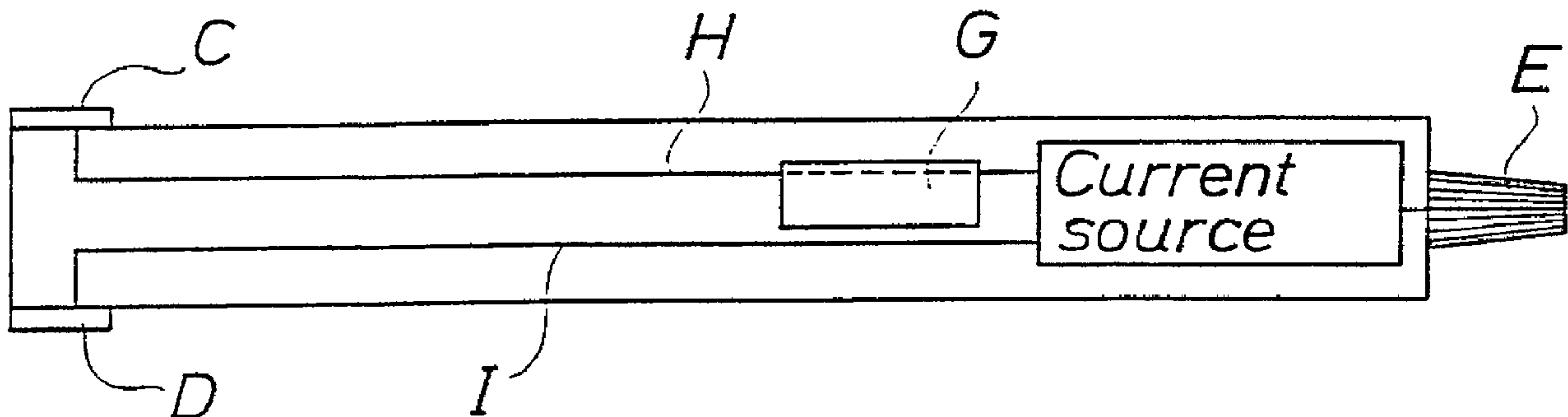




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(54) Title: MEASURING OF PAIN



(57) **Abrégé/Abstract:**

The invention relates to a measuring instrument for the measurement of an existing pain or a feeling of nausea of a patient. The measuring instrument induces pain in an arbitrary body part of said patient, by supplying an electrical current. The measuring instrument provides a current increase into said body part, until said induced pain is experienced by the patient as being as great as the existing pain/nausea. The current is supplied from a current source arranged in the measuring instrument via wires (H, I) and electrodes (C, D), said electrodes being applied onto that part of the body in which pain is to be induced. When the pain induced is experienced to be as great as the existing pain/nausea, the body part is removed from the electrodes, whereupon a pain value is registered and shown on a display (F).



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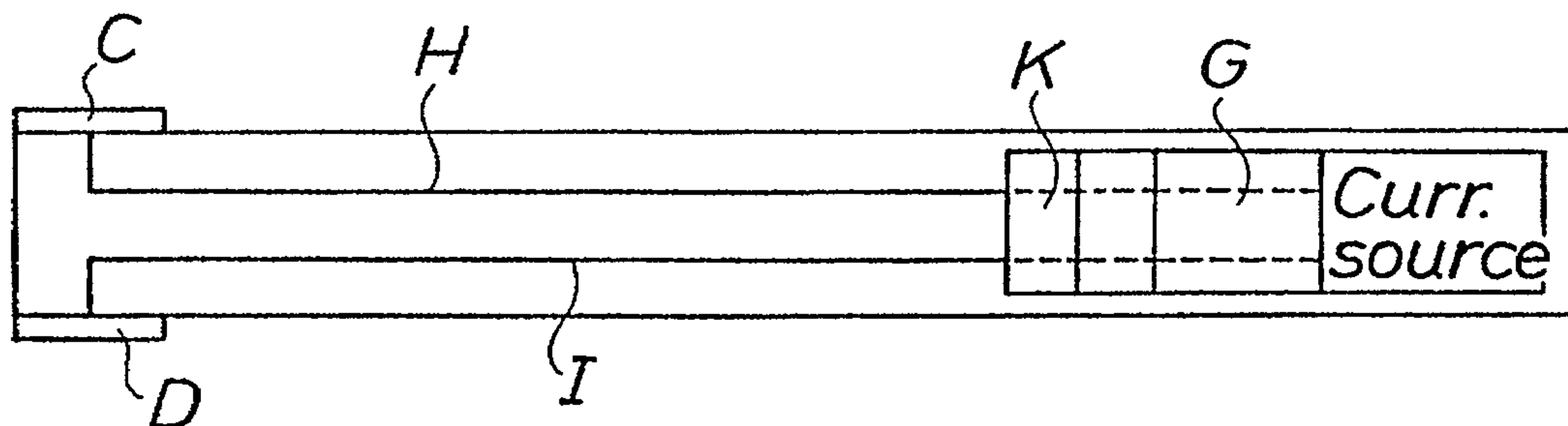
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**(57) Abstract**

The invention relates to a measuring instrument for the measurement of an existing pain or a feeling of nausea of a patient. The measuring instrument induces pain in an arbitrary body part of said patient, by supplying an electrical current. The measuring instrument provides a current increase into said body part, until said induced pain is experienced by the patient as being as great as the existing pain/nausea. The current is supplied from a current source arranged in the measuring instrument via wires (H, I) and electrodes (C, D), said electrodes being applied onto that part of the body in which pain is to be induced. When the pain induced is experienced to be as great as the existing pain/nausea, the body part is removed from the electrodes, whereupon a pain value is registered and shown on a display (F).

