distribution, as measured or as determined by

suitably transforming the measured values, to the logarithmic normal distribution an explicit classification of the "overall" condition with reference to the condition of an ideal biological organisation can be obtained. Further indications in this respect can be obtained in addition to the comparison when according to further embodiments of the invention the deviations of the same order, e.g. the relative differences of the moments of the first to nth order are determined and/or the change in the statistical distribution with time is established and subjected to a correlation analysis. The temporal development of the statistical distribution describes the dynamic behaviour of the network of internal dependencies forming the basis of the measurement. The correlation analysis (e.g. factor analysis) enables the internal relationships between the skin areas to be described dynamically for a known assignment of the measured values, these relationships including all interrelationships with the organs.

From this it follows that in the sense of the invention a test person is able to be classified "overall" as being "healthy" when his distribution function $p(x)$ does not significantly deviate from $p_n(x)$, where $p(x)$ represents the measured distribution function and $p_n(x)$ the ideal distribution function for a healthy individual. This distribution function $p_n(x)$ is a logarithmic normal distribution and can be established according to the invention from the measured values of the test person, i.e. it not being necessary to obtain the normal distribution as an empirical function of the measured values of a plurality of healthy test persons.

Inversely the "illness condition" in this "overall" sense can be defined by the systematic (and fully) listed deviations between the functions $p(x)$ and $p_n(x)$. One salient advantage of the

method according to the invention is, among other things, that there is no need to recourse to establishing the measured values of a plurality of test persons, but to calculate the ideal distribution function applicable to the individual test person directly from the measured values and to compare it to the actual statistical distribution.

In accordance with a further aspect of the invention a device for implementing the method according to the invention is provided which includes a multi-channel sensor unit for detecting a selected physiological characteristic of the living creature at a plurality of measurement points distributed over a defined body region and outputting corresponding signals, means for processing the signals output by the multi-channel sensor unit and means for calculating from the signals output by said signal processing means the actual statistical distribution and the logarithmic normal distribution of the signal-related measured values of the physiological characteristic obtained. Obtaining the measured values is particularly uncomplicated and speedy when according to a further embodiment of the invention the sensor arrangement includes a plurality of contact or proximity sensor elements distributed over a defined surface area as well as a means of successively scanning them. As regards further embodiments of the invention reference is made to the claims.

The invention will now be explained in more detail with reference to an example and the drawing in which:

Fig. 1a, 1b shows the statistical distribution of the conductivity values of the skin of a patient before treatment (Fig. 1a) and after treatment (Fig. 1b) as compared to the logarithmic normal distribution employing the same mean values and variances in each case.

Fig. 2a, 2b shows the ratio of the moments of the rth order (r = 1...6) for a logarithmic normal distribution and a measured distribution before treatment (Fig. 2a) and after treatment (Fig. 2b).

Fig. 3 is a block diagram of a means of obtaining the conductivity of the skin and for processing the obtained measured values according to one embodiment of the invention

Fig. 4 is a section view showing the sensor member of a sensor arrangement of the means according to Fig. 3 and

Fig. 5 is a view of the sensor arrangement according to Fig. 3 as seen from below.

With reference first to Figs 3 - 5 one embodiment of a means or an apparatus for implementing the method according to the invention will now be described on the basis of measuring the electrical conductivity of the skin of a patient. The means includes according to Fig. 3 a sensor arrangement 1, a signal processing means 2 and a processor 3.

The sensor arrangement 1 can be a multichannel electrode comprising a sensor member 4 and a scanner member 5. The sensor member 4 is shown in more detail in Figs. 4 and 5 and includes a

plurality of needle-shaped electrodes or sensor elements 13 located longitudinally shiftable in a base member. Each sensor element 13 is assigned a spring to preload the sensor element in its initial position as shown in Fig. 4 in which the free ends of the sensor elements 13 protruding from the base member are located in a plane which may be flat or curved in accordance with the curvature of a bodily region, e.g. of the hand to be tested of a test person. The preloading of the sensor elements 13 causes them to exert a defined pressure on the skin surface when brought into contact therewith. An "adequate" number of sensor elements 13 is provided, it having been established that a number between 50 and 150, e.g. 60 sensor elements 13 is adequate in the aforementioned sense.

The sensor elements 13 are further distributed over a defined e.g. circular measurement area 14 of the sensor member 4. The scanner member 5 of the sensor arrangement 1 which can be of a type as generally known to the person skilled in the art, serves to successively scan the individual sensor elements 13 and to furnish the signals characterizing the conductivity values obtained at the individual sensor elements 13 to the processing means 2. The measurement values obtained may be e.g."pointer drops" of "electroacupuncture" methods as usual nowadays which result as soon as the measurement electrode is applied to the measurement point with constant contact pressure on the basis of a maximum value.

