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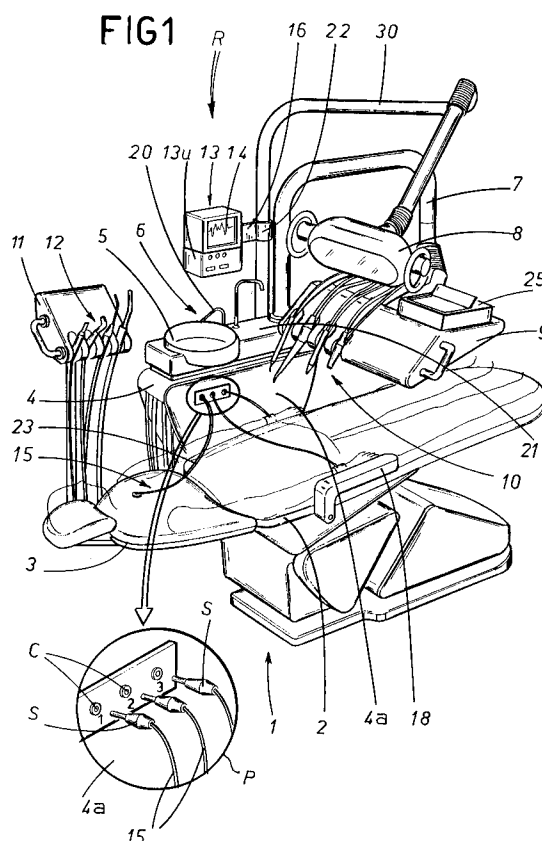
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**I-40121 Bologna (IT)**(54) **A dental surgery apparatus.**

(57) A dental surgery apparatus (R) of conventional design is fitted with an electrocardiograph (13), comprising a processing unit (13u), a monitor (14) on which to display the ECG trace, and a set of sensors (15) of which the leads (23) are concealed in or connected to the apparatus and the sensing elements are attached to the body of the patient.

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The present invention relates to a dental surgery apparatus with electrocardiograph.

There is currently a trend toward significantly high levels of technology in equipment for dental surgeries and treatment centres; doubtless, such a development has been influenced by the growing standards of attainment in professional skills and specialization on the part of dental practitioners by whom odonto-surgical operations are performed on the premises in question.

Given that such operations can be complex, lengthy and delicate, the dental surgeon needs increasingly to ensure that many of the patient's primary bodily functions can be monitored more effectively, and in real time; this is especially the case where large areas of the oral cavity have to be anaesthetized for an appreciable duration.

It therefore occurs to the applicant, pursuing a philosophy focused on the continuing improvement and technological refinement of dental surgery equipment, and in particular of the dentist's chair and its associated apparatus, that provision might advantageously be made within the apparatus for an electrocardiograph by means of which to monitor the cardiocirculatory functions of a patient constantly and comprehensively during treatment.

Accordingly, the object of the present invention is to provide an apparatus such as will allow a dental surgeon, nurse or hygienist to apply sensors simply and swiftly to the body of a patient occupying the chair and thereupon to obtain a full and continuous display of cardiac functions while an operation is performed on the oral cavity of the patient.

The stated object is realized in a dental surgery apparatus as characterized by the appended claims.

The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- fig 1 illustrates a dental surgery apparatus with electrocardiograph according to the invention, seen schematically and in perspective;
- fig 2 shows a further perspective of the apparatus of fig 1, illustrating variations in the layout of the display and sensors of the electrocardiograph;
- fig 3 is a block diagram illustrating connections between the electrocardiograph and means by which other components of the apparatus are operated;
- fig 4 is a further block diagram illustrating an alternative layout of the electrocardiograph within the apparatus.

With reference to the accompanying drawings, the components of a dental surgery apparatus according to the invention (figs 1 and 2) include a

frame 1, and a chair 2 supported by the frame; the chair in its turn comprises a fully reclining backrest 3, and preferably, two armrests 18 anchored rotatably to the backrest one on either side.

4 denotes a first vertical column positioned to one side of the chair 2, which carries a spittoon cup 5 and means 6 of supplying water, typically a pipe 20 that terminates in a spout over a shelf 21 serving as a stand for a drinking glass (not illustrated); the same first column 4 also supports two arms denoted 30 and 7, which are anchored pivotably at separate points, positioned in such a manner as to overhang the chair 2, and adjustable for height.