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5 MEASURING OF PAIN

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AREA OF THE INVENTION

The present invention relates to a measuring instrument and a method of measuring, by means of said instrument, an existing pain experienced by a patient.

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STATE OF THE ART

When a person in need of medical treatment first comes into contact with a doctor, a physiotherapist, a nurse etc., this person generally tries to describe his pain verbally, so that the medical staff are at least able to make a primary diagnosis of the patient's condition and suggest a suitable treatment. However, this creates a significant problem for the medical staff, depending upon different persons experiencing, and therefore describing, their pain or symptoms in different ways. One person may e.g. be more resistant to pain than others. Another person may e.g. have become used to his pain after a certain period of time and may therefore describe his/her pain in milder terms than he/she would have done if the pain had arisen recently. The varying descriptions of pain which a diagnostician may be exposed to, complicate a quick and exact diagnosis of a person's ailment or injury.

For the sake of simplicity, in the below text the patient is always referred to as being male. It should of course be understood, however, that the same applies to female patients.

In order to hitherto measure pain in patients, doctors, physiotherapists etc. use a so called measuring rod or ruler; this technique is called Visual Analogue Scale (VAS). The general design of a measuring rod having a VAS scale is

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shown in Figures 1 and 2. There is, however, a variety of different designs of this measuring rod, but their function is generally the same and will be described with reference to Figures 1 and 2.

5 As can be seen from Fig. 1, the measuring rod is divided into grades from e.g. 0-10, where "0" means no sensation of pain and where "10" means unbearable sensation of pain or worst possible sensation of pain. Fig. 2 shows the reverse side of the measuring rod of Fig. 1, and during a measure-
10 ment the patient will only see this side.

Suppose a patient having a pain in his arm goes e.g. to a doctor. The doctor picks up his ruler (measuring rod) and asks the patient if he can describe his sensation of pain by placing his finger on that spot on the ruler which best
15 corresponds to the sensation of pain in his arm. The doctor has of course previously explained to the patient how the ruler functions, i.e. that one end A of the ruler corresponds to no sensation of pain and the other end B of the ruler corresponds to an unbearable sensation of pain (Fig.
20 2).

Assume that the patient places his finger on the ruler at a value of "7" on the pain scale (0-10). The scale on the ruler is turned towards the doctor so that only he can see the pain scale (Fig. 1) and the patient can only see the
25 reverse side of the ruler as shown by Fig. 2.

The doctor thus quickly obtains information about how the patient at present subjectively experiences the pain in his arm.

The doctor then prescribes a treatment for the patient,
30 e.g. some kind of painkiller.

When the patient comes for his next visit to the doctor, the same procedure with the ruler is repeated, and the patient now places his finger at a location on the ruler which e.g. corresponds to the value "2" on the pain scale
35 (0-10).

The doctor thus obtains an indication that the pain in the arm has decreased; the doctor of course comparing the previous value of "7" with the present value of "2". Thus, the doctor can conclude that the treatment has been
40 effective.

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If the patient during his next visit instead places his finger at a location on the ruler which e.g. corresponds to the pain value of "8,5", the doctor can instead determine that the previous treatment has been ineffective, and he can
5 therefore act accordingly; e.g. prescribe a new medicine or a referral to a physiotherapist, a masseur etc. The doctor thus uses the measuring rod to determine whether a treatment has been effective or not.

One problem with this ruler according to Figures 1 and 2
10 is that the patient must consciously think about and evaluate where to place his finger on the ruler, between the values no sensation of pain and unbearable sensation of pain, as shown in Fig. 2. The patient is all the time aware of, that the closer he places his finger in relation to the
15 end A of the ruler, i.e. no sensation of pain, the less pain he is supposed to sense, and the closer he places his finger in relation to the end B of the ruler, i.e. unbearable sensation of pain, the more pain he is supposed to sense. This awareness of the patient is just what the present invention
20 eliminates.

Another problem with the ruler according to Figures 1 and 2 is that the doctor cannot objectively verify the pain value given by the patient; the patient may e.g. lie about his sensation of pain and place his finger at the same pain
25 value at different measurement occasions.

A further problem with the ruler according to the Figures 1 and 2 is that different persons sense pain in different ways.

Some persons can stand pain better than others and will
30 describe their pain with a low value (e.g. "2") on the ruler; other persons have a low pain threshold and will describe the same pain with a high value (e.g. "9") on the ruler.

The present invention eliminates also this problem.
35 In order to find out if the previous art solves the problems mentioned above, a pre-study was performed, whereby the following documents were found.

The document EP,B1 0 438 541 describes a portable instrument performing a multidimensional indication of pain
40 sensed by a person. The portable instrument has indicators

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that may be adjusted by a person to provide a physical indication of the type of pain intensity being sensed by said person.

The document US, 4,641,661 describes an electronic
5 meter for determining the pain threshold for a pressure applied to the skin surface of a patient. The pressure is increased until the patient presses a button when he/she senses pain. The pressure achieved is registered.

The document US, 4,697,599 describes a device for
10 localisation and detection of pain by measurement of the conductivity of the tissue.

The document US, 5,020,542 shows a method for measuring the sensibility of the skin of a patient to electrical stimulation.

15 The document JP, 7,023,964 describes a method for measuring pain objectively and quantitatively.

The document GB, 2,049,431 describes a so-called measuring rod for providing a subjective measurement of the pain sensed by the patient.

20 The documents found do not solve the problems mentioned above.

SUMMARY OF THE INVENTION

Thus, the object of the present invention is to solve the above problems.