The signal processing means 2 includes an amplifier 6 for amplifying the individual signals output by the sensor arrangement 1. The output of the amplifier 6 is connected to a

bypass filter 7 which has the effect of filtering out any noise signals from the measurement signals. The filtered measurement signals are then applied to an AD converter 8. The digital output signals of the AD converter 8 are passed via an interface 9 of the signal processing means 2 to a processor 3. In this way the processor 3 receives digital signals which are amplified and free of noise, these signals corresponding to the measurement signals established by the sensor arrangement 1.

In addition, the signal processing means 2 includes a means of applying a defined reference AC voltage to a suitable body location of the test person. If the measured values are obtained on one side of the hand of the test person, a suitable measurement point for applying the reference voltage is the other side of the hand. The means for applying the reference voltage includes a voltage generator 10, the output of which is furnished to a suitable hand electrode 12 via a variable amplifier 11.

The processor 3 establishes from the signals output by the processor 2 the logarithmic normal distribution $p_n(x)$ corresponding to the measurement values obtained from and initially applicable to the test person, i.e.the ideal distribution function of the latter and, furthermore, the real distribution function $p(x)$. The logarithmix normal distribution is that which has the same mean value $\bar{x}$ and the same dispersion σ as the measured distribution $p(x)$. From the deviations between $p(x)$ and $p_n(x)$ an indication is possible as to the nature and scope of the health problems involved.

The processor 3 also establishes other parameters characteristic of the health condition of the test person such as e.g. the ratio of the moments of the rth order of the logarithmic normal distribution to the measured statistical distribution. The result of the computations can be displayed on a computer monitor and/or printed out in the form of graphs or tabulated data. The processor 3 also handles localization and computation of the maximum conductivity value within the measured matrix.

Computation of the measured distribution function p(x) and the logarithmic normal distribution $p_n(x)$ is explained in the following on the basis of an example computation in which the numerical values are those as tabulated in Table 1.

Example computation

1. Dividing the frequency values into n classes, whereby in this case n = 14. The class ~~marks~~ mean values are given over the full measurement range (as stated in Tab. 1) as 4, 12, 20, 28,...,108 in steps of 8 (as the x axis of Fig. 1a, b shows). In the following these values are identified k_m (i) where i = 1,....,14. For example $k_m(2) = 12$, $k_m(3) = 20$.

2. Computation of the measured distribution p(x)

a) Computation of the sum of the frequency values (p(x)) given in Table 1. As an example the values <u>before</u> treatment are given.

The sum stated N in the following is

$$N = \sum_{i=1}^{k=14} P(x_i)$$

Thus N = 0+14+22+34+18+32+2+0 = 122

The frequency values P(x) are then divided by the sum N

$$\frac{0}{122} = 0,\ \frac{14}{122} = 0.115,\ \frac{22}{122} = 0.18,\ \frac{34}{122} = 0.279,\ \frac{18}{122} = 0.148,$$
$$\frac{32}{122} = 0.262,\ \frac{2}{122} = 0.016,\ \frac{0}{122} = 0.$$

Expressed as an equation:

$$p(x_i) = \frac{1}{N} P(x_i) = P_i$$

This measured distribution is depicted as a bar graph.

3. Computation of log. normal distribution

- Computing central value $\bar{x}$ and dispersion σ:

$$\bar{x} = \frac{1}{N} \sum_{i=1}^{k} P(x_i) * Km(i)$$

$$\sigma = \sqrt{\frac{1}{N-1} \sum_{i=1}^{k} (Km(i) - \bar{x})^2 P(x_i)}$$

Example:

$$\bar{x} = \frac{1}{122}(14 * 52 + 22 * 60 + 34 * 68 + 18 * 76 + 32 * 84 + 2 * 92) = 70.49.$$

$$h\sigma = (52 - 70.49)^2 * 14 + (60 - 70.49)^2 * 22 + (68 - 70.49)^2 * 34$$
$$+(76 - 70.49)^2 * 18 + (84 - 70.49)^2 * 32 + (92 - 70.49)^2 * 2$$

$$\sigma = \sqrt{\frac{1}{121} * h\sigma}$$

expedients:

$\kappa = \sqrt{\ln\left(\frac{\sigma^2}{\bar{x}^2} + 1\right)} = 0.156.$

$\mu = \ln \bar{x} - \frac{\ln \sigma^2}{2} = 4.243$

log. normal distribution

$$p_n(x_i) = \frac{1}{\sqrt{2\pi \ln \sigma Km(i)}} \exp\left(-\frac{1}{2}\left(\frac{\ln Km(i) - \mu}{\kappa}\right)^2\right)$$

Example for class ~~mark~~ value 68:

$$p_n(68) = \frac{1}{\sqrt{2 * \pi * 0.156 * 68}} \exp\left(-\frac{1}{2}\left(\frac{4.219 - 4.243}{0.156}\right)^2\right) = 0.121$$

All values of $p_n(x_i)$ are then summed over all i's and divided by the total sum. This total sum $\sum_{i=1}^{k=14} p_n(x_i) = 0.412$ so that e.g.at the mark 68 is not 0.121 but according to this standarization $p_n(68) = \frac{0.121}{0.412} = 0.294$

Example

On a patient seriously afflicted with bronchial asthma the electrical conductivity values were established at 112 measurement points on the skin and the relative frequency of the values entered on a scale from 0 to 100.

