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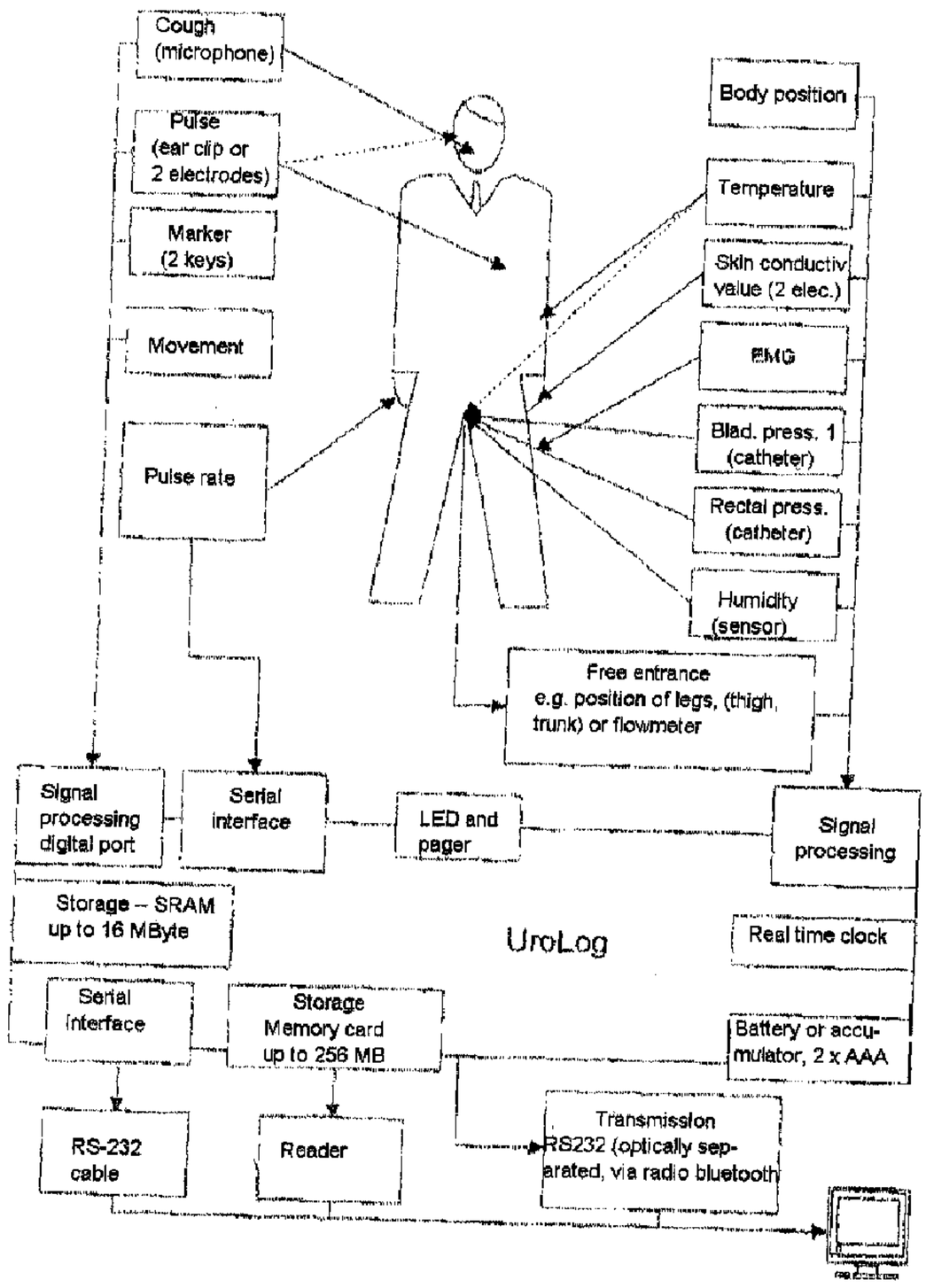
(54) Titre : DISPOSITIF PERMETTANT L'EXAMEN DES TROUBLES DE LA FONCTION VESICALE
(54) Title: APPARATUS FOR INVESTIGATING PATHOLOGICAL IMPAIRMENTS TO BLADDER FUNCTIONS



(57) Abrégé/Abstract:
The invention is based on the knowledge that the examination of vegetative functions can be used to diagnose dysfunction of the bladder. According to the invention, at least one means can be used to measure at least one vegetative function in order to

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(57) Abrégé(suite)/Abstract(continued):
diagnose dysfunction of the bladder. Said functions are especially the pulse, the blood pressure, the skin resistance, the core temperature of the body and/or the skin temperature of the person to be examined. It has been shown that the evaluation of at least one of said vegetative functions can be sufficient to be able to diagnose dysfunction of the bladder, due to the fact that vegetative functions have a direct correlation with the contraction of the bladder. Furthermore, there is a correlation between vegetative functions and the filling of the bladder. Preferably, the means for measuring at least one vegetative function, combined with conventional standard urodynamics, are used in order to increase the reliability of the evaluation.