25 Another object of the present invention is to allow an objective way of performing the pain measurement.

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Yet another object of the present invention is to provide a measurement value of pain which is relevant for comparison between different patients.

5 A further object of the present invention is to provide a portable, very easy to use, measuring instrument for the measurement of pain.

Yet a further object of the present invention is to allow the doctor, the physiotherapist etc. to feel and sense the patient's pain, which has a psychological
10 significance that may entail a shortened time for medical care of the patient, as the patient feels he has been understood.

In accordance with the present invention, there is provided an apparatus for assessing the level of an
15 arbitrary first sensation experienced by a person, the first sensation being compared to an induced physical sensation, the apparatus comprising: a stimulator configured to supply a physical stimulus of an electrical current from a current source to said person and to thereby induce a physical
20 sensation in said person, the current source being connected via wiring to a first and a second electrode; an activator mechanism, being devised to activate an increasing supply of said physical stimulus; a deactivator mechanism actuateable by said person and being devised to deactivate the supply of
25 said physical stimulus; a stimulation level control device configured to provide an increase in said physical stimulus; a registration device for registering a sensation level value dependent on the supplied physical stimulus and corresponding to said first experienced sensation in
30 response to a deactivation by said person of said supply of the physical stimulus when the induced physical sensation is perceived to be comparable to the first experienced

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sensation; and a support structure for said electrodes, the electrodes being positioned on said support structure such that the electrodes are capable of being pressed against a body part of said patient and thereby achieve a closed
5 current circuit for the electrical current stimulus.

Detailed embodiments of the present invention will now be described with reference to the enclosed drawings.

SHORT DESCRIPTION OF THE DRAWINGS

Fig. 1 shows a principle design of a measuring rod
10 (ruler) according to the state of the art, seen from the front;

Fig. 2 shows the measuring rod of Fig. 1 seen from the rear;

Fig. 3 shows a cross sectional view from above of
15 a first embodiment of the measuring instrument according to the invention;

Fig. 4 shows a side view of the measuring instrument of Fig. 3;

Fig. 5 shows a second embodiment of the measuring
20 instrument according to the invention;

Fig. 6 shows a cross sectional view from above of a third embodiment of the measuring instrument according to the invention;

Fig. 7 shows a side view of the measuring
25 instrument of Fig. 6;

Fig. 8 shows a cross sectional view from above of a fourth embodiment of the measuring instrument according to the invention;

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Fig. 9 shows a fifth embodiment of the measuring instrument according to the invention; and

Fig. 10 shows a cross sectional view from above of a sixth embodiment of the measuring instrument according to
5 the invention;

DETAILED DESCRIPTION OF EMBODIMENTS OF THE INVENTION

In the following, each of the embodiments mentioned according to Figures 3-10 will be discussed. The first embodiment of the invention will be described in more
10 detail, as this embodiment will also describe the idea of

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the invention by means of an example.

The other embodiments are based on the same inventive idea.

Referring now to Figures 3 and 4, two electrodes C and D are attached, one on each side, at one end of the measuring instrument. The electrodes are connected by wires I and H to a current source, where the current is controlled by a control knob E.

At one side of the measuring instrument there is a display F, capable of showing, e.g. digitally, a value of e.g. 0-10. This value is of course intended for indication, in the same way as before, of a degree of pain sensed, where the value "0" corresponds to a total absence of pain and the value "10" corresponds to an unbearable pain.

Furthermore, there is a memory register G for storage of an arbitrary number of pain readings (0-10).

The present invention will now be described by way of an example, with reference to Figures 3 and 4.

Assume that a patient having pains in his arm comes to a doctor. The doctor produces his measuring instrument according to the first embodiment, and asks the patient to take a steady grip with e.g. his index finger and thumb around the electrodes C and D.

The doctor now informs the patient that a current will be supplied to the electrodes, the increase of which will be controlled by the doctor via the control knob E. The doctor further informs the patient that he will sense a pain in the index finger and thumb that are grasping the electrodes C and D; as the current increases, the pain in the fingers will increase accordingly. The doctor now informs the patient that he should release the grip around the electrodes C and D when the pain in his fingers is experienced to be as great as the pain in the bad arm.

The doctor thus increases the current through the wires H and I with the control knob E, and when the patient senses that the pain in his fingers is as great as the pain in the bad arm he releases his grip around the electrodes C and D, whereupon a pain reading, e.g. "7,8" is registered in the memory G and is displayed digitally on the display F. This pain value is of course proportional to the magnitude of the

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current.

When the patient returns after treatment, the same procedure is repeated, whereupon the pain reading "2" is registered. Thus, the doctor now knows, in the same manner as before, that the treatment has been effective.

The above described measuring instrument according to the present invention however differs markedly from the earlier measuring rod according to Figures 1 and 2, through the patient associating, by means of the measuring instrument according to the present invention, a pain (in his fingers) with another pain (in his bad arm).

The patient thus releases the grip around the electrodes C and D when the pain in his fingers is experienced as being as great as the pain in his arm, and the patient thus has no idea about which pain reading on the scale (0-10) he causes.

When the patient uses the measuring instrument according to the present invention, he will not refer to any greatest (unbearable sensation of pain) or smallest (no sensation of pain) pain value as with the measuring rod according to Figures 1 and 2.

The pain measurement according to the present invention is thus objective in the sense that the patient cannot consciously determine what pain value he will obtain, as it is the comparison between the pain in his fingers and the pain in his arm that is his reference, not any visual pain scale.