The frequencies at which the values in the various scale ranges were measured are listed in Table 1 for n = 8 measurement intervals. The left-hand column relates to the values prior to treatment, those in the right to the values following relatively successful treatment (patient suffered less).

The data itself indicates neither an objective criterion for the health condition of the patient prior to treatment nor the degree of improvement following treatment, whereas when testing the frequencies p(n) in obtaining specific values of conductivity n as to their agreements with the logarithmic normal distribution (represented in Figs. 1a and 1b by the solid line curve) we then find:

1) Before treatment there are significant deviations from the normal distribution (Fig. 1a) as well as in the deviations of the moments of third and higher order (Fig. 2a) defined as

$$(m^r = \sum_{i=1}^{N} p(n_i) \cdot (n_i - \bar{n})^r)$$

This indicates that the patient is not healthy, the nature and seriousness of the affliction being recognizable in this

projection as the nature and degree of deviation from the logarithmic normal distribution.

2) Following treatment both a significantly better agreement with the logarithmic normal distribution (Fig.2b) and also a lesser deviation of the higher order moments from the ideal moments of the normal distribution are recognizable, the curves being transformed so that the moments of the first and second order (averages and variances) of the ideal and measured distribution agree.

Table 1: Measured frequencies of conductivity values obtained at 112 points on the skin in an assigned measurement range of 0 to 100 on a test person suffering from bronchial asthma

	before treatment	after
Measurement range	frequencies	frequencies
0 - 48	0	0
48 - 56	14	15
56 - 64	22	34
64 - 72	34	34
72 - 80	18	30
80 - 88	32	8
88 - 96	2	1
96 - 112	0	0

Up until now the invention has been described on the basis of measuring the electrical conductivity of the skin as the physiological characteristic. When other characterics are made use of the means of the invention must be modified accordingly. For example, the intensity with which the skin radiates in the

infrared or optical range can be utilized as the characteristic. In this case proximity sensor elements are used preferably in an arrangement and number corresponding to that of the needle-shaped sensor elements of the embodiment already described. Other means for sensing the physiological characteristics can take the form of grid, roller or brush-type electrodes. Although, in addition, the above describes in particular the preferred assessment of the overall health condition of a test person on the basis of comparing the real distribution function to the ideal, i.e. logarithmic normal distribution of the measured values obtained from the test person, the invention is understood to also cover a comparison on the basis of a reference statistical distribution of the data established for the physiological characteristic in question from measurements made on a number of healthy individuals.

The claims defining the invention are as follows:

1. A method of permitting an indication as to the health condition of a living creature on the basis of a comparison of a selected physiological characteristic of the living creature to a corresponding reference characteristic of the healthy condition characterized by said selected physiological characteristic being detected by means of a multi-channel sensor unit having a plurality of sensor elements distributed over a predetermined surface area, at a plurality of measurement points corresponding to said plurality of sensor elements, determining by means of statistical methods the statistical distribution and the logarithmic normal distribution of the signal levels of the signals output by said sensor unit and corresponding to the measurement values of said selected physiological characteristic, ~~performing an~~ establishing ~~of~~ the departures of the statistical distribution from the logarithmic normal distribution of said signal levels, whereby said logarithmic normal distribution being taken as a reference characteristic.

2. A method according to claim 1 wherein a region of the skin of the living creature is employed as the body region.

3. A method according to claim 1 or 2 wherein the physiological characteristic to be obtained is the conductivity of the skin to which a specific electric potential is applied.

4. A method according to claim 3 wherein the change with time in the conductivity is established according to methods of electroacupuncture.

5. A method according to claim 1 or 2 wherein the physiological characteristic to be detected is the radiation intensity of the skin, particularly in the optical or infrared range.

6. A method according to any one of the preceding claims wherein the deviations of the same order are determined from the comparison.

7. A method according to any one of the preceding claims wherein furthermore the change in the statistical distribution is established as a function of time and subjected to a correlation analysis.

8. A device for permitting an indication as to the health condition of a living creature according to the method of claim 1 characterized by a multi-channel sensor unit for detecting a selected physiological characteristic of the living creature at a plurality of measurement points distributed over a defined body region and for outputting corresponding signals, a means for processing the signals output by said multi-channel sensor unit, and a means for calculating from the signals output by said signal processing means the actual statistical distribution and the logarithmic normal distribution of the signal-related measured values of the physiological characteristic obtained.

9. A device according to claim 8 wherein said multi-channel sensor unit includes a plurality of sensor elements distributed over a defined surface areas and means for successively scanning said sensor elements.

10. A device according to claim 9 wherein said sensor elements include needle-shaped elements similar to acupuncture needles.

