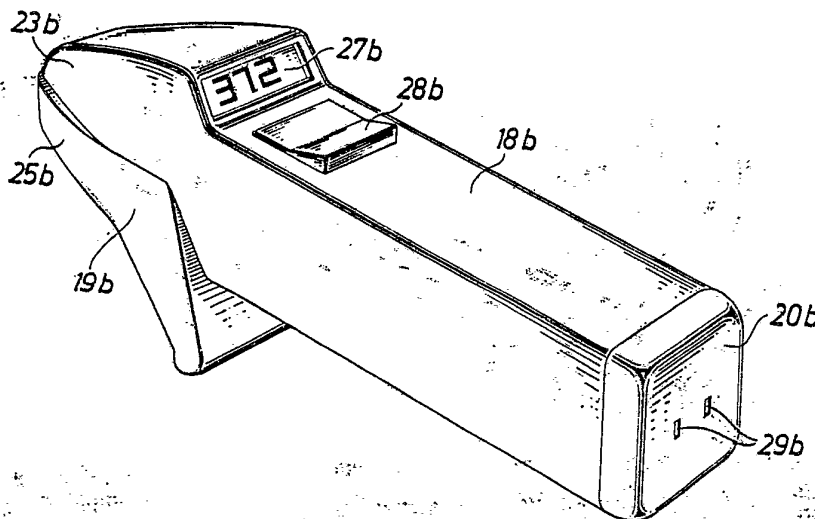




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(21) International Application Number: PCT/SE78/00013 (22) International Filing Date: 3 July 1978 (03.07.78) (71) Applicant (for all designated States except US): GAMBRO AB [SE/SE]; Fack, 220 10 Lund-10 (SE). (72) Inventors; and (75) Inventors/Applicants (for US only): HÅKANSSON, Bo, Håkan [SE/SE]; Astrakavägen 6, 223 56 Lund (SE). PERSSON, Per, Eskil, Lennart [SE/SE]; Bredgatan 27, 222 21 Lund (SE). (74) Agent: BOBERG, Gunnar; Gambro AB, Patentavdelningen, Fack, 220 10 Lund-10 (SE).		(81) Designated States: BR, CF (OAPI patent), CG (OAPI patent), CH, CH (European patent), CM (OAPI patent), DE, DE (European patent), FR (European patent), GA (OAPI patent), GB, GB (European patent), LU, LU (European patent), MG, MW, SE, SE (European patent), SN (OAPI patent), SU, TD (OAPI patent), TG (OAPI patent), US. (82) Elected States: BR, DE (European patent), GB (European patent), SE, SE (European patent), SU. Published with: <i>International search report</i> <i>Amended claims</i>

(54) Title: A DEVICE FOR THE GRIPPING OF A TEMPERATURE MEASURING DEVICE AND FOR THE READING OF MEASURING VALUES OBTAINED WITH THE DEVICE

**(57) Abstract**

Device for the gripping of a temperature measuring device and for the reading of measuring values obtained with this device. The said temperature measuring device comprises a temperature-sensitive sensor (1), whose electrical properties, e.g. the resistance, vary with the temperature, e.g. a thermistor (1), and which is connected via two contacts (3, 4) to two electric conductors (9, 10) arranged on a support (7), which electric conductors terminate in two contact surfaces at the end remote from the sensor (1). An arrangement in accordance with the invention, which is intended mainly to be used for medical temperature measuring, is characterized by at least two measuring contact surfaces which can be coupled together with the said contact surfaces (31, 32) arranged on the inside or insides of the jaws or a tonglike construction (18-26). These measuring contact surfaces constitute a circuit which in addition comprises a source of energy (45), a display unit (49) and means (46-48) for the conversion of the measuring value obtained to a value which can be read on the display unit (49).

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TITLE

A DEVICE FOR THE GRIPPING OF A TEMPERATURE MEASURING
DEVICE AND FOR THE READING OF MEASURING VALUES
OBTAINED WITH THE DEVICE

5

TECHNICAL FIELD

The present invention relates to a device for the
gripping of a temperature measuring device and for the
reading of measuring values obtained with the device, this
10 temperature measuring device comprising a temperature-
-sensitive sensor, whose electrical properties, e.g. the
resistance, vary with the temperature; e.g. a thermistor,
and which is connected via two contacts to two electric
conductors arranged on a support, which electric conductors
15 terminate in two contact surfaces at the end remote from
the sensor.

The device in accordance with the invention is intended
mainly to be used for medical temperature measurement. It
will be clear, however, to those versed in the art that it
20 can also be used in other circumstances, e.g. in purely
industrial applications.

BACKGROUND ART

An embodiment of the device in accordance with the
25 invention is specially adapted for temperature measuring
devices of the type which is described in the Swedish patent
applications 78.03046-7 (US patent application 779 152),
78.04199-3 (US patent application 787 422) and
(US patent application 879 183).

30 Another embodiment of the subject of the invention is
specially adapted for a temperature measuring device which
is described in detail in the PCT application PCT/SE78/00012
submitted at the same time, which describes a simplified
temperature measuring device and a method for the manu-
35 facture of such a device. The latter temperature measuring
device is also shown in fig. 2 of the drawings discussed
below.



DISCLOSURE OF THE INVENTION

The device in accordance with the invention is characterized by at least two measuring contact surfaces which can be coupled together with the said contact surfaces
5 arranged on the inside or insides of the jaws of a tong-like construction, these measuring contact surfaces constituting part of a circuit which in addition comprises a source of energy, a display unit together with means for the conversion of the measuring value obtained to a
10 value which can be read on the display unit.

If the device in accordance with the invention is used for medical temperature measurement, the tonglike construction enables the user to grip and to read very reliably and rapidly a temperature measuring device placed, for
15 example, in the mouth of a patient. At the same time this gripping and reading can take place in a satisfactorily hygienic manner.

In cases where the said temperature measuring device has two electric conductors arranged on one and the same
20 side of a support, each jaw of the tonglike construction can be provided on its inside with two measuring contact surfaces for the coupling together with the respective contact surfaces on the electric conductors. These contact surfaces are appropriately coupled together two and
25 two with one from each jaw in such a manner that the temperature measuring device can be introduced with either side up.

In the case where the temperature measuring device is designed so that its electric conductors are arranged on
30 opposite sides of a striplike support, each jaw of the tonglike construction can be provided on its inside with only one measuring contact surface.

The temperature measuring device used is appropriately made as small and simple as possible, so that it can be
35 thrown away after use. The device for gripping and reading



of the temperature measuring device however is adapted so as to be suitable for a normal hand. Consequently, it is appropriate to provide it with means for guidance of the temperature measuring device and its contact surfaces so that they may be led to make reliable contact with the measuring contact surfaces in the same.

The said means for guiding the temperature measuring device and its contact surfaces may consist, for example, of a substantially V-shaped groove inside one of the jaws and a corresponding projection on the inside of the other jaw.

The abovementioned V-shaped groove and corresponding projection are appropriately designed so that their cross-section diminishes towards the interior of the jaw and corresponds farthest in to the width of the temperature measuring device used.