Furthermore, as a given pain value corresponds to a given current level, pain values between different patients can be compared. It is thus possible, based on the pain values, to determine objectively that a certain patient will endure greater pain than another patient; this is e.g. not possible with the measuring rod according to Figures 1 and 2. With the measuring instrument according to the present invention the doctor can easily check if the patient is "lying" about his pain by performing an arbitrary number of measurements and comparing the pain values from the different measurements; if approximately the same pain value is obtained throughout all measurements it can be regarded as reasonable that the patient speaks the truth.

The doctor can also experience the pain which the patient senses, by grasping himself around the electrodes C

and D; this may be of psychological importance to the patient and entail a shortening of his time in medical care.

Fig. 5 shows a second embodiment of the measuring instrument according to the invention. This embodiment differs from the measuring instrument in Figures 3 and 4 only by the current to the electrodes C and D being increased by means of a push-button J.

By depressing this button J, the current is thus increased in an arbitrary, predetermined fashion; for example 50 μ A upon each depression.

The Figures 6 and 7 show an especially preferred embodiment of the measuring instrument. This embodiment functions in such a way that when e.g. the thumb and the index finger grasp around the electrodes C and D, a current circuit is closed, whereby a current flows from the current source via the wire H and the electrode C through the thumb and the index finger, and back to the current source via the electrode D and the wire I. The current increases automatically by steps of e.g. 50 μ A, being controlled by a microprocessor K. Furthermore, the microprocessor may be programmed so as to control the current increase in a linear or exponential manner. The microprocessor also controls the time it will take for the current to increase from a minimum current to a maximum current.

When the current has increased to such an extent that the patient experiences the pain in his thumb and index finger to be as great as the pain in e.g. his bad arm, the patient releases his grip around the electrodes C and D, whereupon the current circuit is interrupted, and the current value is registered, in the same manner as before, in the memory G and shown on the display F. This measuring instrument according to Figures 6 and 7 is thus very easy to handle and user friendly, as it only needs for the patient to grasp with his thumb and index finger around the electrodes C and D, whereupon the current increase takes place fully automatically. The measuring instrument according to Figures 6 and 7 may also be equipped with a stop button (not shown) for stopping the automatic current increase. When the patient depresses this stop button, the automatic current increase will stop, causing the current source only to feed

a constant current, corresponding to the current flowing immediately before the stop button was depressed.

This stop button may be used, for example, when the doctor wants to experience the current strength that the patient senses. This is thus performed through the patient stopping the current increase when the existing pain (e.g. his bad arm) is experienced as being as great as the pain caused by the current, by depressing the stop button, whereupon the doctor grasps, with his fingers, around the electrodes C and D. It may, as mentioned before, have a certain psychological impact, that the doctor can experience the patient's pain, as the patient may then feel understood. If the stop button is depressed again, the current will resume its automatic increase.

Fig. 8 shows a fourth embodiment of the measuring instrument. This measuring instrument in principle functions in the same manner as the measuring instrument of Figures 6 and 7; the current will increase automatically when the current circuit is closed (i.e. when the electrodes C and D are short-circuited).

This measuring instrument however differs from the earlier described measuring instruments by having its electrodes C and D arranged in such a manner as to be applicable anywhere on the body. This measuring instrument is especially advantageous for use with extremities which are paired, e.g. arms, legs, ears, etc.

Assume for example that a patient has a pain in his left knee. The doctor then applies the electrodes C and D of the measuring instrument according to Fig. 8 onto the patient's right knee, whereupon pain is also induced in this knee. The measuring instrument according to Fig. 8 thus utilises the principle that it is easier for a patient to associate a pain in his left knee with a pain in his right knee; it is easier to compare pain sensations in similar body parts. The sensation of pain in each side of the body is transferred independently to the brain. Consequently, the sensitivity in a certain area of the body can be compared to that in a reference area on the opposite side thereof.

In the embodiments of the measuring instrument according to the present invention, it should be understood that it is

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also possible to reduce the current via the push-button J or the control knob E. In one embodiment of the present invention it will be possible to combine the automatic current increase and the stop button with the push-button J or the control knob E.

It will also be possible for a patient to perform the pain measurement himself, in the absence of a doctor, physiotherapist, etc. In this case, the pain values are not shown on the display F but are only stored in the memory G, so as not to inform the patient about them. The doctor may subsequently, by means of a certain button (not shown) retrieve these values from the memory G and show them on the display means.

The memory G will be designed so that arbitrary information, such as e.g. time, date, various patient names with their respective series of pain values etc., may be stored. There will also be a possibility for printing out this information on e.g. a strip of paper.

Fig. 9 shows an especially preferred embodiment of the measuring instrument which is a combination of the measuring instrument of Figs. 6 and 7 and the measuring instrument of Fig. 8. This measuring instrument is thus designed on the one hand to be grasped around the electrodes L and M with the fingers, on the other to be applicable onto an arbitrary body part via the electrodes N and O, in the same way as described before.

In order for the patient to receive adequate pain stimulation in the body part which is touched by the electrodes, it is necessary to secure a predetermined minimum pressure against the electrodes.

One way of achieving this is to see to it that this predetermined minimum pressure corresponds to the force required to grasp the electrodes C and D by the thumb and index finger and at the same time to hold the measuring instrument in a horizontal position. In this case it will be required that a string is attached to an arbitrary position on the measuring instrument, whereby e.g. the doctor holds the other end of the string, to prevent the instrument from falling to the floor when the patient releases the electrodes C and D. If the doctor is increasing or decreasing

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the electrode current manually, in this case, when the measuring instrument is in a horizontal position, an external hand-held control is required. The hand-held control is then connected to the measuring instrument by a wire and
5 thus replaces the push-button J and the control knob E. If the current increase is automatic, naturally no external hand-held control is necessary.