11. A device according to claim 8 or 9 wherein said multi-channel sensor unit comprises sensor elements for obtaining the measured values by proximity.

12. A device according to claim 8 or 9 wherein said multi-channel unit includes grid, roller or brush-type electrodes to obtain the physiological characteristic.

13. A method according to claim 1 substantially as hereinbefore described with reference to the drawings.

14. A device according to claim 8 substantially as hereinbefore described with reference to the drawings.

DATED : 1 February, 1995

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Attorneys For:
MAX REINHARD

David P Fitzpatrick

Abstract

A method of determining the health condition of a living creature comprises the steps of detecting a selected physiological characteristic, e.g. the conductivity of the skin, of the living creature at a statistically significant plurality of measuring points distributed over a defined body portion of the living creature, determining, e.g. by means of a computer, the statistical distribution of the measured values and comparing the statistical distribution of the measured values to a reference statistical distribution of the selected physiological characteristic. The said reference statistical distribution is a logarithmic distribution which is determined according to the calculating methods of statistics by means of the computer directly from the measured values obtained for the individual tested living creature. The invention for the first time permits a reliable indication as to overall health condition of a human or animal.

Fig. 1a

BRONCHIAL ASTHMA (BEFORE TREATMENT)

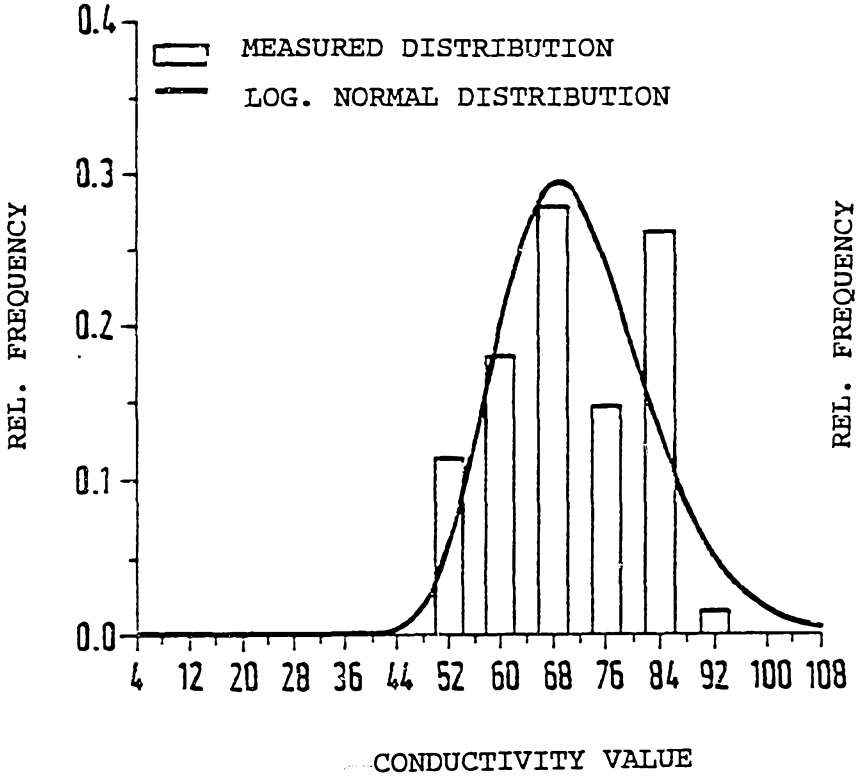


Fig. 1b

BRONCHIAL ASTHMA (AFTER TREATMENT)

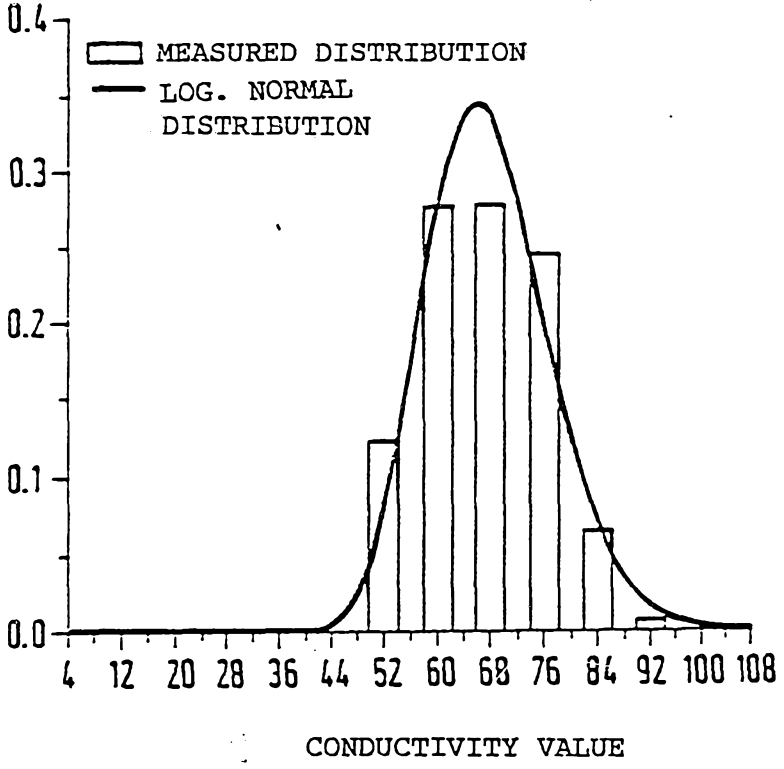


Fig. 2a

BRONCHIAL ASTHMA (BEFORE TREATMENT)