The device in accordance with the invention can be adapted so that it closes around the temperature measuring device used against the effect of a spring. In practice, however, it has been found appropriate if the jaws are adapted so that they are opened against the effect of a spring, which on closing of the jaws produces a certain minimum contact pressure between measuring contact surfaces of the device and corresponding contact surfaces of the temperature measuring device used.

The tonglike construction appropriately comprises a housing-like casing which encloses the said source of energy, e.g. a battery, the said means for conversion of the measuring value obtained, together with the said display unit which comprises an outer reading window, the casing forming one jaw, whilst the other jaw is formed by a finger grip part which is spring-mounted in the casing.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig.1 shows a first example of a temperature measuring



device which is suitable for use together with the device in accordance with the invention.

Fig.2 shows a second example of such a temperature measuring device suitable for use together with the device
5 in accordance with the invention.

Fig.3 shows a device in accordance with the invention especially adapted for utilization together with the temperature measuring device in accordance with fig.1.

Fig.4-7 show four views perpendicular to one another of
10 a component part of the device according to fig.3.

Fig.8,9 and 10 in the same manner show three views perpendicular to one another of a second component part of the device according to fig.3.

Fig.11 and 12 in the same manner show two views perpendicular to one another of a third component part of the
15 device according to fig.3.

Fig.13 shows a preferred embodiment of the device in accordance with the invention adapted for utilization together with the temperature measuring device according to
20 fig.2.

Fig.14-17 show three views perpendicular to one another, partly in section, of a casing substantially corresponding to the shell shown in fig.13, but modified a little with regard to the outer shape.

Fig.18-20 show three views perpendicular to one another of a finger grip component adapted to the casing according to fig.14-17.
25

Fig.21 and 22 in the same manner show two view perpendicular to one another of a lid adapted to the casing
30 according to fig.14-17.

Fig.23 and 24 show schematically a shape of a contact suitable for the jaws on the construction shown in fig.13.

Fig.25 and 26 show other contact shapes which are more suitable for the construction according to fig.3-12.

Fig.27 and 28 show a pair of simple alternatives
35

especially for the measuring device shown in fig.1.

Fig.29-32 shows schematically four different alternative contact arrangements.

Fig.33 and 34 shows schematically how the different electrical components can be arranged in a simple manner so that they are readily exchangeable in the casing of the tonglike construction according to the invention.

Fig.35 finally shows a schematic wiring diagram for the electric equipment present.

TEMPERATURE MEASURING DEVICES USABLE IN ASSOCIATION WITH THE INVENTION

In fig.1 a temperature measuring device is shown which is usable in association with the invention. However, in fig.2 a preferred temperature measuring device is shown, and this will therefore be described first.

It consists of a sensor 1 which in the example shown is constituted of a thermistor. This thermistor consists of an inner ceramic material 2, whose electric resistance varies with the temperature. On its underside the thermistor is provided with two contacts 3 and 4, which for example may consist of a thin layer of silver. Similarly, the thermistor is provided on its upper side with a silver contact 5 intended for trimming. The trimming may take place in such a manner that a small area 6 is removed from the contact by mechanical treatment, e.g. shot peening or with the help of a laser beam.

The thermistor is arranged on a support 7 which consists of an inner plastic material 8 with outer metal coatings 9 and 10. These metal coatings may, for example, consist of copper. At its front end, that is to say, at the end provided with the sensor, the support 7 is short-circuited by a soldering 11 in such a manner that the metal coating 9 is in contact with a part 10' of the upper layer 10. This part 10' of the upper metal coating 10 is separated from the rest of this metal coating by a cut 12 which is intended

to isolate electrically the two contacts 3 and 4 from one another.

The support 7 with the thermistor 1 described above in turn is placed on a somewhat broader strip 13. This strip 13 may consist of an inner cardboard material with outer plastic coatings 15 and 16. The support 7 is placed so that the thermistor 1 is fully located within the surface 17 of the somewhat broader strip 13 carrying the support 7. The opposite end of the support on the other hand is arranged so that it projects beyond the somewhat broader strip 13. The idea behind this is that the part of the total construction shown to the right in fig.2 should be capable of being dipped in an insulating plastic coating, so that the thermistor 1, the connecting contacts 3,4 and 5 together with at least the nearest parts of the electric conductors 9 and 10 are enwrapped in a tight manner together with the corresponding end of the somewhat broader strip 13. This plastic wrapping may be made relatively thin with the help of transparent material and is therefore not shown in fig.2. The sterile package, into which the construction is finally to be packed until its use, is also not shown.

The measuring device in accordance with fig.1 corresponds in principle to that according to fig.2. Consequently, the same reference numerals have been used, but with the addition of the letter a. The main difference is that the two electric conductors 9a and 10a are arranged on one and the same side of the same supporting plastic layer 8a. Furthermore, this construction lacks the plastic-coated supporting sheet 13 of cardboard which is present in the construction according to fig.2.

DESCRIPTION OF A FIRST EMBODIMENT OF THE DEVICE IN ACCORDANCE WITH THE INVENTION

In fig.3-12 a first embodiment of the device in



accordance with the invention is described. This first embodiment is mainly adapted to the temperature measuring device shown in fig.1 which has its contacts 9a and 10a arranged on one and the same side of a support 8a.

5 The construction shown consists of a first tong-half 18 which is illustrated in fig.4-7 and a second tong-half 19 which is illustrated in fig.8-10. Furthermore, a lid 20 is included which is shown in fig.11-12.

10 The two tong-halves are mounted on each other with the help of an axle 21 and are normally retained in open position with the help of a spring 22. The tongs are thus closed against the effect of this spring. The tong-half 18 is provided at its front end, that is to say, the lower jaw 23, with a substantially V-shaped groove 24. In the same
15 manner the other tong-half 19 is provided at its front end, that is to say, the upper jaw 25, with a corresponding projection 26. This V-shaped groove and this projection respectively are shown in the figures with constant cross-section. In practice, however, they are appropriately
20 shaped so that their cross-section diminishes towards the interior of the jaw, so that they guide the contacts 9a and 10a of the measuring device 7a used even more securely to make contact with the corresponding contact surfaces inside the tong jaws. The latter contact surfaces are described
25 in more detail in the following with reference to e.g. fig. 25 and 26. For the rest, fig.3-12 should be sufficiently clear, so that no further detailed explanation is required.

PREFERRED EMBODIMENT OF THE SUBJECT OF THE INVENTION

30 Fig.13 shows an embodiment of the subject of the invention which is preferred from a point of view of design. How this embodiment which is preferred from a point of view of design can be produced in practice should be evident from fig.14-22, which show a similar technical construction, but
35 of a somewhat modified shape.



The constructions according to fig.13-20 correspond in essential parts to the construction according to fig. 3-12. Consequently, the same reference numerals have been used, but with the addition of the letter b in fig.13 and c in fig.14-22.

The construction according to fig.13 thus consists of a square casing 18b which at its one end is closed by a lid 20b. At the front end of the casing 18b is mounted a finger-grip part 19b. The casing 18b moreover has a reading window 27b which forms part of a display unit present inside the device. Furthermore, the casing comprises an electric switch 28b which is operated when it is desired to read the temperature. At 29b finally an electric connection is indicated for the possible recharging of a battery arranged inside the device.