Abstract

The present invention is based on the recognition that the investigation of somatic functions can be used to diagnose pathological impairments to bladder functions. It is therefore inventively suggested to use one or a plurality of means for measuring one or a plurality of somatic functions for diagnosing impairments to bladder functions. These functions are in particular pulse, blood pressure, skin resistance, body core temperature and/or skin temperature of the person being examined. It has been demonstrated that evaluating one or a plurality of these somatic functions can be adequate for being able to diagnose pathological impairments to bladder functions, since somatic functions have a direct correlation to bladder contraction. In addition, there is a correlation between somatic functions and bladder filling. Preferably means for measuring one or a plurality of somatic functions is/are employed in combination with conventional standard urodynamics in order to increase the certitude of the evaluation.

F-8208

Apparatus for Investigating Pathological Impairments to Bladder Functions

The present invention relates to apparatus for investigating pathological impairments to bladder functions.

Impairments to bladder functions due to damage to the central nervous system are the most common cause of urinary incontinence. Untreated, they always lead to a massive decline in quality of life and to substantially reduced life expectancy, especially after lesion of the spinal cord with paraplegia or other accident-related damage to the central nervous system, e.g., cranio-cerebral trauma. Thirty years ago, the survival time for quadriplegia, that is, paralysis of arms and legs, was a few months; for paraplegia, that is, paralysis of the legs only, it was a few years. At that time therapeutic measures in the urological field comprised placement of a permanent catheter or care with diapers or a urinal, as well as surgical measures, possibly in terms of performing a sphincterotomy or installation of an artificial urine drain by circumventing the bladder by means of a section of intestine, e.g., ileal conduit. Intensive neurological efforts over the past 20 years have led to a substantial improvement in this situation. Thus, today it can be assumed that a paraplegic has practically no reduction in life expectancy provided he undergoes regular check-ups in specialized centers. Even after quadriplegia, substantial improvements in terms of life expectancy have been achieved in the urological field consistent with the magnitude of the lesion.

Thus a number of conservative and surgical therapy techniques are known with which specific pathological findings can be successfully treated in a very targeted manner. It is necessary to diagnose the precise pathological findings in order to employ the correct, custom-designed therapy. However, in problematic cases this is not possible with the required certainty, so that frequently an incorrect or inadequate therapy is employed.

In standard urodynamics, the bladder is filled with a liquid using a catheter. A fill speed of 20 to 50 mL/min is provided, so that the filling process takes approximately five minutes, which is approximately 50 to 100 times faster than the bladder fills with urine naturally. While the bladder is undergoing artificial filling, the pressure inside the bladder and the pressure inside the rectum are measured using two pressure sensors attached to catheters. A contraction in the bladder musculature results in a positive difference between bladder pressure and rectum pressure. If this contraction occurs involuntarily while the bladder is being filled, this is an indication of a pathological change in bladder control. Rectum pressure is a reference value for bladder pressure. Because when there is coughing or when the abdominal musculature is tensed, the interior pressure in the lower body increases overall, so that one measurement of bladder pressure alone is not adequate for detecting an involuntary contraction of the bladder musculature. In addition, in standard urodynamics, liquid volume during urination is frequently measured by means of a receptacle. In order to increase accuracy, this measurement process is repeated one or two times, so that the measurement can last a total of 45 to 60 minutes. The measurement can even take up to two hours for neurogenic patients.

The disadvantage of standard urodynamics is the diagnosis' high susceptibility to error. Thus, when the patient moves or changes position, positive differences between bladder pressure and rectum pressure occur that have not been caused by involuntary contractions. In addition,

the unnaturally rapid filling of the bladder provokes involuntary contractions in the bladder musculature, even in healthy patients. Therefore it does not provide an evaluation with reliable certitude. This susceptibility to error is frequently a substantial limitation in the diagnostic reliability of urodynamic investigations, especially in neurogenic patients.

Furthermore, in neurogenic patients with autonomic dysreflexia (high blood pressure, caused e.g. by movements or certain conditions of various organs such as stomach, intestinal tract, and urinary tract, due to insufficiency in blood pressure regulation using the nervus vagus), this autonomic dysreflexia is easily provoked by rapid bladder filling and/or the bladder contraction caused thereby.