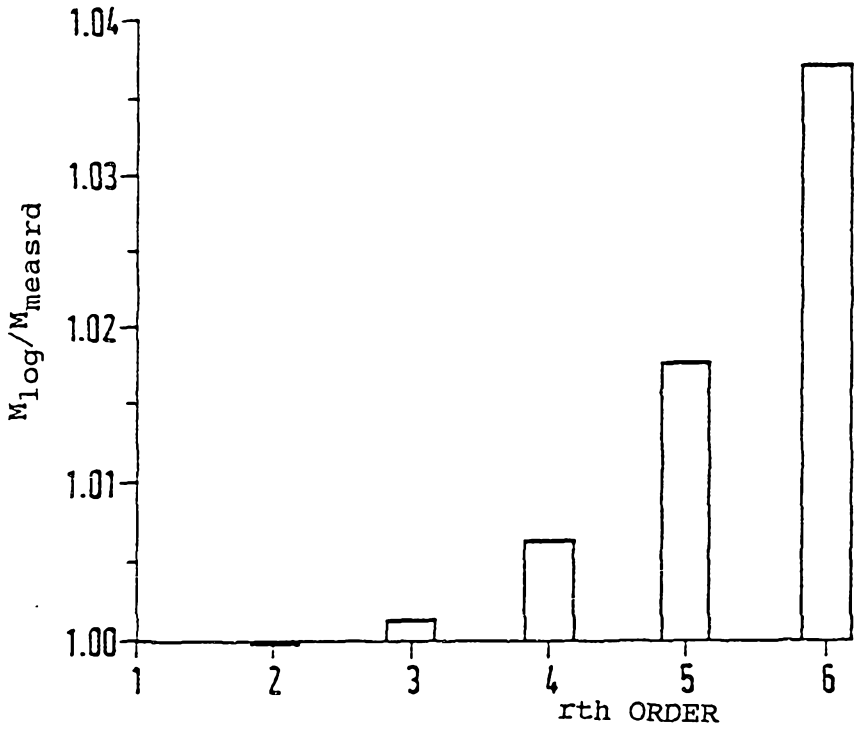
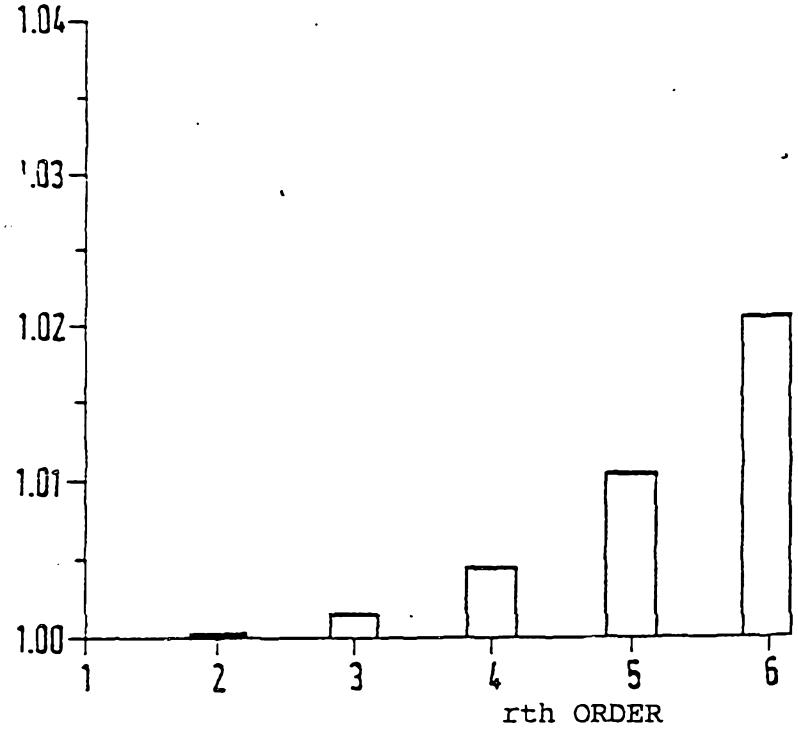


Fig. 2b

BRONCHIAL ASTHMA (AFTER TREATMENT)