The construction according to fig.14-22 also consists of a substantially square casing 18c and a grip part 19c. Moreover, a lid 20c is present.

The construction according to fig.14-22 is intended mainly to be used together with the measuring device according to fig.2. It does not require, therefore, the same guidance of the measuring device as the device according to fig.3-12. Consequently, there are no parts here corresponding to the V-shaped groove 24 and the V-shaped projection 26. The shape of the contacts is described in more detail in the following with reference to fig.23 and 24.

The finger grip part 19c is mounted in the casing 18c with the help of an axle (not shown) which is intended to be introduced into the holes 21c' and 21c'' respectively. Furthermore, the construction is to be provided with a spring (not shown) corresponding to the spring 22 in the construction according to fig.3. This spring is appropriately arranged in such a manner, however, that it normally holds the two jaws 23c and 25c closed against one another. The opening of the tongs thus has to take place against the

effect of the spring force. Thus it will be this spring force which will produce a certain defined pressure on the contact surfaces of the measuring device used.

5 SUITABLE CONTACT SHAPES

In fig.23 and 24 a shape of the contact suitable for the construction according to fig.13 is described. Consequently reference numerals with the additional letter b are used. The same construction may also be used, however, in the embodiment according to fig.14-22.

The line 30b indicates the outer contour for either the upper jaw 23b or for the lower jaw 25b. Numeral 31b indicates the contour of the contact surface of the lower jaw, whilst 32b designates the corresponding contact surface of the upper jaw.

The respective contact surfaces, as shown in fig.24, may consist of a strip 33b and 34b respectively arranged in a groove 35b and 36b respectively in the upper jaw 23b and in the lower jaw 25 b respectively.

It is also conceivable to have a further U-shaped strip in the lower jaw inside the upper jaw. This design may also be used conversely, so that two strips are placed in the upper jaw with a strip in the bottom jaw located in between.

The strip should be made of a non-oxidizing material which gives good electric contact with e.g. copper. Thus e.g. an outer layer of silver or gold may be used. Moreover, it is important that the realization is such that no unintentional short-circuiting in the circuits is obtained.

In fig.25 is shown how two electric conductors 31' can be placed in two grooves 36' in a lower jaw substantially corresponding to the lower jaw 23 in the embodiment according to fig.3-12.

In fig.26 a further contact arrangement is shown which is suitable for the embodiment of the subject of the invention shown in fig.3-12. Here the lower jaw is



designated 23" and the upper one 25". Furthermore, the electric contacts in the lower half are designated 31" and those in the upper half 32". Thanks to the contact sheet 38" and 39" it is sufficient here to connect only
5 the contacts 31" to the working circuit included in the construction. In spite of this the measuring device according to fig.1 can be introduced between the jaws 23" and 25" with its top side turned either upwards or downwards.

10 If it is desired to use the construction according to fig.3-12, but with contacts only in the one jaw, the measuring device according to fig.1 can be modified in the manner as indicated in fig.27 and 28. In the construction according to fig.27 the whole measuring device
15 7d is folded over at the end remote from the thermistor 1d, so that electric conductors 9d and 10d corresponding to 9a and 10a are present once again on both sides of the measuring device.

In the construction according to fig.28 it is instead
20 the electric conductors 9e and 10e that are bent around the edge of the end of the measuring device 7e remote from the thermistor 1e.

In fig.29-32 different contact arrangements are shown schematically. Fig.29 and 31 correspond closest to that
25 according to fig.26. In the same manner the construction according to fig.30 substantially corresponds to the contact arrangement according to fig.23-24. Fig.32 shows that it is also possible to have two contacts in the one jaw and a wider contact in the other jaw.

30

INTERNAL ELECTRIC EQUIPMENT

In fig.33 and 34 is shown schematically how the internal electrical equipment may be arranged so that it is readily exchangeable on a board 40' and 40" respectively. The
35 numerals 41', 41"; 42', 42" and 43', 43" indicate the parts

included such as e.g. a microprocessor, a transistor and a resistor respectively. The board 40' is subsequently connected electrically to the contacts 31a' and 32a' via a spring sliding contact 44'. In a corresponding manner
5 the board 40" is connected to the contacts 32a" and 31a" via a connection cable 44", which means that the electrical parts may be taken out of the casing without the contact with contacts 31a" and 32a" being broken.

10 In fig.35 finally a simple wiring diagram of the electric system as a whole is shown.

Numeral 1f designates the thermistor which forms part of the measuring device. 31f and 32f designate the contact surfaces on the measuring device used as well as the corresponding contact surfaces in the respective tong jaws.

15 Numeral 45 designates a tuning and supply component which transmits a low current through 1f to measure the resistance of the same which varies with the temperature. The value obtained is tuned in the form of a signal to a processor 46 which may be said to constitute a small micro-computer.
20 This micro-computer contains e.g. a clock and an arithmetic element which can be programmed for different programmes, e.g. for measurement in °C or in °F. The correct programme is selected with the help of a control unit 47. Numeral 48 designates an actuating button which is operated when
25 reading is required. The value finally obtained is shown on a display unit 49. The source of energy required, e.g. a battery, may be included e.g. in part 45. Alternatively, it can be arranged separately and be connected in a suitable manner to the remaining parts of the system.

30 The component parts 45-49 may be varied in their construction and function within wide limits. It would serve no purpose therefore to describe these parts in greater detail. Anybody versed in the art who wishes to pursue the invention only needs to specify his wishes to a supplier of such parts,
35 so that the latter can then "tailor-make" the parts in



accordance with the wishes specified.

- 5 Naturally, the invention is not limited merely to the embodiments described above, but it can be varied within the scope of the following claims. For example, as an alternative to the thermistor 1 (1a) a thermocouple can be used, whose electromotoric force varies with the temperature.



CLAIMS

1. A device for the gripping of a temperature measuring device (7) and for the reading of measuring values obtained with this device, this temperature measuring device comprising a temperature-sensitive sensor (1), whose electrical properties, e.g. the resistance, vary with the temperature, e.g. a thermistor, and which is connected via two contacts (3,4) to two electric conductors (9,10), which terminate in two contact surfaces at the end remote from the sensor (1), characterized by at least two measuring contact surfaces (31b,32b;31',31';31'',31''; 32'',32''; 31a',32a'; 32a'',32a'') which can be coupled to the said contact surfaces and which are arranged on the inside or insides of the jaws of a tonglike construction, these measuring contact surfaces (31,32) constituting part of a circuit which in addition within said tonglike construction comprises a source of energy (45), a display-unit (49) and means for the conversion of the measuring value obtained to a value which can be read on the display unit (49).
2. A device in accordance with claim 1, for a temperature measuring device (7a) with the said electric conductors arranged on one and the same side of a support (8a), characterized in that each jaw (23,25) of the tonglike construction is provided on its inside with two measuring contact surfaces (e.g. 31') for coupling together with the respective contact surfaces on the electric conductors (9a,10a), these measuring contact surfaces being appropriately coupled together two and two with one from each jaw in such a manner that the temperature measuring device can be introduced with either side upwards (fig. 26,29,31).
3. A device in accordance with claim 1, for a temperature measuring device with the said electric conductors (7) arranged on opposite sides of a striplike support (8), characterized in that each jaw (e.g.23b,25b) of the tonglike



construction is provided on its inside with one measuring contact surface.