In video urodynamics, in addition to standard urodynamics the patient is subjected to x-ray examination approximately 8 to 10 times during the measurement process. This is intended to make it possible to diagnose bladder/sphincter dyssynergia. Such dyssynergia is characterized in that the bladder musculature contracts although the sphincter musculature has not released the urethra. One possible consequence is that the urine backs up to the kidneys, which can suffer damage as a result.

It is therefore one object of the present invention to eliminate the aforesaid disadvantages of known apparatus for investigating pathological impairments to bladder functions. In particular known apparatus are to be further developed such that evaluation certitude, i.e., diagnostic certitude, is substantially increased.

This object is attained by an apparatus in accordance with claim 1. The dependent claims concern advantageous embodiments.

The present invention is based on the recognition that the investigation of somatic functions can be used to diagnose pathological impairments to bladder functions. It is therefore inventively suggested to provide one or a plurality of means for measuring one or a plurality of somatic functions. These functions are in particular pulse, blood pressure, skin resistance, body core temperature and/or skin temperature of the person being examined. It has been demonstrated that evaluating one or a plurality of these somatic functions can be adequate for being able to diagnose pathological impairments to bladder functions, since somatic functions have a direct correlation to bladder contraction. In addition, there is a correlation between somatic functions and bladder filling.

A bladder contraction is triggered by the somatic system. As the consequence of such triggering, the sweat glands open so that shortly prior to and during a bladder contraction the skin resistance drops almost to zero, similar to a short circuit. Since normally skin resistance – depending on the position of the measuring electrodes – is in the range of several kiloohms, this effect can be measured with great reliability.

Due to somatic control for triggering a bladder contraction, a contraction of the blood vessels occurs, as well, and as a result there is an immediate increase in blood pressure, which can itself be measured with great reliability. The pulse or cardiac rate increases, as well, as an indirect result of the increase in blood pressure and due to the direct somatic control. Then, body core temperature drops as a result of the increased pulse rate, since increased blood circulation effects an elevated cooling effect in the interior of the body.

With an inventive apparatus, measurement is performed during a natural filling of the bladder by the patient's kidneys, diuresis. This avoids provoking autonomic dysreflexia due to unnaturally rapid filling of the bladder.

In addition, in accordance with the present invention means for measuring non-somatic functions can be provided, in particular for measuring bladder pressure, rectum pressure, urethral pressure, and/or anal sphincter pressure. These measurements diagnose impairments to bladder functions as is commonly done in the conventional manner in standard urodynamics.

Finally, in accordance with the present invention additional means can be provided for measuring non-somatic functions or parameters, in particular for measuring the position of the patient, his movements during the investigation, the angle of his legs or thighs relative to his upper body, for measuring coughing, how full his bladder is, and tensing in the abdominal musculature and the musculature of the urethral sphincter muscle. All of these functions or parameters can be important for involuntary contractions of the bladder musculature.

The result is that the certitude of the evaluation increases if there is any uncertainty when the data from just somatic functions are evaluated.

The present invention is explained in greater detail in the following using a preferred exemplary embodiment and Fig. 1, whereby:

Fig. 1 illustrates a block diagram of a preferred embodiment of the inventive apparatus ("UroLog"), and

Fig. 2 illustrates one module in accordance with a preferred embodiment of the inventive apparatus ("UroLog") with connectors and connecting cables.

In accordance with one preferred embodiment, the inventive apparatus for investigating impairments to bladder functions includes a compact module that during the investigation period is situated on or in the vicinity of the body of the person being examined. Fig. 1 illustrates this module symbolically. Connected to the module is means or a plurality of means for measuring various somatic and/or non-somatic functions or parameters of the person via serial interfaces or via signal preparation units. If necessary, one or more other means for measuring other conditions can also be connected to the module.

The data measured by these means are stored by means for recording data that is arranged in the module and preferably includes 4 MBits or 8 MBits of memory. However, a transmitter can also be arranged in or on the module; it transmits the data to a stationary receiver. In this case, the means for recording data does not have to be in arranged in the module, but can also be arranged stationary at the receiver, whereby the receiver forwards the data to the recording means for recording.

As in conventional urodynamics, the apparatus illustrated in Fig. 1 measures bladder pressure and rectal pressure. Pressure sensors can be employed that are introduced into the patient's bladder or rectum via a catheter. A Wheatstone bridge can be used for the pressure sensors, whereby a resistance depends on pressure. The pressure sensors are connected to the module via electrically conducting cable.