RATIO OF MOMENTS OF rth ORDER

Fig. 3

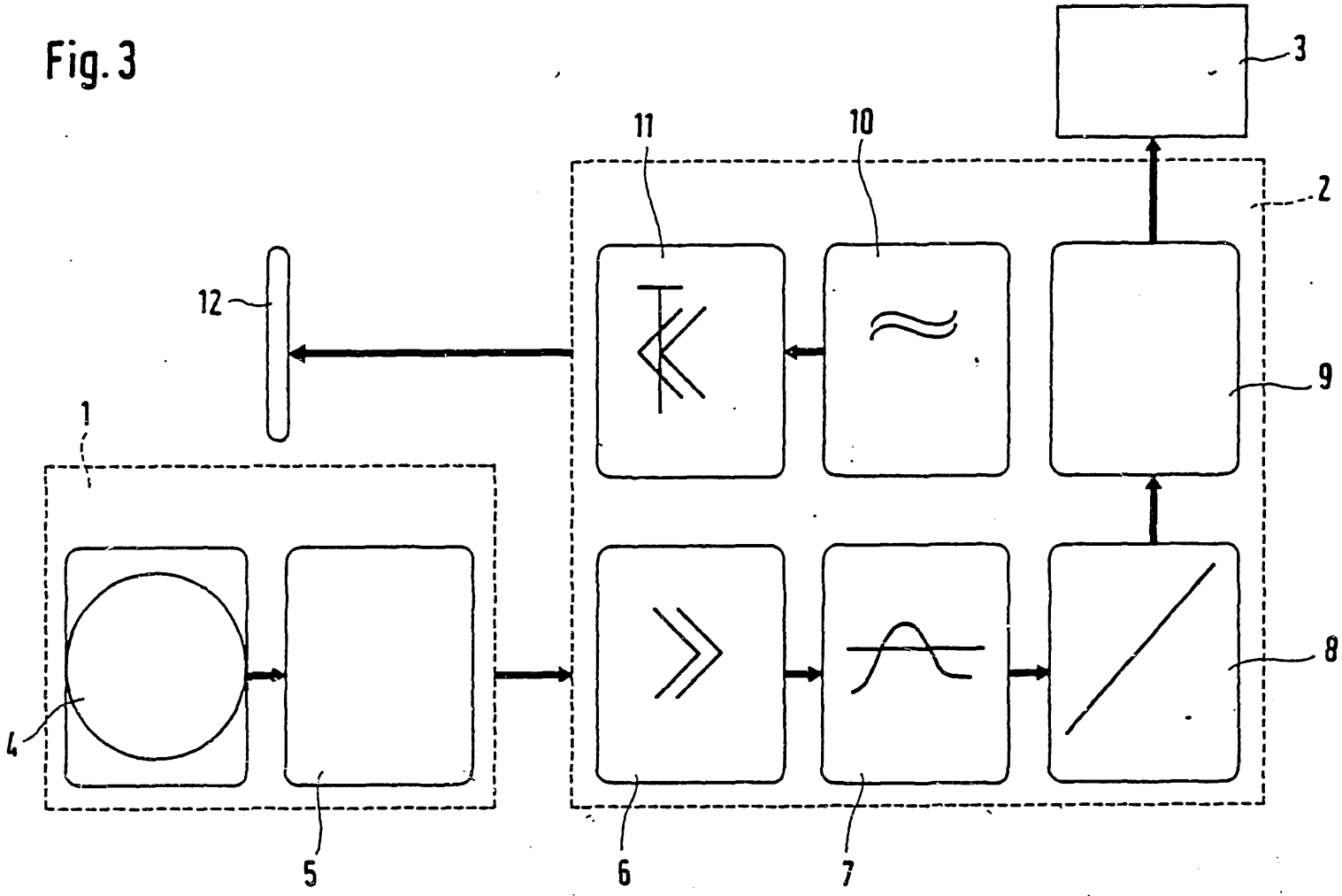


Fig. 4

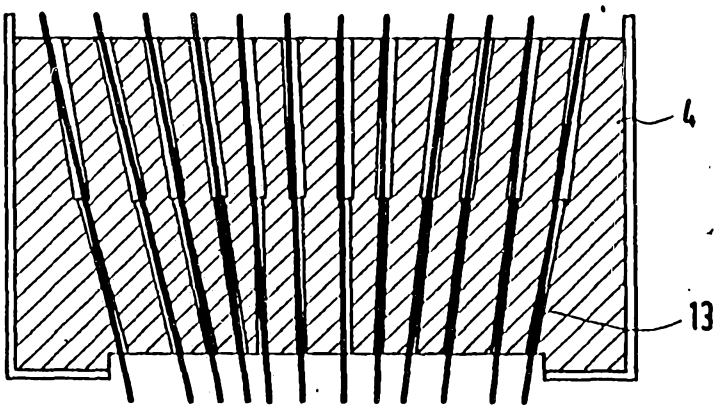
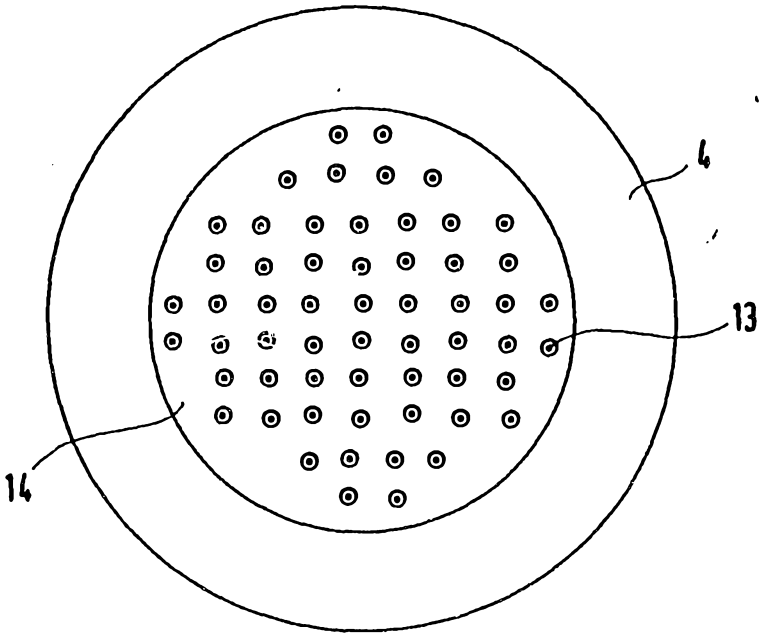


Fig. 5



INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP 92/02380

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.^{5} : A61B 10/00; A61B 5/05; A61B 5/103; A61H 39/00

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)

Int. Cl.^{5} : A61B; A61H

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 practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y	US, A, 4 310 003 (SCHLAGER) 12 January 1982, see abstract	9,10,12,13, 11
X	WO, A, 8 805 283 (SRI) 28 July 1988, see abstract; figure 3	9,10,12,13
Y	FR, A, 2 236 514 (DANNEMANN) 16 January 1975, see page 5, paragraph 3; figure 1	11
A	US, A, 3 939 841 (DOHRING) 24 February 1976, see abstract; figures 1,2	11
A	FR, A, 2 418 646 (MALATIER) 28 September 1979,	
A	WO, A, 8 808 273 (VANCAILLIE) 3 November 1988,	
A	CH, A, 448 372 (LABORATOIRES SUISSE DE RECHERCHES HORLOGERES) 29 March 1968,	

☐ Further documents are listed in the continuation of Box C. ☐ 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
26 January 1993 (26.01.93)	4 February 1993 (04.02.93)
Name and mailing address of the ISA/ European Patent Office Facsimile No.	Authorized officer Telephone No.

Form PCT/ISA/210 (second sheet) (July 1992)

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO.