Yet another method for arranging this predetermined minimum pressure on the electrodes is to use a resilient
10 contact as shown in Fig. 10. In this case, the electrodes must be pressed inwards until they touch the contacts P and Q, whereby the current circuit is closed. This pressure for closing the circuit is consequently so matched as to achieve an adequate pain stimulation.

15 It should be understood that the measuring instrument according to the embodiments described above is a portable instrument that can easily be carried by e.g. a doctor. The length of the instrument will principally correspond to the length of the previous measuring rod. However, the instrument will be somewhat thicker than the previous measuring
20 rod, as this instrument has to contain a certain amount of electronics.

The measuring instrument preferably comprises at least a battery, a means of upwards transformation of voltage, a
25 microprocessor for display control etc., and possibly memory circuits. The pain scale to be utilised preferably runs from 0,0 - 9,9, 0 - 60 or 0 - 99.

It has been shown, empirically, that the pain measurements with this measuring instrument functions in a very
30 satisfactory way when the following measurement method is used:

- the patient grasps around the electrodes (C, D) with his right thumb and index finger;
- the current is increased automatically when the circuit is closed (alternatively, the patient has to press the
35 start button in order to start the automatic current increase);
- when the pain in his fingers is experienced as being as great as his existing pain in e.g. a knee, the patient
40 depresses the stop button. The automatic current increase

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ceases and the stimulation remains constant. The patient will at this point try "once extra", that the pain in his fingers is as great as the existing pain;

- the patient then releases his tweezers grip around the electrodes (C, D). If the patient thinks the pain in his fingers is lower than the existing pain, he may push the stop button again, making the current increase automatically, etc. It is thus not until the patient releases his tweezers grip (open circuit), that the measurement is terminated;

- the doctor depresses the value button, the pain value is shown on the LCD, and the pain value is noted down.

It is to be understood that the stop button is arranged at such a location on the measuring instrument as to be easily accessible for the patient.

It is further foreseen that the measuring instrument (the pain meter) will be used for pain measurements outside the hospital. A large application area is pain measurement during studies of pharmaceutical drugs. The pain meter must then follow the patient 24 hours/day.

The patient will perform the pain measurement himself as described above, with the difference that upon a finished measurement, the pain value is saved in a memory and the pain meter is switched off automatically. The patient consequently will not see the measured pain value. After e.g. four weeks the patient goes to see his doctor. The doctor takes the pain meter and connects it to a computer, preferably via an interface. The saved pain values are transferred to the computer for further analysis/processing.

Examples of data saved are patient name/birth data, date (each measurement), time (each measurement), and pain value (each measurement). It is also conceivable that the pain meter includes a system for making the patient aware of that it is time to perform a measurement, or that the pain meter is integrated into a system where this function is available.

In the foregoing, we have only discussed a comparison between an induced pain and an existing pain. It is of course to be understood, that the measuring instrument according to the invention may be used to compare an induced

pain with, in general, an arbitrary feeling. If, for example, a patient feels ill at ease, this feeling may be compared with a pain induced into the patient by means of the measuring instrument. The invention is especially
5 intended for also allowing the comparison between a pain induced by the measuring instrument and sensations of nausea. It is to be understood that in the concept of pain, we also include unpleasant sensations.

The quintessence of the present invention, however, is
10 that the patient receives a physical stimulus (electrical current) into a part of his body, and compares said induced pain in this body part with an existing pain (e.g. his bad arm) or with a feeling of nausea. When the induced pain in the body part coincides with the existing pain/nausea sen-
15 sation, the pain value is registered through the patient actively causing the induced pain to cease.

In this way the pain may be objectively graded, with the physical stimulus (the current) as reference, i.e. there is no reference to any fixed values running from "no sensation
20 of pain" to "worst possible sensation of pain".

It is to be understood that the physical stimulus does not necessarily have to be an electrical current; it could also be a mechanical pressure or application of heat.

The above description is only to be regarded as advan-
25 tageous embodiments of the invention, and the scope of the invention is only defined by the contents of the accompanying patent claims.

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CLAIMS:

1. An apparatus for assessing the level of an arbitrary first sensation experienced by a person, the first sensation being compared to an induced physical sensation,
5 the apparatus comprising:

a stimulator configured to supply a physical stimulus of an electrical current from a current source to said person and to thereby induce a physical sensation in said person, the current source being connected via wiring
10 to a first and a second electrode;

an activator mechanism, being devised to activate an increasing supply of said physical stimulus;

a deactivator mechanism actuateable by said person and being devised to deactivate the supply of said physical
15 stimulus;

a stimulation level control device configured to provide an increase in said physical stimulus;

a registration device for registering a sensation level value dependent on the supplied physical stimulus and
20 corresponding to said first experienced sensation in response to a deactivation by said person of said supply of the physical stimulus when the induced physical sensation is perceived to be comparable to the first experienced sensation; and

25 a support structure for said electrodes, the electrodes being positioned on said support structure such that the electrodes are capable of being pressed against a body part of said patient and thereby achieve a closed current circuit for the electrical current stimulus.

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2. The apparatus as recited in claim 1, wherein the electrodes are positioned on opposite sides of said support structure such that the electrodes are capable of being grasped between the fingers of said person.

5 3. The apparatus as recited in claim 2, wherein the support structure is portable, elongate and adapted such that the force between fingers grasping the electrodes required to maintain said support structure in e.g. a horizontal position corresponds to a predetermined minimum
10 pressure.

4. The apparatus as recited in claim 1, wherein the electrodes being positioned close to each other on one side of said support structure such that the electrodes are capable of being applied to an arbitrary part of the body of
15 said person.