In the apparatus illustrated in Fig. 1, pulse rate, skin resistance, and skin temperature are measured for the somatic functions. When there is a contraction

in the bladder musculature – depending on the position of the measuring electrodes – the skin resistance drops from a few kiloohms to almost zero, similar to a short circuit. Two or more electrodes can be used for this that can be arranged e.g. in the region of the hand. As another result of a contraction of the bladder musculature, blood vessels constrict so that blood pressure also rises immediately. Blood pressure can be measured preferably in a non-invasive manner.

The pulse rate also increases as a result of the increase in blood pressure and due to direct somatic triggering. In the apparatus illustrated in Fig. 1, the pulse rate is preferably measured using an ear clip. With such an ear clip, the earlobe is illuminated with a light source, whereby the quantity of light that passes through the ear changes periodically with the pulse beat. A light sensor measures this periodic change in light intensity. Alternatively, two electrodes that are arranged in the region of the heart can also be employed to measure the pulse. These electrodes can measure a voltage that is produced during contraction of the cardiac musculature. In addition, it is possible to measure the pulse using a finger clip, whereby oxygen saturation provides the initial value for the measurement.

Since somatic triggering opens the sweat glands during a contraction of the bladder musculature, there is elevated evaporation from the surface of the skin so that the skin temperature drops correspondingly. This effect can be measured using temperature-sensitive resistances that can be arranged on the skin surface, e.g. in the region of an arm.

A contraction of the bladder musculature or a positive difference between bladder pressure and rectum pressure can also result from corresponding movements by the patient, e.g. tensing of the abdominal musculature, or from coughing. Therefore in accordance with one preferred embodiment of the

invention, a sensor for measuring tensing of the abdominal musculature, a motion sensor, and a sensor for determining body position are provided. Coughing, which is connected to sudden tensing of the abdominal musculature, can be detected using a microphone. Alternatively, however, a band can also be arranged about the thorax, whereby coughing is detected via sudden shortening of the circumference of the thorax.

In addition to being important for bladder filling, the patient's movement, body position, and leg position during the investigation period is important for the urge to urinate and for involuntary contractions of the bladder musculature. Leg position, in particular the angle between upper body and thigh, can be measured using a fiberglass cluster, whereby a light source is arranged at one end of the fiberglass cluster, and a light sensor is arranged at the other end. The fiberglass cluster is preferably attached laterally on the thorax and laterally along the thigh. When the patient is standing or lying flat, a maximum quantity of light travels through the fiberglass cluster. However, when the angle between upper body and thigh changes, the fiberglass cluster is bent somewhat so that less light travels all the way through the fiberglass cluster.

The inventive apparatus can furthermore include a video or digital cameral and a memory card for collecting image data. Image data about movements can be collected, especially while the patient is sleeping, in order to attain certitude in the evaluation.

Finally, a moisture sensor that is arranged preferably in a diaper and a flow measuring device can measure the existence and severity of any incontinence.

Marking buttons for manual actuation by the patient can also be provided. This makes it possible for the patient to mark certain events, such as e.g. the sensation of a need to urinate. Corresponding inputs can later also be taken into account in the evaluation.

The module is preferably operated using a battery or an accumulator, in particular two AAA batteries. This makes it possible for the person to be evaluated to move freely, as he normally would, for the period of the investigation, which can take up to 30 hours, or, depending on scanning rate and memory, up to 20 days. The scanning rate can be selected freely starting with scanning every two minutes up to a maximum 1024 Hz.

After the investigation period, the module can be connected via a serial interface, in particular via an RS-232 port with interface, to a computer with which the measured data can be evaluated using evaluation software. Evaluation of the data can also be evaluated by a physician using a graphic representation, however, in order to arrive at the correct diagnosis.

Fig. 2 illustrates a module 1 in accordance with one preferred embodiment of the inventive apparatus ("UroLog") with connectors and cables. The module 1 is 58 mm x 105 mm x 19 mm in size, weighs approximately 0.2 kg, and is splash-resistant or – if necessary – water-tight. Attached to the module is a connector 2 with cables, whereby at the ends of the cables are an "EMG, ECG, EDA" electrode connection box 3, a connector 4 for a microphone, a connector 5 for a catheter for measuring rectal pressure, a connector 6 for a catheter for measuring bladder pressure, and a connector 7 for a temperature sensor.

Patent Claims:

1. Apparatus for investigating impairments to bladder functions, characterized in that said apparatus includes means for measuring one or a plurality of somatic functions of a person to be examined.

2. Apparatus in accordance with claim 1, characterized in that said means for measuring somatic functions includes means for measuring the pulse of the person to be examined.

3. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the pulse of the person to be examined includes one or a plurality of, in particular 2 or 3, electrode cables and one or a plurality of ear clips and/or one or a plurality of finger clips.

4. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring somatic functions includes means for measuring the blood pressure of the person to be examined.

5. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the blood pressure of the person to be examined is non-invasive.

6. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring somatic functions includes means for measuring the skin resistance of the person to be examined.

7. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the skin resistance of the person to be examined is suitable for measuring an electrical voltage from an applied electrical voltage source at at least two sites on the surface of the skin, whereby said means for measuring the skin resistance in particular includes one or a plurality of electrode cables and two or more electrodes.

8. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring somatic functions includes means for measuring the body core temperature of the person to be examined.

9. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the body core temperature of the person to be examined includes a temperature-sensitive resistance that is attached to a tube for insertion into the rectum.

10. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the body core temperature of the person to be examined includes a pill for oral ingestion that contains a temperature-sensitive resistance and a transmitter for transmitting body core temperature data, whereby a receiver located outside of the body receives said body core temperature data.

11. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring somatic functions includes means for measuring the skin temperature of the person to be examined.

12. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the skin temperature of the person to be examined includes a temperature-sensitive resistance that can be brought into contact with the surface of the skin.

13. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the bladder pressure as a non-somatic function.

14. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring bladder pressure includes a catheter and a pressure sensor, whereby said pressure sensor is arranged at the distal end of said catheter.

15. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring bladder pressure includes a catheter and a pressure sensor, whereby said catheter can transmit the pressure in the bladder outward from the body via a channel, and whereby said pressure sensor can be arranged outside of the body, in particular on said channel in the proximal area of said catheter.

16. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the rectum pressure as a non-somatic function.

17. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring rectum pressure includes a catheter and pressure sensor, whereby said pressure sensor is arranged at the distal end of said catheter.

18. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring rectum pressure includes a catheter and a pressure sensor, whereby said catheter can transmit the pressure in the bladder outward from the body via a channel, and whereby said pressure sensor can be arranged outside of the body, in particular on said channel in the proximal area of said catheter.

19. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the urethral pressure as a non-somatic function.

20. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the urethral pressure includes a catheter and a pressure sensor, whereby said pressure sensor is arranged on the distal area of said catheter.

21. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring urethral pressure includes a catheter and pressure sensor, whereby said catheter can transmit the pressure in the bladder outward from the body via a channel, and whereby said pressure sensor can be arranged outside of the body, in particular on said channel in the proximal area of said catheter.

22. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the anal sphincter pressure as a non-somatic function.

23. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring anal sphincter pressure includes a catheter and a pressure sensor, whereby said pressure sensor is arranged on the distal area of said catheter.

24. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring anal sphincter pressure includes a catheter and a pressure sensor, whereby said catheter can transmit the pressure in the bladder outward from the body via a channel, and whereby said pressure sensor can be arranged outside of the body, in particular on said channel in the proximal area of said catheter.

25. Apparatus in accordance with any of the preceding claims, characterized in that said catheter of said means for measuring bladder pressure and said catheter of said means for measuring urethral pressure are identical, whereby said channels run separately.

26. Apparatus in accordance with any of the preceding claims, characterized in that said catheter of said means for measuring rectum pressure and said catheter of said means for measuring anal sphincter pressure are identical.

27. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring an incontinence event as a non-somatic function.

28. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring an incontinence event includes a moisture sensor, in particular using a resistance and/or capacity measurement, whereby said moisture sensor can be integrated into a diaper.

29. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring an incontinence event includes a

flow meter that can be arranged inside or outside of the person to be examined.

30. Apparatus in accordance with any of the preceding claims, characterized in that said catheter of said means for measuring bladder pressure and said catheter for said flow meter are identical.

31. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the severity of an incontinence event as a non-somatic function.

32. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the severity of an incontinence event includes a diaper and a moisture sensor.

33. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the position of the person to be examined, in particular the corpus.

34. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the position of the person to be examined includes a hollow external sphere in which a rotatably borne internal sphere is disposed, whereby a spherical segment has been removed from said internal sphere and/or said internal sphere has a center of gravity that differs from the sphere center, so that said internal sphere always has the same angle relative to the direction of force of gravity.

35. Apparatus in accordance with any of the preceding claims, characterized in that said internal sphere of said means for measuring position has electrical contact surfaces on the internal surface and said external sphere of said means for measuring position

has electrical contact surfaces on the external surface, so that the position of said body can be evaluated via the contact surfaces that are in contact with one another.

36. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring movements of the person to be examined.

37. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring movements of the person to be examined include a shock sensor that can be attached to the body of the person to be examined.

38. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for measuring the angle of the legs of the person to be examined, in particular the angle between the thigh in relation to the body.