The one arm 30 supports an overhead lamp 8, and the remaining arm 7 a console 9 carrying a plurality of primary handpieces 10 (illustrated schematically, being conventional in embodiment).

11 denotes a second vertical column, remote from the base 1, supporting a plurality of secondary or auxiliary handpieces 12. The apparatus also houses electrical means 31 (see figs 3 and 4) interfaced with hydraulic and pneumatic means 32 and 33, all of which combining to bring about the operation of the various elements mentioned above.

In addition to the components mentioned thus far, the apparatus disclosed, denoted R in its entirety, incorporates an electrocardiograph 13 comprising a processing unit 13u, a monitor 14 by means of which to display the electrocardiographic signal, and a plurality of sensors 15 for attachment to the body of the patient which are stowed internally of the apparatus when not in use.

In the example of figs 1 and 3, the monitor 14 is integral with the processing unit 13u and mounted to one end of a horizontal bracket 16 of which the remaining end is secured to the arm 30 carrying the lamp 8; more exactly, the bracket 16 is associated with the arm 30 by way of a sleeve 22 ensheathing the pivoted upright member of the arm.

Figs 2 and 4 show an alternative solution in which the monitor 14 remains integral with the processing unit 13u, but in this instance is incorporated into the handpiece console 9, mounted flush with the screen positioned to occupy one of the horizontal faces of the relative housing. To advantage, the monitor 14 (analog or digital, and preferably the latter) will be one and the same as a display unit already fitted to the most recent generation of handpiece consoles, through which the operator of the apparatus is able to monitor various functions (handpiece speed setting, temperature, disinfection and sterilization cycles, timer, etc.).

Similarly, the sensors 15 (which in the example of the drawings are three in number, i.e. sufficient for the purposes of producing a reliable ECG

trace) might be located at different positions on the apparatus R. In one possible solution (fig 1), the sensors 15 are concealed inside the first vertical column 4 and accessible through the panel 4a facing the chair 2; in effect, the single sensors 15 will be associated with flexible connection means taking the form of conventional sheaths 23 covering the relative conductors, which are retractable into the column and therefore of variable length in such a way as to permit of being drawn out at the moment of use and applied to the appropriate points of the patient's body, namely the wrists and throat.

In a second solution, the sensors 15 are stowed in at least one of the pair of horizontal armrests 18 associated with the backrest 3, passing through respective collars 24 afforded by the armrest 18 in question; likewise in this instance, the sensors 15 are attached to flexible connection means and can thus be drawn out to the appropriate length from the armrest 18 at the moment of application to the patient.

Yet another possible arrangement is illustrated in fig 1 (see inset P); in this instance, the single sensors 15 are associated with respective plugs S insertable individually into corresponding contact sockets C afforded by the column 4, and removable thus from the apparatus altogether. The advantage of this arrangement is that it allows for a safer and more convenient disinfection and sterilization of the sensors 15 following treatment on a single patient.

The electrocardiograph 13 might also be equipped with accessories, for example a printer 25 by means of which to produce hard copies of the ECG traces generated by the processing unit 13u.

Naturally enough, the processing unit 13u might also be incorporated directly into the electrical means 31 of the apparatus, thereby rendering the design generally more compact and more complete and achieving greater reliability in operation of the electrocardiograph 13 as a whole.

Thus, with a dental surgery apparatus as disclosed, it becomes possible to provide an additional and more complete back-up in monitoring the principal bodily functions of a patient during operations of a certain complexity; moreover, the architecture of the essential chair and column structures remains unaffected, and the proven practical and ergonomic advantages of the modern apparatus are therefore retained intact.

## Claims

1. A dental surgery apparatus, comprising:
  - a frame (1), supporting a reclining chair (2);

- a first vertical column (4), positioned alongside the chair and carrying at least a spittoon cup (5) and means (6) of supplying water to the cup;
- at least two arms (30, 7) anchored pivotably to and supported by the first column (4), of which the free ends support a lamp (8), and a console (9) carrying a plurality of primary handpieces (10), respectively;
- a second vertical column (11) positioned alongside the chair (2), supporting a plurality of secondary or accessory handpieces (12);
- electrical means (31), interfaced with hydraulic and pneumatic means (32, 33), by which to operate the various components of the apparatus, characterized
- in that it comprises an electrocardiograph (13) consisting in a processing unit (13u), at least one monitor (14) connected to the processing unit and serving to display an electrocardiographic trace generated by the unit, and a plurality of sensors (15) connected electrically and mechanically to the apparatus, for application to the body of a patient occupying the chair.