4. A device in accordance with claim 1, characterized by means (e.g. 24,26) for the guiding of the temperature measuring device (e.g. 7a) and its contact surfaces to make contact with the measuring contact surfaces (e.g. 31').

5. A device in accordance with claim 4, characterized in that the said means for guiding of the temperature measuring device (7a) and its contact surfaces are constituted of a substantially V-shaped groove (24) inside one of the jaws (23) and a corresponding projection (26) inside the other jaw (25).

6. A device in accordance with claim 5, characterized in that the V-shaped groove (24) and the corresponding projection (26) have a cross-section which diminishes towards the interior of the jaws and corresponds farthest in to the width of the temperature measuring device (7a).

7. A device in accordance with claim 1, characterized in that the jaws are adapted so as to be opened against the effect of a spring, which is adapted to produce the required coupling pressure when the jaws enclose the temperature measuring device and its contact surfaces.

8. A device in accordance with any one of the preceding claims, characterized in that tonglike construction comprises a housing-like casing (e.g. 18b) enclosing the said source of energy (45) e.g. a battery, the said means (45-48) for the conversion of the measuring value obtained, together with the said display-unit (49) which comprises an outer reading window (e.g. 27b), this casing (18) forming one jaw (23b), whilst the other jaw is formed by a finger-grip part (19b) which is spring-mounted in the casing.

AMENDED CLAIMS

(received by the International Bureau on 16 January 1979 (16.01.79))

1. A device for the gripping of a temperature measuring device (7) and for the reading of measuring values obtained with this device, this temperature measuring device comprising a temperature-sensitive sensor (1), whose electrical properties, e.g. the resistance, vary with the temperature, e.g. a thermistor, and which is connected via two contacts (3,4) to two electric conductors (9,10), which terminate in two contact surfaces at the end remote from the sensor (1), characterized by at least two measuring contact surfaces (31b,32b;31',31';31'',31''; 32'',32''; 31a',32a'; 32a'',32a'') which can be coupled to the said contact surfaces and which are arranged on the inside or insides of the jaws of a tonglike construction, these measuring contact surfaces (31,32) constituting part of a circuit which in addition within said tonglike construction comprises a source of energy (45), a display-unit (49) and means for the conversion of the measuring value obtained to a value which can be read on the display unit (49).

2. A device in accordance with claim 1, for a temperature measuring device (7a) with the said electric conductors arranged on one and the same side of a support (8a), characterized in that each jaw (23,25) of the tonglike construction is provided on its inside with two measuring contact surfaces (e.g. 31') for coupling together with the respective contact surfaces on the electric conductors (9a,10a), these contact surfaces being appropriately coupled together two and two with one from each jaw in such a manner that the temperature measuring device can be introduced with either side upwards (fig.26,29,31).

3. A device in accordance with claim 1, for a temperature measuring device with the said electric conductors (7) arranged on opposite sides of a striplike support (8), characterized in that each jaw (e.g.23b,25b) of the tonglike



construction is provided on its inside with one measuring contact surface.

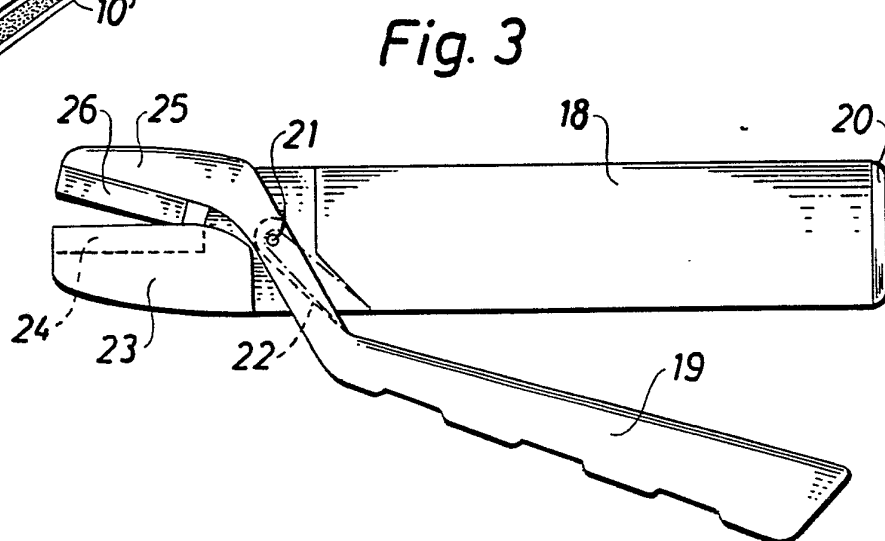
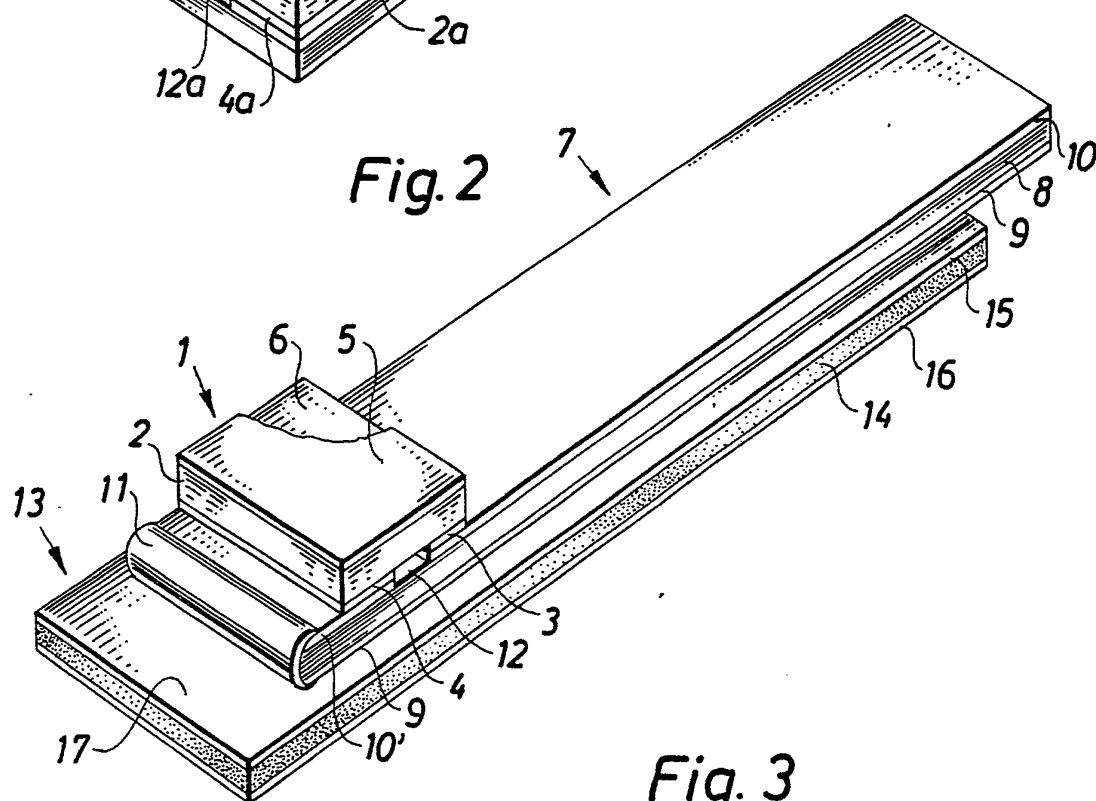
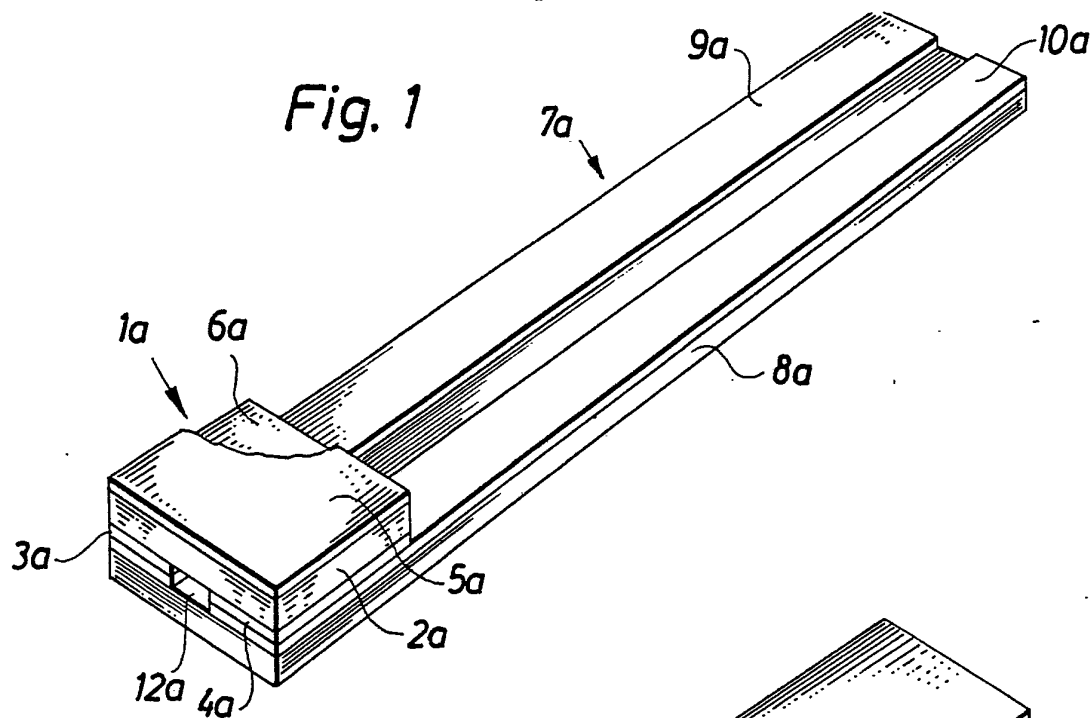
4. A device in accordance with claim 1, characterized by means (e.g. 24,26) for the guiding of the temperature measuring device (e.g. 7a) and its contact surfaces to make contact with the measuring contact surfaces (e.g. 31').