39. Apparatus in accordance with any of the preceding claims, characterized in that said means for measuring the angle of the legs of the person to be examined includes one or a plurality of light guides, in particular one or a plurality of glass fibers, as well as a light source and a light sensor, whereby said light guides can be attached along the legs so that the angle can be calculated using the quantity of light transmitted through said light guides.

40. Apparatus in accordance with any of the preceding claims, characterized in that the apparatus has means for registering coughing by the person to be examined.

41. Apparatus in accordance with any of the preceding claims, characterized in that said means for registering coughing includes a microphone.

42. Apparatus in accordance with any of the preceding claims, characterized in that said means for registering coughing includes a band that can be placed about the thorax of the person to be examined, whereby a sensor for measuring a longitudinal change in said band is provided so that when there is sudden shortening of the band a conclusion can be drawn that there is coughing.

43. Apparatus in accordance with any of the preceding claims, characterized in that said means for registering coughing includes a microprocessor that can analyze the measured acoustic signals to determine if there is coughing.

44. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus includes means for measuring the muscle tension in the abdominal musculature, whereby two or more electrodes can measure a voltage produced by said musculature.

45. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus includes means for measuring the muscle tension of the urethral sphincter muscle, whereby two or more electrodes can measure a voltage produced by said musculature.

46. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus includes means for measuring how full said bladder is.

47. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus has means for recording data.

48. Apparatus in accordance with any of the preceding claims, characterized in that said values measured by said means for measuring one or a plurality of somatic functions can be recorded and/or stored by means for recording data, in particular over a predetermined period of time, in particular values measured by said means for measuring pulse, by said means for measuring blood pressure, by said means for measuring skin resistance, by said means for measuring body core temperature, and/or by said means for measuring skin temperature.

49. Apparatus in accordance with any of the preceding claims, characterized in that said means for recording data can record and/or store non-somatic functions, in particular over a predetermined period of time, in particular values measured by said means for measuring bladder pressure, by said means for measuring rectum pressure, by said means for measuring urethral pressure, by said means for measuring anal sphincter pressure, by said means for measuring an incontinence event, by said means for measuring the severity of an incontinence event, by said means for measuring the muscle tension of abdominal musculature, by said means for measuring the muscle tension of the urethral sphincter muscle, and/or by said means for measuring how full said bladder is.

50. Apparatus in accordance with any of the preceding claims, characterized in that said means for recording data can record and/or store behaviors of said person to be examined, in particular over a predetermined period of time, in particular values measured by said means for measuring position, by said means for measuring

movements, by said means for measuring the angle of the legs, and/or by said means for registering coughing.

51. Apparatus in accordance with any of the preceding claims, characterized in that said means for recording data includes a magnetic, optical, analog, and/or digital storage medium, in particular one or a plurality of memory chips.

52. Apparatus in accordance with any of the preceding claims, characterized in that said storage medium is exchangeable.

53. Apparatus in accordance with any of the preceding claims, characterized in that said storage medium has sufficient capacity to store said data for several hours, in particular for more than 6 hours, in particular for more than 24 hours.

54. Apparatus in accordance with any of the preceding claims, characterized in that one or a plurality of marking means, in particular buttons, are provided, with which certain events can be stored manually on said means for recording data, in particular events such as a certain sensation in the bladder experienced by the person to be examined, drinking, urination, and the like.

55. Apparatus in accordance with any of the preceding claims, characterized in that said marking means is suitable for manually inputting signals of different height in order to be able to input the intensity of a certain event, such as for instance a rotatable knob with a scale or a compressible button with pressure-sensitive input.

56. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus includes a video camera or a digital camera and a memory card for acquiring image data for obtaining image data in particular while the patient is sleeping image data are obtained for detecting movement [sic].

57. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus includes a transmitter for transmitting said measured values on said somatic and/or non-somatic functions, in particular by radio, light, or using bluetooth technology.

58. Apparatus in accordance with any of the preceding claims, characterized in that said apparatus includes a receiver for receiving said transmitted measured values on said somatic functions, said and/or non-somatic functions [sic] and/or said other measured values.

59. Apparatus in accordance with any of the preceding claims, characterized in that said receiver can contact said transmitter automatically.

60. Apparatus in accordance with any of the preceding claims, characterized in that said transmitter can contact said receiver automatically.

61. Apparatus in accordance with any of the preceding claims, characterized in that said means for recording data is arranged at said receiver.

62. Apparatus in accordance with any of the preceding claims, characterized in that said means for recording data is arranged in a

compact module that the person to be examined can wear on his body or in the vicinity of his body during the investigation period, whereby all of said means for measuring said somatic and/or non-somatic functions and/or said other measured values are in contact with said module.