EP 9202380
SA 65876

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international 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. 26/01/93

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-4310003	12-01-82	US-A-	4186748	05-02-80
		CA-A-	1118053	09-02-82
		EP-A-	0009048	02-04-80
		GB-A,B	2036399	25-06-80
		SE-A-	7908256	05-10-79
		WO-A-	7900594	23-08-79
WO-A-8805283	28-07-88	US-A-	4802488	07-02-89
		DE-T-	3790884	17-11-88
		EP-A-	0299992	25-01-89
		GB-A,B	2228089	15-08-90
		GB-A,B	2240399	31-07-91
FR-A-2236514	16-01-75	DE-A-	2335414	30-01-75
		AT-B-	342185	28-03-78
		GB-A-	1432729	22-04-76
US-A-3939841	24-02-76	None		
FR-A-2418646	28-09-79	None		
WO-A-8808273	03-11-88	US-A-	4852579	01-08-89
		EP-A-	0310662	12-04-89
CH-A-448372		US-A-	3450866	17-06-69

EPO FORM P0479

INTERNATIONALER RECHERCHENBERICHT

Internationales Aktenzeichen PCT/EP 92/02380

I. KLASSIFIKATION DES ANMELDUNGSGEGENSTANDS (bei mehreren Klassifikationssymbolen sind alle anzugeben)[6]

Nach der Internationalen Patentklassifikation (IPC) oder nach der nationalen Klassifikation und der IPC

Int.Kl. 5 A61B10/00; A61B5/05; A61B5/103; A61H39/00

II. RECHERCHIERTE SACHGEBIETE

Recherchierter Mindestprüfstoff [7]

Klassifikationssytem	Klassifikationssymbole
Int.Kl. 5	A61B ; A61H

Recherchierte nicht zum Mindestprüfstoff gehörende Veröffentlichungen, soweit diese unter die recherchierten Sachgebiete fallen [8]