5. A device in accordance with claim 4, characterized in that the said means for guiding of the temperature measuring device (7a) and its contact surfaces are constituted of a substantially V-shaped groove (24) inside one of the jaws (23) and a corresponding projection (26) inside the other jaw (25).

6. A device in accordance with claim 5, characterized in that the V-shaped groove (24) and the corresponding projection (26) have a cross-section which diminishes towards the interior of the jaws and corresponds farthest in to the width of the temperature measuring device (7a).

7. A device in accordance with claim 1, characterized in that the jaws are adapted so as to be opened against the effect of a spring, which is adapted to produce the required coupling pressure when the jaws enclose the temperature measuring device and its contact surfaces.

8. A device in accordance with any one of the preceding claims, characterized in that tonglike construction comprises a housing-like casing (e.g. 18b) enclosing the said source of energy (45) e.g. a battery, the said means (45-48) for the conversion of the measuring value obtained, together with the said display-unit (49) which comprises an outer reading window (e.g. 27b), this casing (18) forming one jaw (23b), whilst the other jaw is formed by a finger-grip part (19b) which is spring-mounted in the casing.



- 2 -

Fig. 4

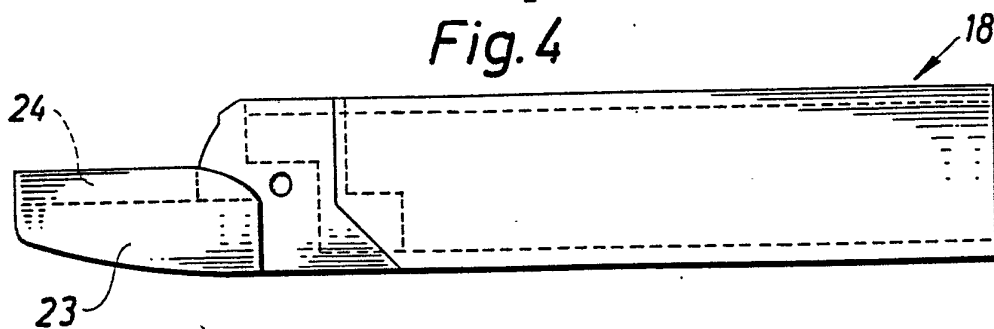


Fig. 5

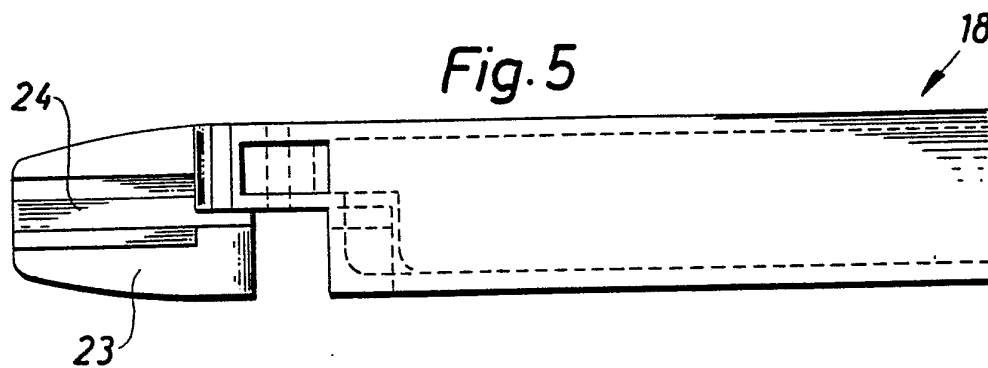


Fig. 6

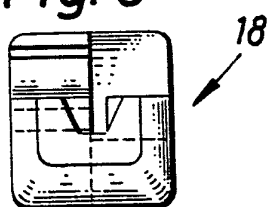


Fig. 7

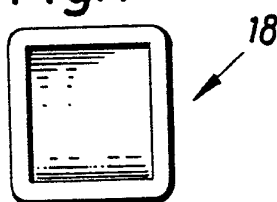


Fig. 8

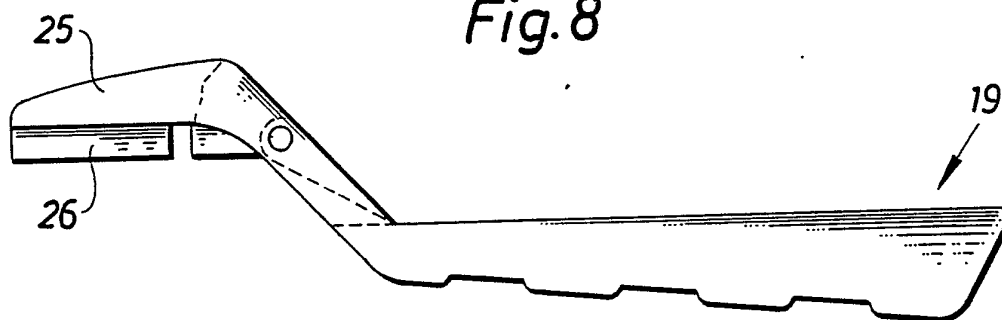


Fig. 9

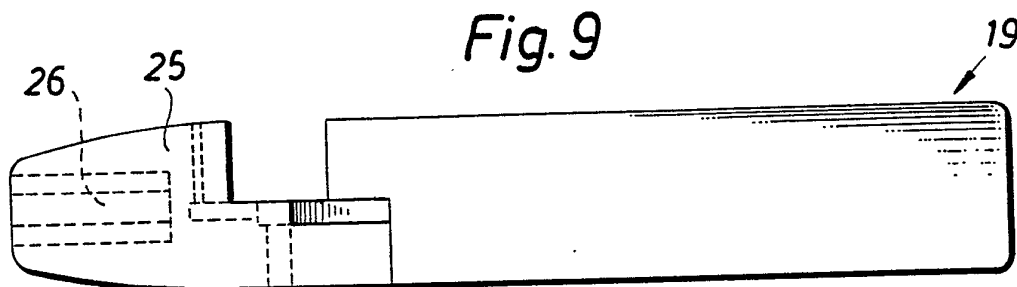


Fig. 10

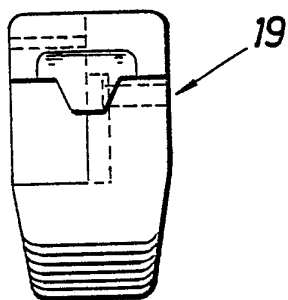


Fig. 11

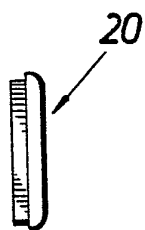


Fig. 12

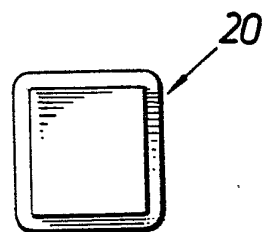


Fig. 13

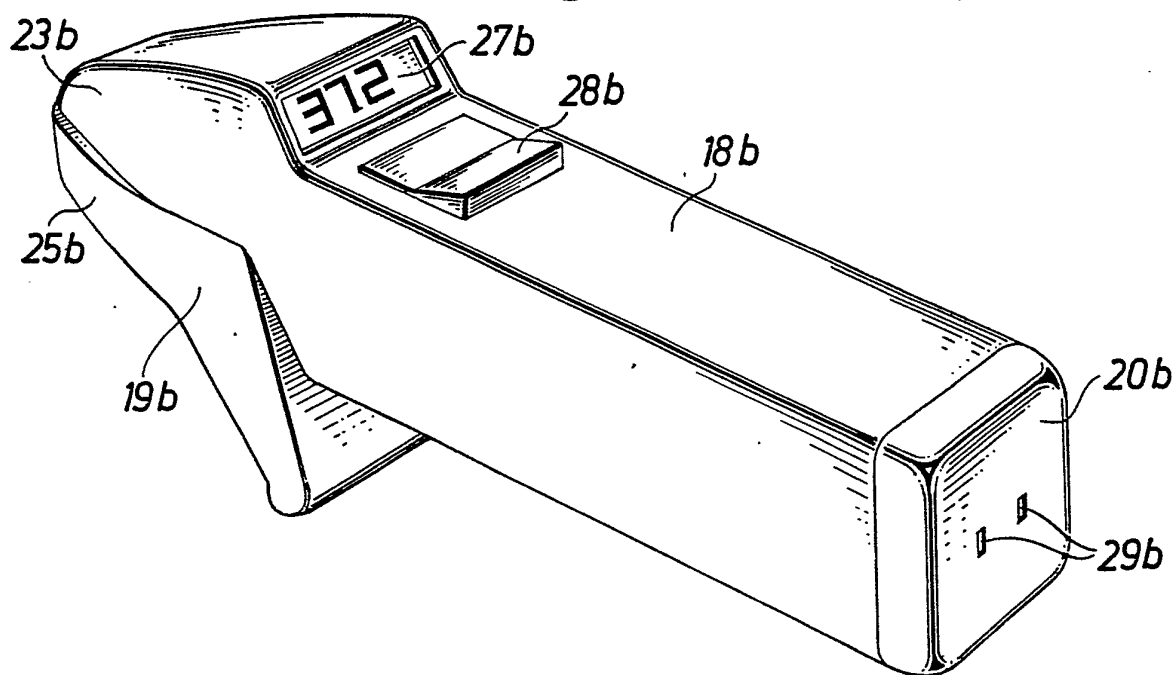


Fig. 14

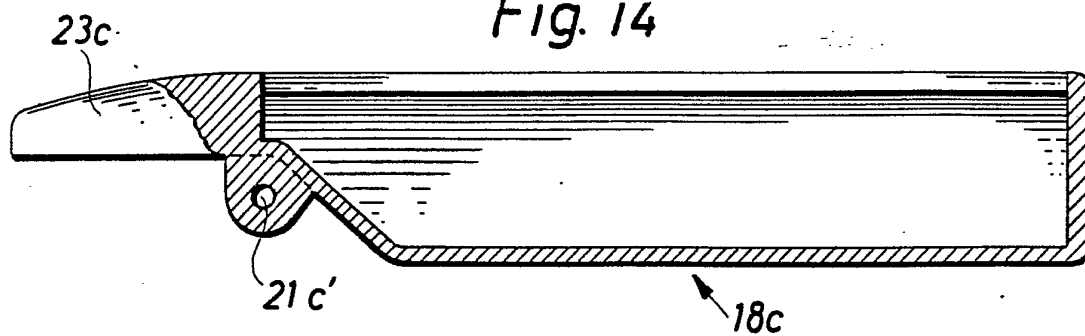


Fig. 15

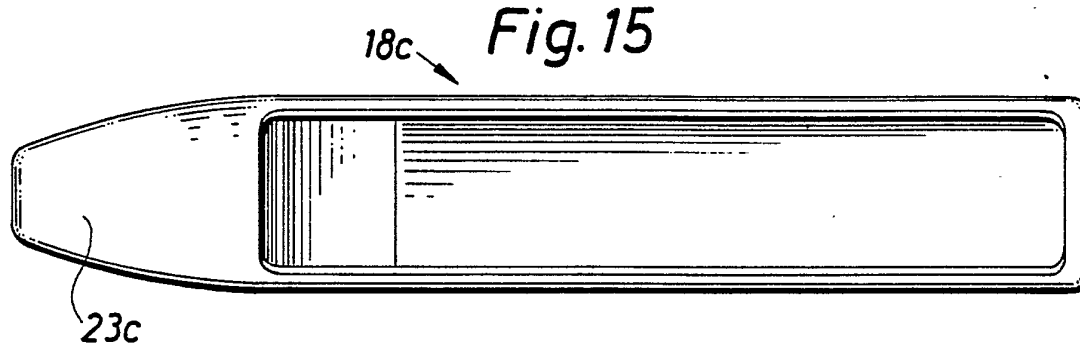


Fig. 16

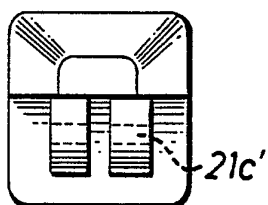


Fig. 17

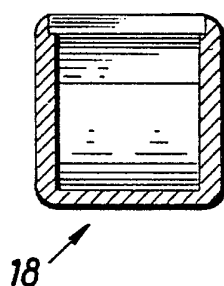


Fig. 18

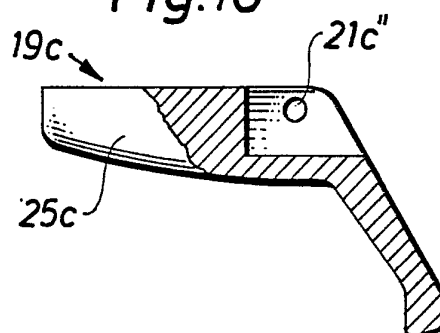


Fig. 19

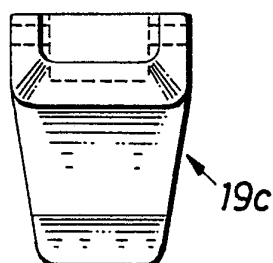


Fig. 20

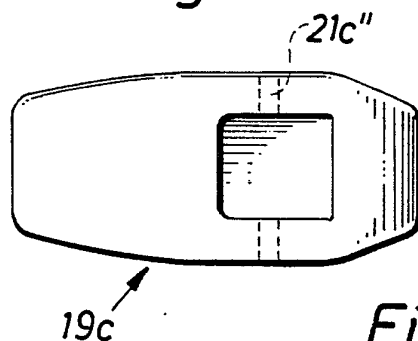


Fig. 21

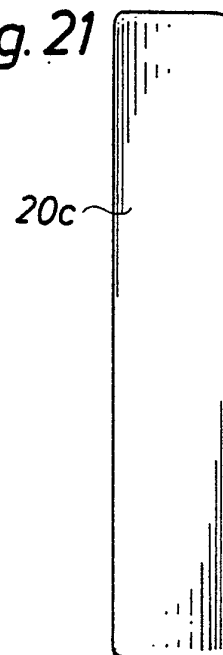


Fig. 22

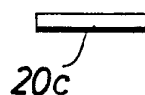
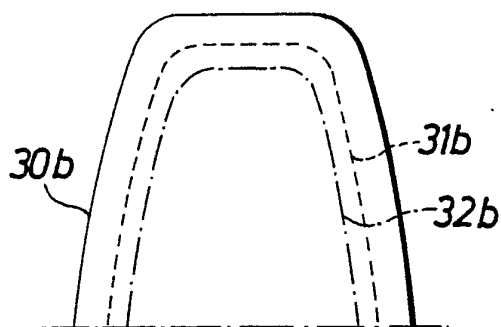