63. Apparatus in accordance with any of the preceding claims, characterized in that said module can be operated by a battery during said investigation period.

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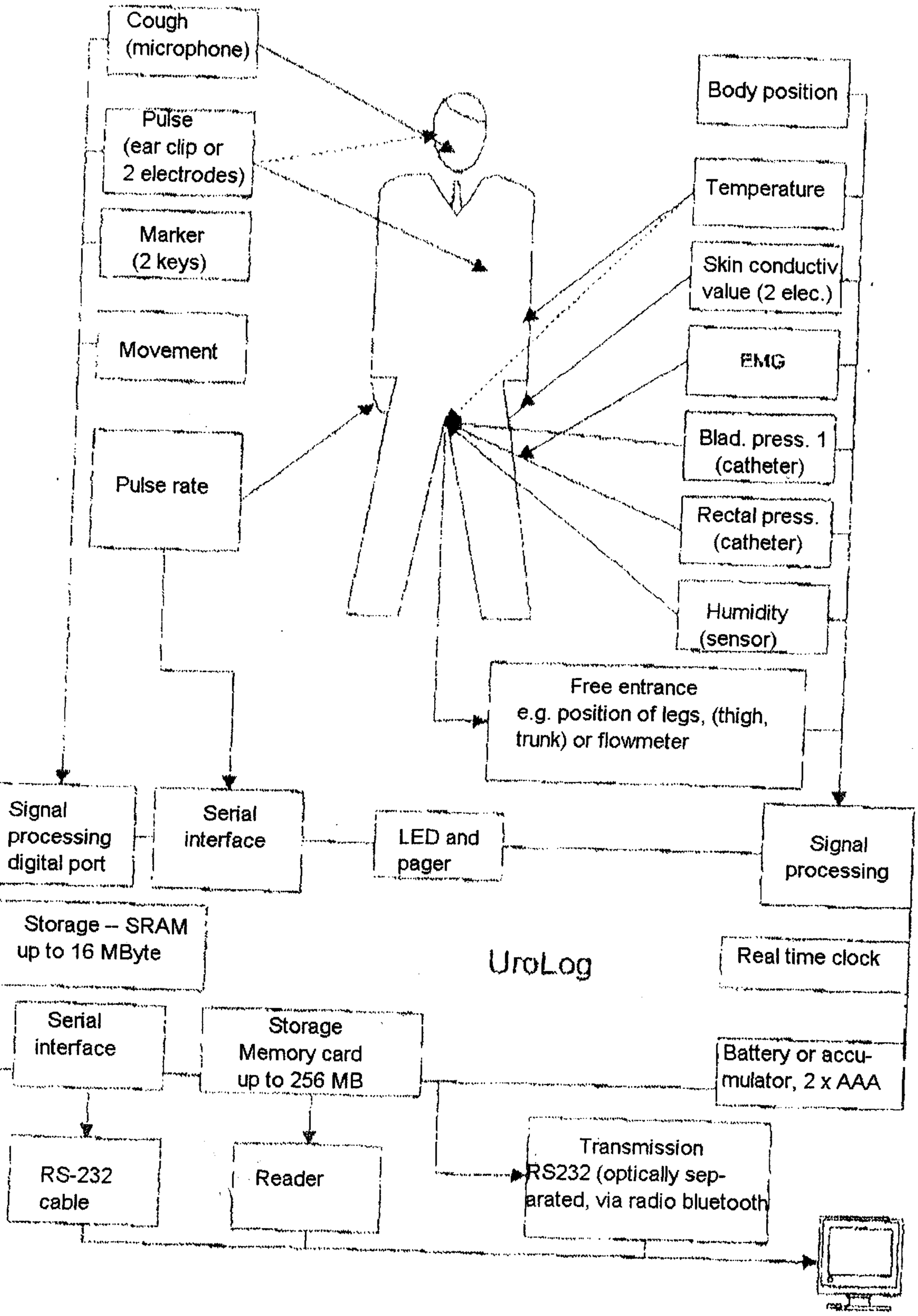
Cough (microphone)
Pulse (ear clip or 2 electrodes)
Marker (2 keys)
Movement
Pulse rate
Body position
Temperature
Skin conductiv value (2 elec.)
EMG
Blad. press. 1 (catheter)
Rectal press. (catheter)
Humidity (sensor)
Free entrance e.g. position of legs, (thigh, trunk) or flowmeter
Signal processing digital port
Serial interface
LED and pager
Signal processing
Storage -- SRAM up to 16 MByte
UroLog
Real time clock
Serial interface
Storage Memory card up to 256 MB
Battery or accu-mulator, 2 x AAA
RS-232 cable
Reader
Transmission RS232 (optically sep-arated, via radio bluetooth