III. EINSCHLAGIGE VEROFFENTLICHUNGEN [9]

Art.°	Kennzeichnung der Veröffentlichung [11], soweit erforderlich unter Angabe der maßgeblichen Teile [12]	Betr. Anspruch Nr.[13]
X Y	US,A,4 310 003 (SCHLAGER) 12. Januar 1982 siehe Zusammenfassung	9,10,12, 13 11
X	WO,A,8 805 283 (SRI) 28. Juli 1988 siehe Zusammenfassung; Abbildung 3	9,10,12, 13
Y	FR,A,2 236 514 (DANNEMANN) 16. Januar 1975 siehe Seite 5, Absatz 3; Abbildung 1	11
A	US,A,3 939 841 (DOHRING) 24. Februar 1976 siehe Zusammenfassung; Abbildungen 1,2	11
A	FR,A,2 418 646 (MALATIER) 28. September 1979	

-/--

° Besondere Kategorien von angegebenen Veröffentlichungen [10] :

"A" Veröffentlichung, die den allgemeinen Stand der Technik definiert, aber nicht als besonders bedeutsam anzusehen ist

"E" älteres Dokument, das jedoch erst am oder nach dem internationalen Anmeldedatum veröffentlicht worden ist

"L" Veröffentlichung, die geeignet ist, einen Prioritätsanspruch zweifelhaft erscheinen zu lassen, oder durch die das Veröffentlichungsdatum einer anderen im Recherchenbericht genannten Veröffentlichung belegt werden soll oder die aus einem anderen besonderen Grund angegeben ist (wie ausgefuhrt)

"O" Veröffentlichung, die sich auf eine mündliche Offenbarung, eine Benutzung, eine Ausstellung oder andere Maßnahmen bezieht

"P" Veröffentlichung, die vor dem internationalen Anmeldedatum, aber nach dem beanspruchten Prioritätsdatum veröffentlicht worden ist

"T" Spätere Veröffentlichung, die nach dem internationalen Anmeldedatum oder dem Prioritätsdatum veröffentlicht worden ist und mit der Anmeldung nicht kollidiert, sondern nur zum Verständnis des der Erfindung zugrundeliegenden Prinzips oder der ihr zugrundeliegenden Theorie angegeben ist

"X" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als neu oder auf erfinderischer Tätigkeit beruhend betrachtet werden

"Y" Veröffentlichung von besonderer Bedeutung; die beanspruchte Erfindung kann nicht als auf erfinderischer Tätigkeit beruhend betrachtet werden, wenn die Veröffentlichung mit einer oder mehreren anderen Veröffentlichungen dieser Kategorie in Verbindung gebracht wird und diese Verbindung für einen Fachmann naheliegend ist

"&" Veröffentlichung, die Mitglied derselben Patentfamilie ist

IV. BESCHEINIGUNG

Datum des Abschlusses der internationalen Recherche	Absendedatum des internationalen Recherchenberichts
26.JANUAR 1993	04. 02. 93
Internationale Recherchenbehörde	**Unterschrift des bevollmächtigten Bediensteten**
EUROPAISCHES PATENTAMT	S A BARTON

III. EINSCHLAGIGE VEROFFENTLICHUNGEN (Fortsetzung von Blatt 2)

Art °	Kennzeichnung der Veröffentlichung, soweit erforderlich unter Angabe der maßgeblichen Teile	Betr. Anspruch Nr.
A	WO,A,8 808 273 (VANCAILLIE) 3. November 1988 ---	
A	CH,A,448 372 (LABORATOIRES SUISSE DE RECHERCHES HORLOGERES) 29. März 1968 -----	

ANHANG ZUM INTERNATIONALEN RECHERCHENBERICHT ÜBER DIE INTERNATIONALE PATENTANMELDUNG NR.

EP 9202380
SA 65876

In diesem Anhang sind die Mitglieder der Patentfamilien der im obengenannten internationalen Recherchenbericht angeführten Patentdokumente angegeben.
Die Angaben über die Familienmitglieder entsprechen dem Stand der Datei des Europäischen Patentamts am 26/01/93
Diese Angaben dienen nur zur Unterrichtung und erfolgen ohne Gewähr.

Im Recherchenbericht angeführtes Patentdokument	Datum der Veröffentlichung	Mitglied(er) der Patentfamilie		Datum der Veröffentlichung
US-A-4310003	12-01-82	US-A-	4186748	05-02-80
		CA-A-	1118053	09-02-82
		EP-A-	0009048	02-04-80
		GB-A,B	2036399	25-06-80
		SE-A-	7908256	05-10-79
		WO-A-	7900594	23-08-79
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		DE-T-	3790884	17-11-88
		EP-A-	0299992	25-01-89
		GB-A,B	2228089	15-08-90
		GB-A,B	2240399	31-07-91
FR-A-2236514	16-01-75	DE-A-	2335414	30-01-75
		AT-B-	342185	28-03-78
		GB-A-	1432729	22-04-76
US-A-3939841	24-02-76	Keine		
FR-A-2418646	28-09-79	Keine		
WO-A-8808273	03-11-88	US-A-	4852579	01-08-89
		EP-A-	0310662	12-04-89
CH-A-448372		US-A-	3450866	17-06-69

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