Fig. 23



- 5 -

Fig. 24

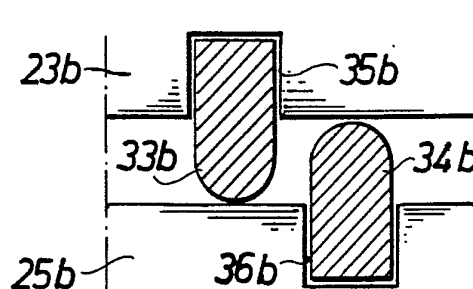


Fig. 25

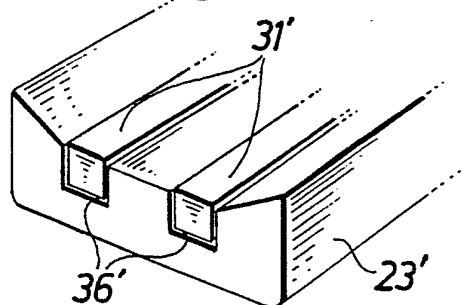


Fig. 26

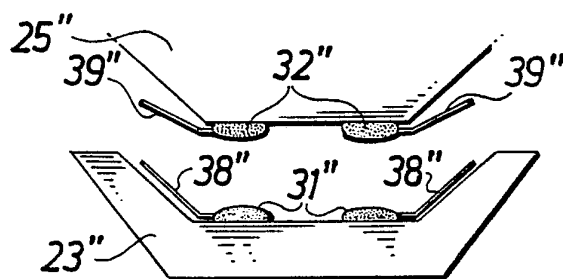


Fig. 27

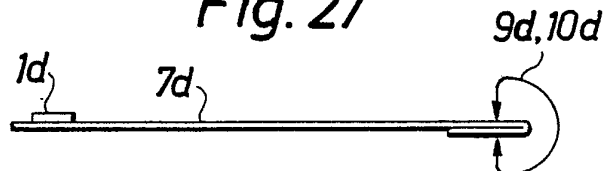


Fig. 28

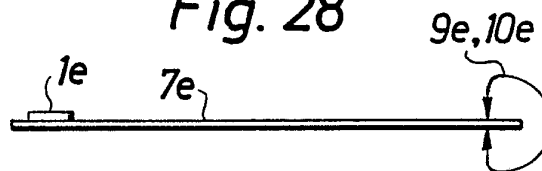


Fig. 29

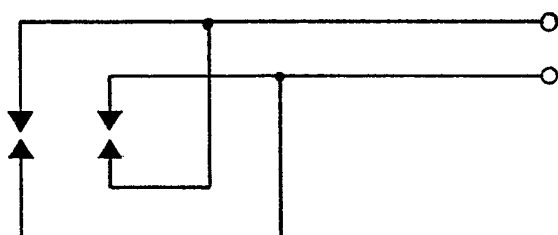


Fig. 30

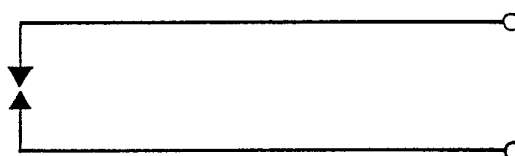


Fig. 31

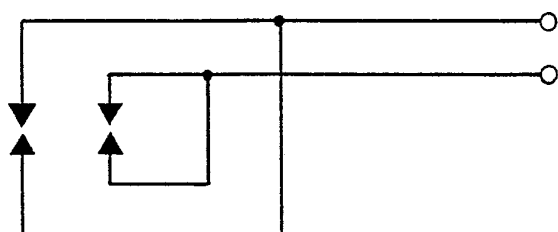


Fig. 32

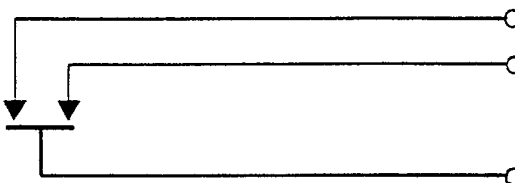


Fig. 33

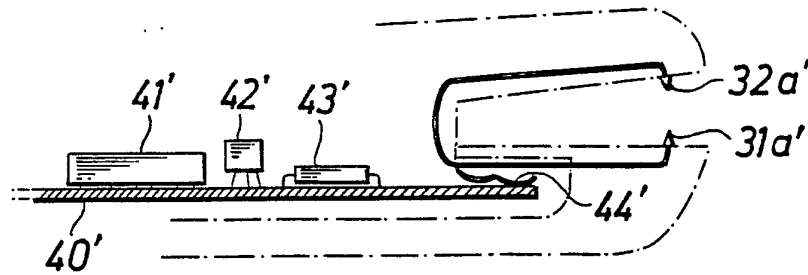


Fig. 34

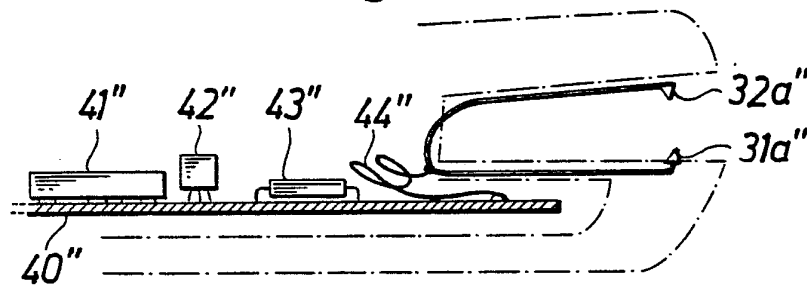
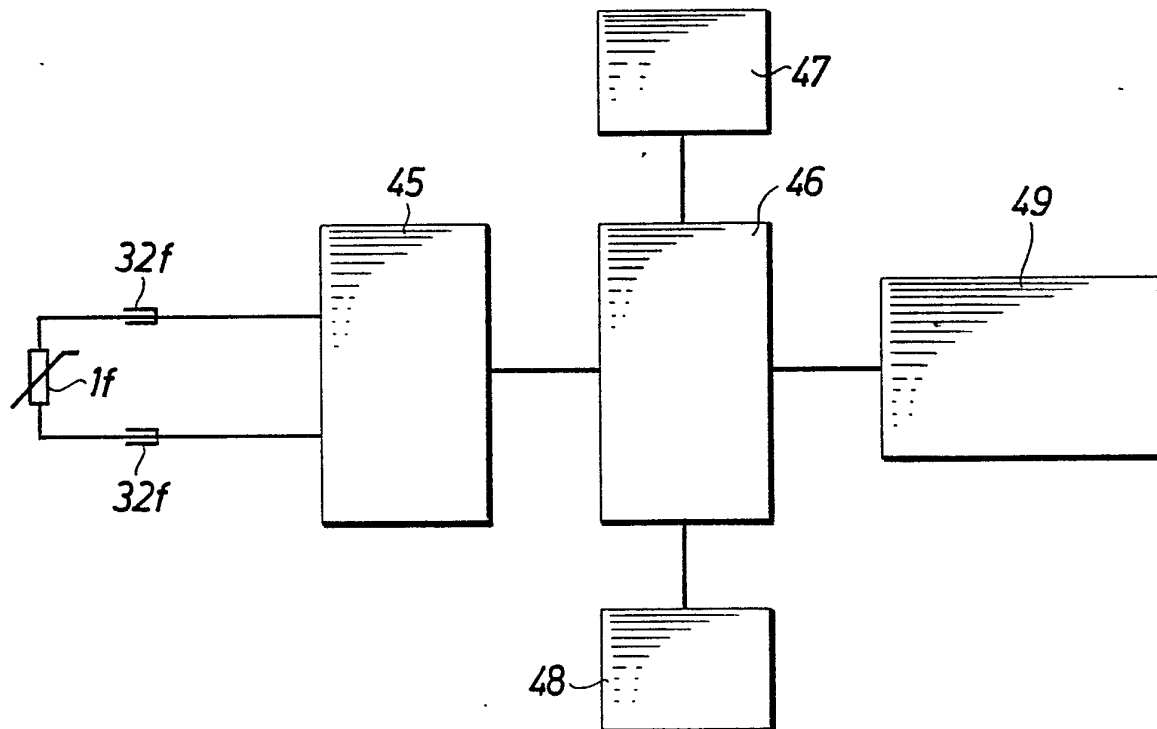


Fig. 35



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE78/00013

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC G 01 K 7/22						
II. FIELDS SEARCHED Minimum Documentation Searched ⁴ <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;">Classification System</th> <th style="width: 80%;">Classification Symbols</th> </tr> <tr> <td style="text-align: center; vertical-align: top;">IPC 2</td> <td style="vertical-align: top;">G 01 K 1/00, 1/02, 7/00-7/24 .../...</td> </tr> </table> Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ⁵ SE, NO, DK, FI classes as above			Classification System	Classification Symbols	IPC 2	G 01 K 1/00, 1/02, 7/00-7/24 .../...
Classification System	Classification Symbols					
IPC 2	G 01 K 1/00, 1/02, 7/00-7/24 .../...					
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴						
Category [*]	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷	Relevant to Claim No. ¹⁸				
A	BR, A, 1339098 published 1973, November 28, R Meier	1-5, 8				
A	US, A, 3642008 published 1972, February 15, Bolduc	1-3, 7				