5. The apparatus as recited in claim 1, further comprising memory circuits being devised for registration of said sensation level value, possibly together with date and time data.

20 6. The apparatus as recited in claim 1, further comprising:

a display devised for displaying a registered sensation level value; and possibly a value switch devised to activate a presentation of said sensation level value on
25 said display.

7. The apparatus as recited in claim 1, further comprising an interface for enabling the transfer of said sensation level values to a computer for analysis and processing.

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8. The apparatus as recited in claim 1, wherein:

said activator mechanism and deactivator mechanism is devised such that the delivery of an increasing electrical current is activated in response to the electrodes being connected in a closed electrical circuit e.g. when in contact with the body of the person and deactivated when the closed circuit is interrupted e.g. due to the electrodes being removed from the body on the motion of the person;

10 the registration device is devised such that a sensation level value dependent on the level of the electrical current is registered by the registration device in response to said interruption of the circuit.

9. The apparatus as recited in claim 1, further comprising a resilient contact means provided between said electrodes and said wiring such that a predetermined pressure against said electrodes is required to establish electrical contact for delivering electrical current to said electrodes.

20 10. The apparatus as recited in claim 1, further being devised such that the electrical current starts to increase automatically in response to the electrodes being short-circuited.

11. The apparatus as recited in claim 1, further comprising an electrical current source of battery means and means for upwards voltage transformation.

12. The apparatus as recited in claim 1, further comprising a microprocessor configured to control the components of said apparatus.

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13. The apparatus as recited in claim 1, wherein the stimulation level control device increases the electrical current in an arbitrary predetermined fashion, for example increasing in steps of 50µA in one of a linear or
5 exponential manner.

14. The apparatus as recited in claim 1, wherein said registration device registers said sensation level value on a scale ranging from one of 0-10, 0-60 or 0-99.

15. The apparatus as recited in claim 1, further
10 comprising a system for signalling time for performing an assessment sequence.

16. The apparatus as recited in claim 1, wherein the sensation to be assessed is one of pain or nausea.

17. The apparatus as recited in claim 1, wherein the
15 induced physical sensation is pain.

SMART & BIGGAR

OTTAWA, CANADA

PATENT AGENTS

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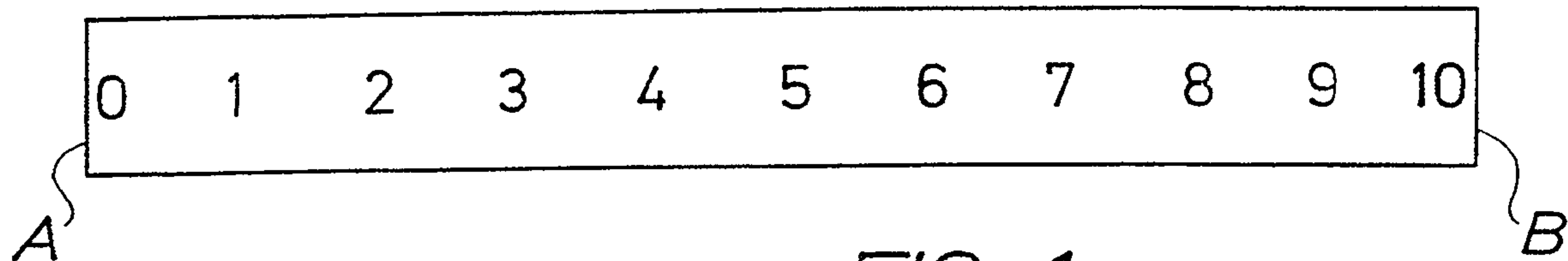