Fig. 1

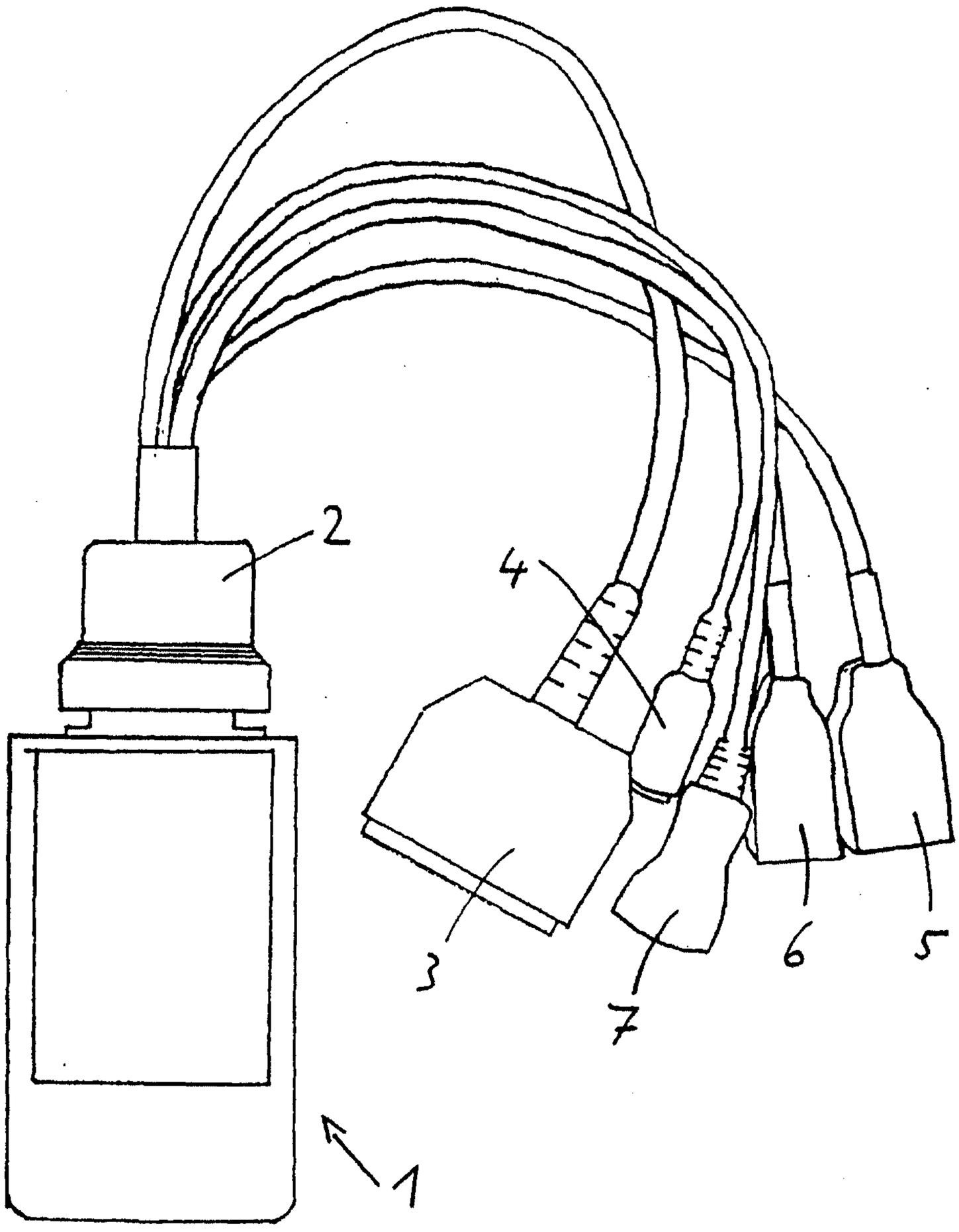

Fig. 2

Cough (microphone)

Pulse (ear clip or 2 electrodes)

Marker (2 keys)

Movement

Pulse rate

Body position

Temperature

Skin conductiv value (2 elec.)

EMG

Blad. press. 1 (catheter)

Rectal press. (catheter)

Humidity (sensor)

Free entrance e.g. position of legs, (thigh, trunk) or flowmeter

Signal processing digital port

Serial interface

LED and pager

Signal processing

Storage -- SRAM up to 16 MByte

UroLog

Real time clock

Serial Interface

Storage Memory card up to 256 MB

Battery or accu-mulator, 2 x AAA

RS-232 cable

Reader

Transmission RS232 (optically sep-arated, via radio bluetooth