2. A dental surgery apparatus as in claim 1, wherein the monitor (14) is integral with the processing unit (13u) and rigidly associated with one end of a supporting bracket (16) of which the remaining end is anchored to the apparatus.

3. A dental surgery apparatus as in claim 1, wherein the monitor (14) is integral with the processing unit (13u) and rigidly associated with one end of a supporting bracket (16) of which the remaining end is anchored to one of the pivotable arms (30, 7).

4. A dental surgery apparatus as in claim 1, wherein the monitor (14) is associated with the handpiece console (9) and the processing unit (13u) is associated with the electrical means (31).

5. A dental surgery apparatus as in claim 1, further comprising a display associated with the handpiece console (9) and providing visual indication of the functions of the apparatus controlled by way of the electrical means (31), wherein the monitor (14) of the electrocardiograph and the display associated with the handpiece console (9) are one and the same,

and the processing unit (13u) is associated with the electrical means (31).

6. A dental surgery apparatus as in claim 1, wherein the sensors (15) are concealed inside the first vertical column (4) and associated singly with flexible connection means (23) in such a way that each can be withdrawn from the column and extended to a required length at the moment of application to the body of the patient. 5 10
7. A dental surgery apparatus as in claim 1, wherein the sensors (15) are stowed internally of at least one horizontal armrest (18) afforded by the chair (2), and associated singly with flexible connection means (23) in such a way that each can be withdrawn from the armrest and extended to a required length at the moment of application to the body of the patient. 15 20
8. A dental surgery apparatus as in claim 1, wherein the sensors (15) are associated with plugs (S) in such way that each can be individually connected to and removed from one of a corresponding set of contact sockets (C) afforded by the column (4). 25
9. A dental surgery apparatus as in claim 1, further comprising a printer device (25) for connection to the electrocardiograph (13), by means of which to produce a hard copy of the electrocardiographic trace generated via the processing unit (13u) from the signal returned by the sensors (15). 30 35