FIG. 1

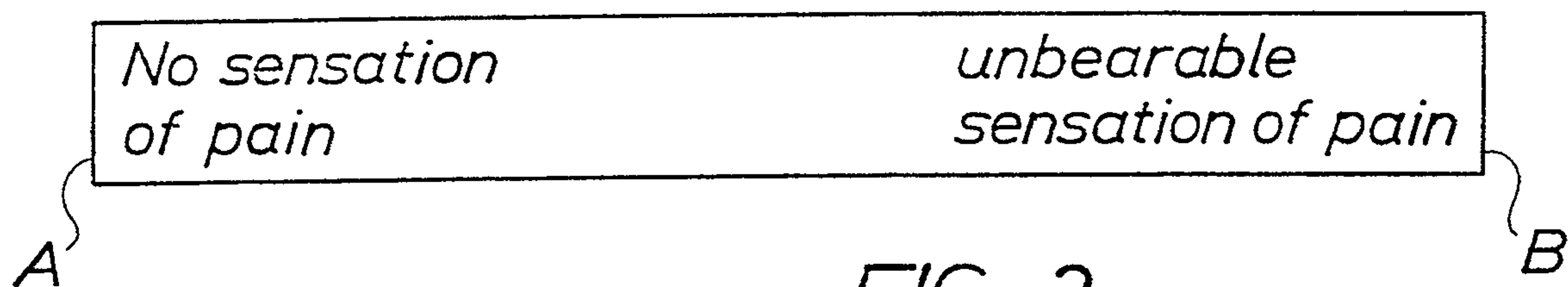


FIG. 2

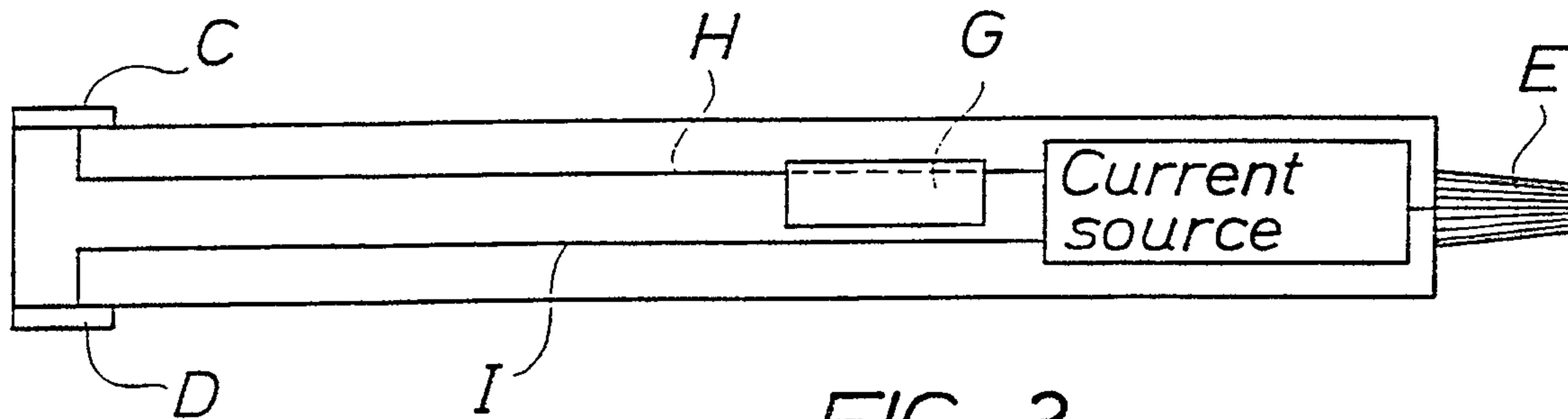


FIG. 3

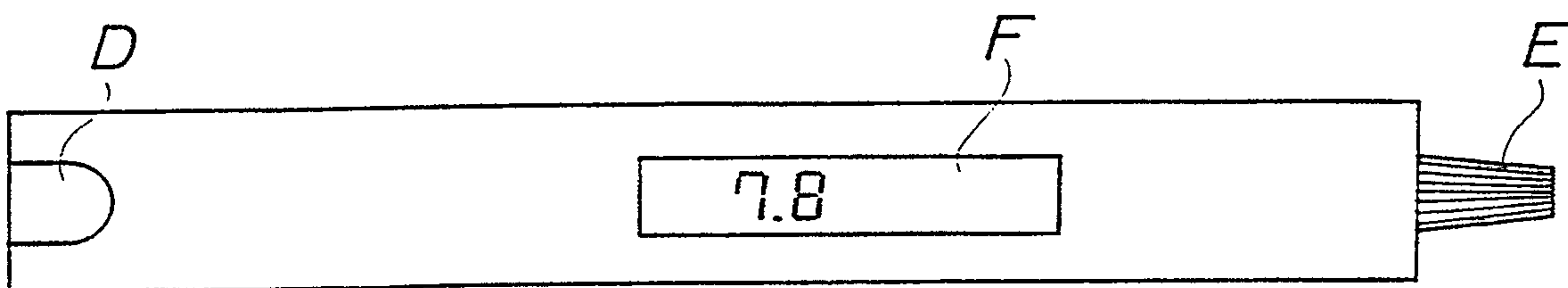


FIG. 4

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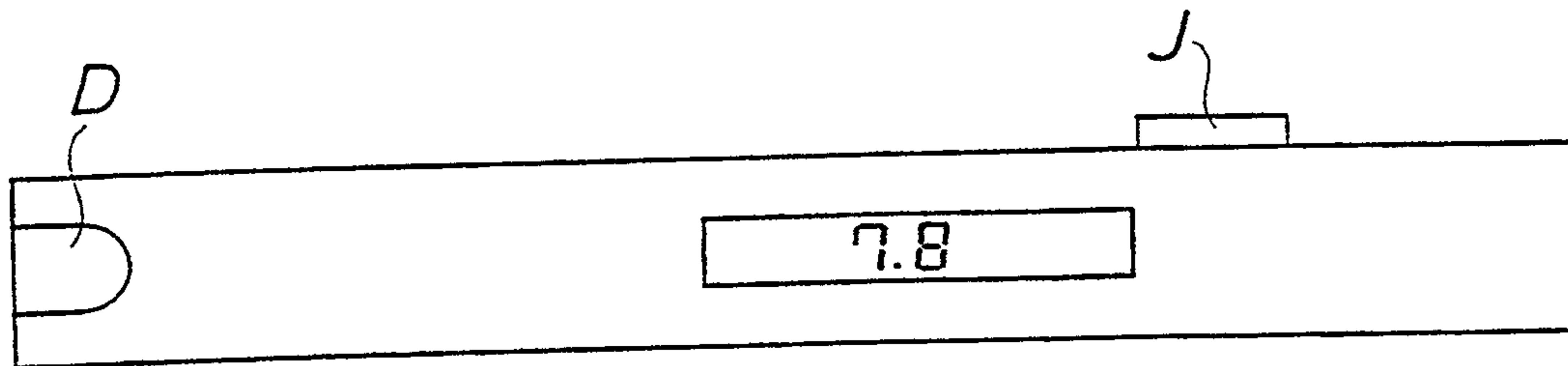