A	US, A, 3949609 published 1976, April 13, see fig 3, Hammerslag	1, 4, 5				
A	US, A, 3681993 published 1972, August 8, see fig 7, Campton et al	1, 3, 8				
A	US, A, 3260114 published 1966, July 12, W B Drolet Jr	1, 7				
T	SE, A, 7803046-7 published 1978, September 19, M Schonberger	1				
T	SE, A, 7804199-3 published 1978, October 15, M Schonberger	1				
X	US, A, 3999537 published 1976, December 28, Noiles	1, 4, 7				
[*] Special categories of cited documents: ¹⁵ "A" document defining the general state of the art "E" earlier document but published on or after the international filing date "L" document cited for special reason other than those referred to in the other categories "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but on or after the priority date claimed "T" later document published on or 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						
IV. CERTIFICATION						
Date of the Actual Completion of the International Search ² 1978-12-08	Date of Mailing of this International Search Report ² 1978-12-12					
International Searching Authority ¹ Swedish Patent Office	Signature of Authorized Officer ²⁰ Hans Bandelin					

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II Continuation Fields Searched:

Deutsche Klassen: 42i:7/01, 8/02, 8/90

US classification: 73:359, 362; 128:2H

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers _____, because they relate to subject matter ¹² not required to be searched by this Authority, namely:

Claim numbers _____, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ¹³, specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ¹¹

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

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.