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FIG1

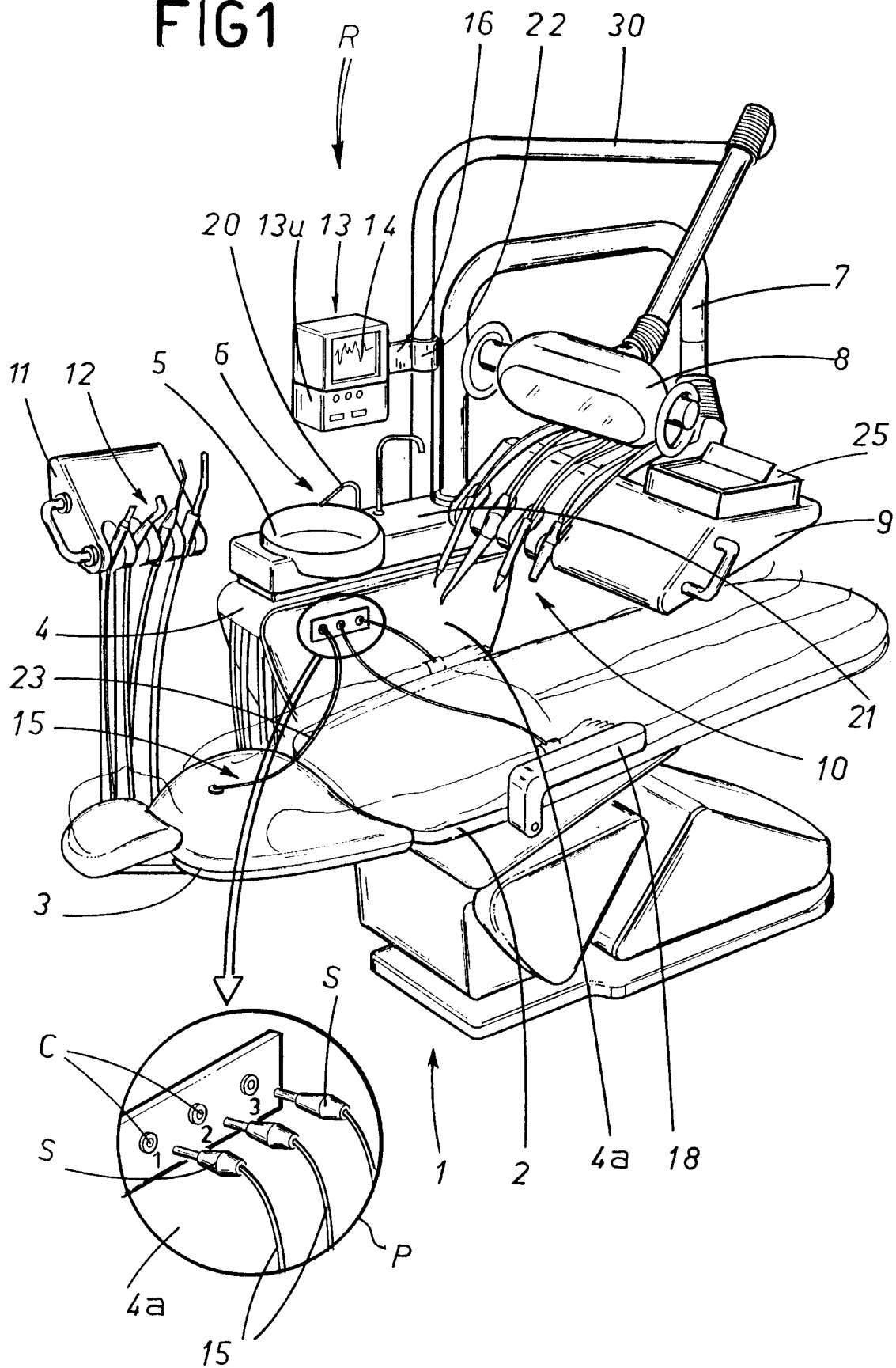


FIG 2

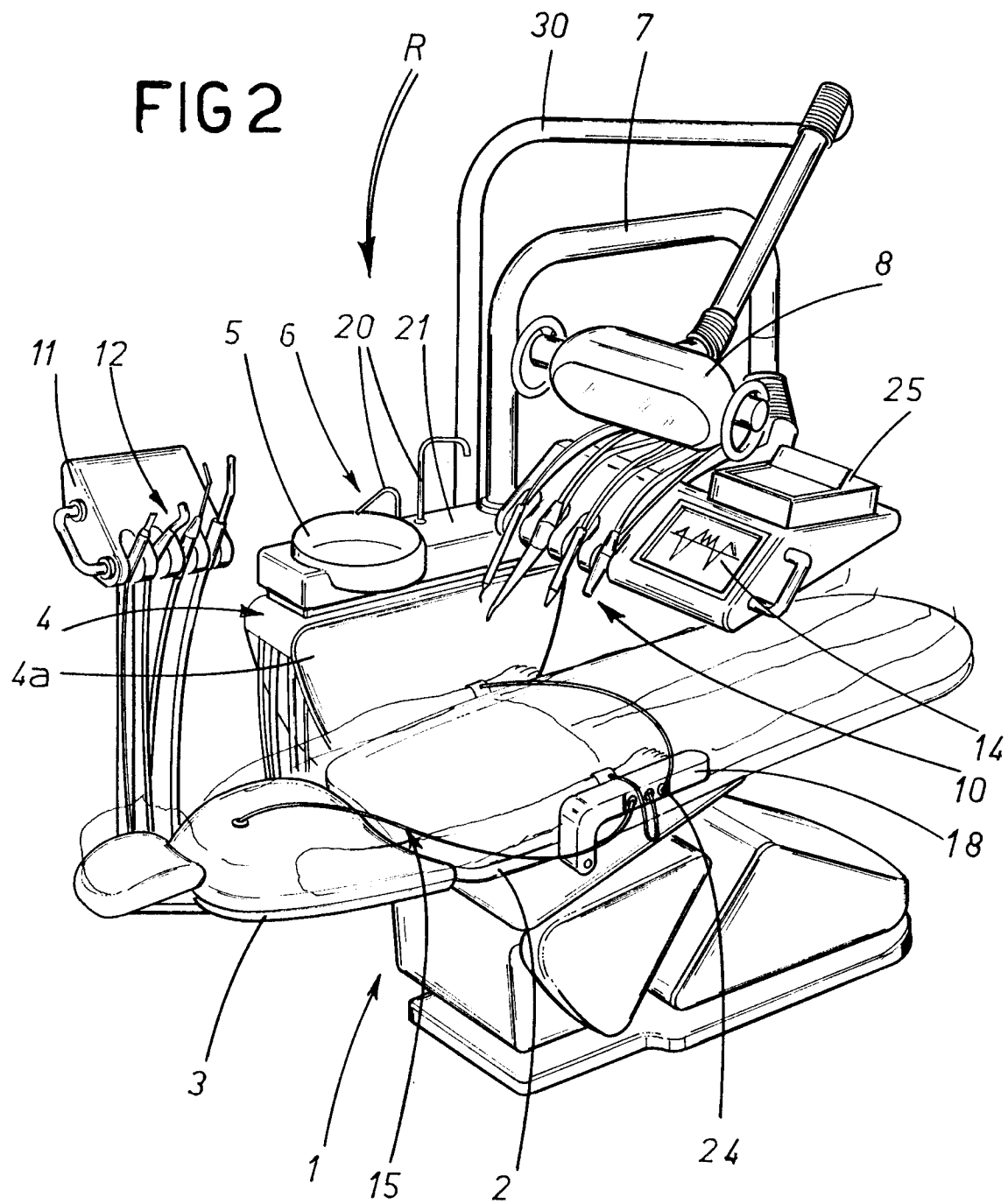


FIG 3

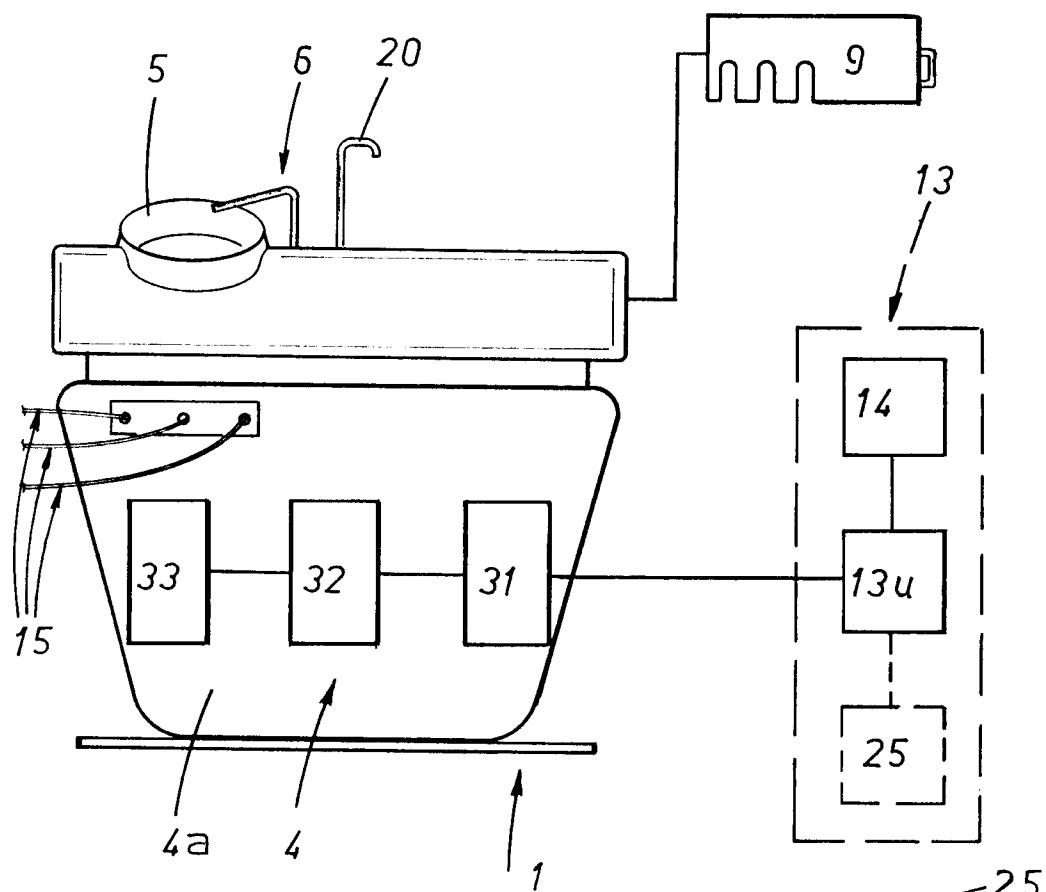
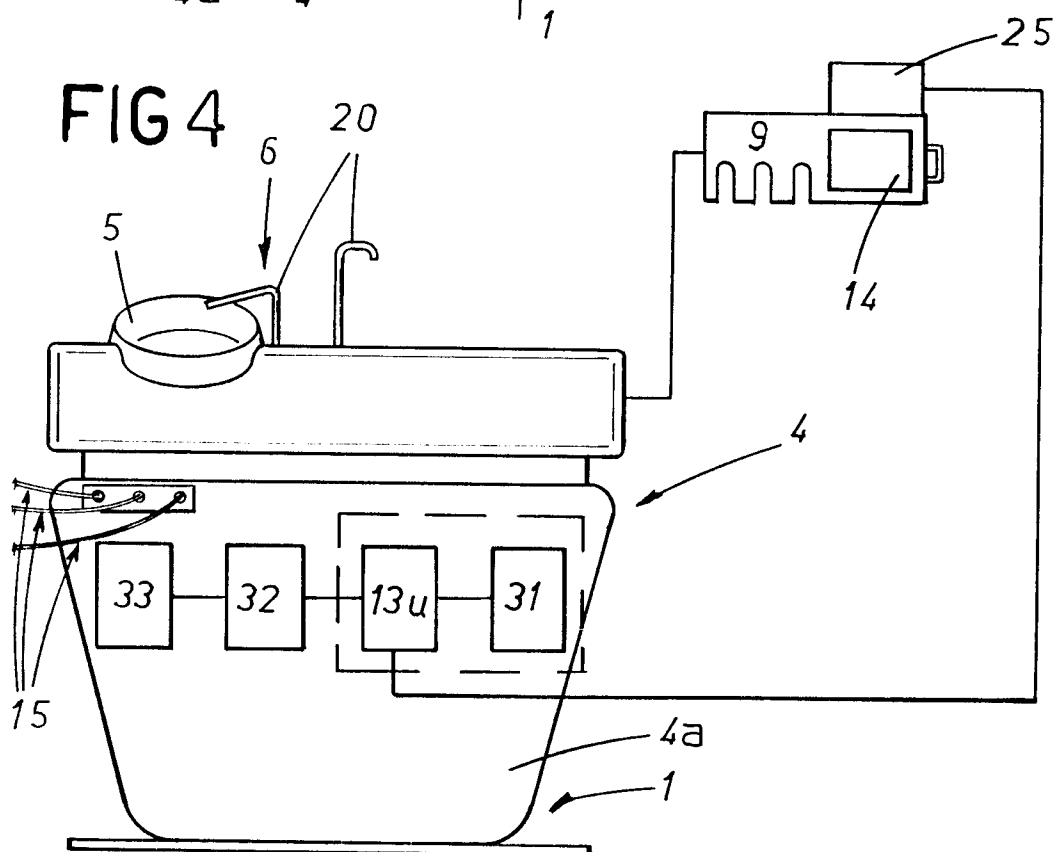


FIG 4





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## EUROPEAN SEARCH REPORT

Application Number  
EP 92 83 0537

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	US-A-4 013 328 (WOLF ET AL.) * column 2, line 35 - line 49 * * column 5, line 26 - line 52; figure 1 * ---	1	A61G15/14
A	WO-A-91 13589 (PRECISION DIAGNOSTICS) * abstract; figure 1 * ---	1	
A	WO-A-80 00655 (ALBERTI ET AL.) * abstract * * page 5, line 18 - line 31; figures 1,2,10 * ---	1	
A	DE-U-89 13 403 (SIEMENS) -----		
			TECHNICAL FIELDS SEARCHED (Int.Cl.5)
			A61G
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 11 November 1993	Examiner SANCHEZ Y SANCHEZ, J
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