FIG. 5

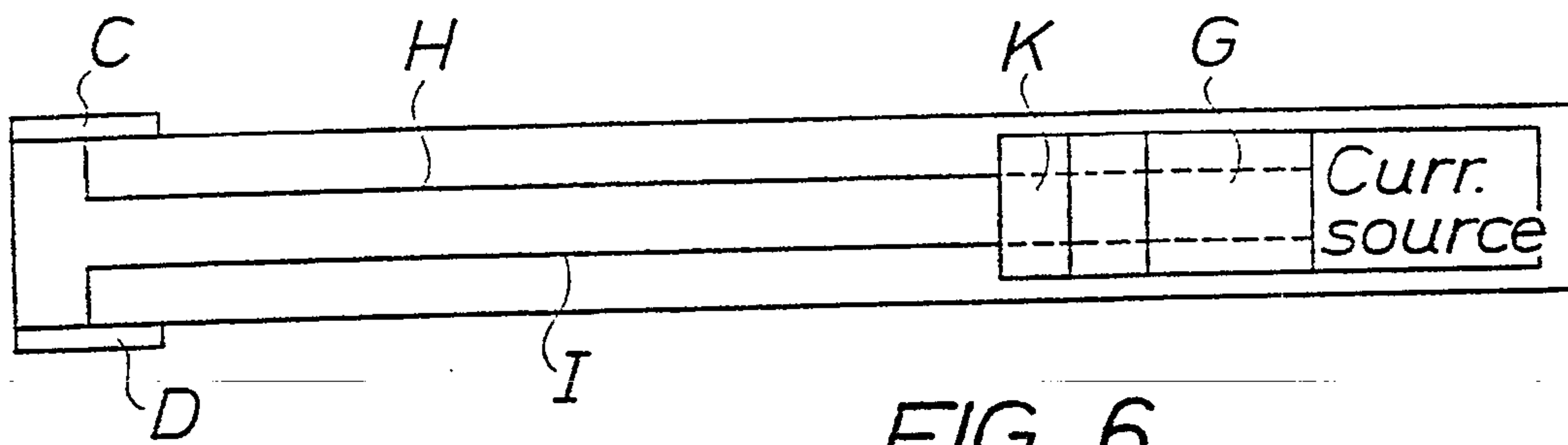


FIG. 6

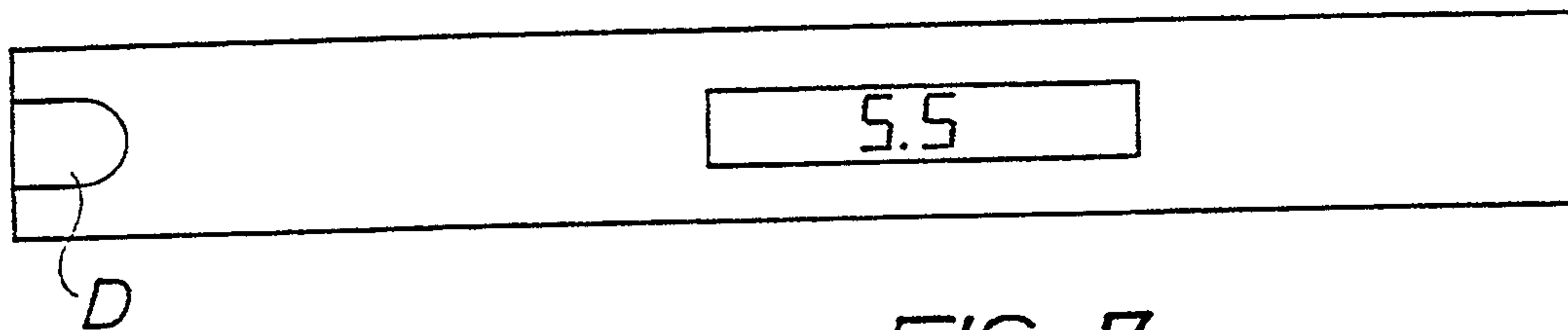


FIG. 7

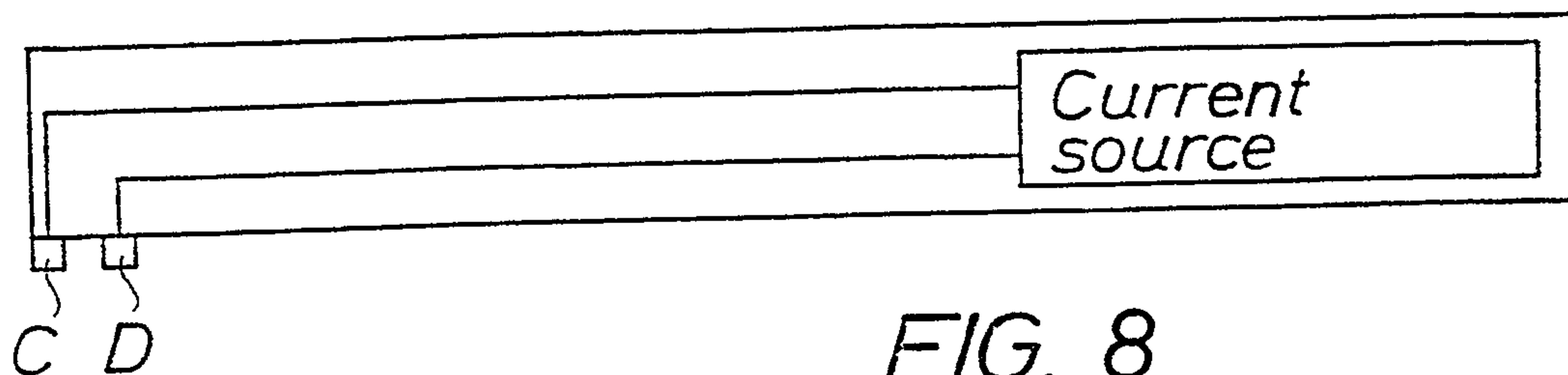


FIG. 8

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