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(54) **PALPOMETER**

PALPOMETER

DOLORIMÈTRE

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Description

BACKGROUND OF THE INVENTION

[0001] The present application is related to methods and apparatus for the assessment of deep pain sensitivity in a patient, and in particular, to a manually actuated palpometer utilized to establish stimulus-response functions on the temporalis and masseter muscles and on the temporomandibular joint using a spring-biased probe configured to provide a uniform and repeatable stimulation to a patient.

[0002] Reliable assessment of deep pain sensitivity is needed for accurate diagnoses of patient sensitivity such as by dentists evaluating temporomandibular disorders (TMD) or doctors evaluating arthritis. Current methods and procedures rely either upon manual palpation by an examiner, or on the use of commercial esthesiometers or electronic pressure algometers. Manual palpation may lack accuracy and repeatability, as the examiner may not be able to provide consistent applications of pressure at various locations on the patient's body. The use of commercial esthesiometers or electronic pressure algometers requires expensive equipment which may not be available to all examiners.

[0003] Hardy, James D. :"The nature of pain", Journal of chronic diseases, vol. 4, no. 1, (1956-07-01), pages 22-51, discloses an apparatus suitable for stimulating pain from the periosteal tissues of the forehead, comprising a plunger surrounded by a metal sleeve within which is mounted a steel spring, and a scale which indicates the degree of compression of the steel spring.

[0004] DE 10126690 discloses a pain sensitivity tester comprising a carrier end, a carrier, a spacer, spring and a read carrier.

[0005] JP S56109792 discloses an adapted ball-point pen for strengthening the grip strength.

[0006] Accordingly, it would be advantageous to develop an easily applicable, manually actuated, palpometer for clinical use, capable of applying a highly repeatable pressure to a selected area on a patient in order to assist an examiner in improving palpation procedures for touch and pain sensitivity.

BRIEF SUMMARY OF THE INVENTION

[0007] The present invention relates to a palpometer device as defined in claims 1-7.

[0008] The present invention further relates to a method for repeatable testing of pain sensitivity in a patient as defined in claims 8-10

[0009] The foregoing features, and advantages set forth in the present disclosure as well as presently preferred embodiments will become more apparent from the reading of the following description in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0010] In the accompanying drawings which form part of the specification:

Figure 1 is a perspective illustration of a palpometer of the present disclosure, having a proximal probe end axially displaceable between a rest position (shown in phantom) and an application position;

Figure 2 is a side plan view of a palpometer of the present disclosure, having a proximal probe end axially displaceable between a rest position (shown in phantom) and an application position;

Figure 3 is a top plan view of a palpometer of the present disclosure, having a proximal probe end axially displaceable between a rest position (shown in phantom) and an application position;

Figure 4 is a sectional perspective view of a palpometer of the present disclosure, taken along the axial midline, having a proximal probe end axially displaceable between a rest position (shown in phantom) and an application position;

Figure 5 is a sectional plan view of a palpometer of the present disclosure, taken along the axial midline, having a proximal probe end axially displaceable between a rest position (shown in phantom) and an application position;

Figure 6A is a illustration of an exemplary probe for a palpometer of the present disclosure;

Figure 6B is an axial view of the proximal end of the exemplary probe shown in Figure 6A;

Figure 7 is a perspective shaded illustration of a variation of the palpometer of the present disclosure, having a proximal probe end axially displaceable between a rest position (not shown) and an application position;

Figure 8 is a front perspective view of the palpometer shown in Figure 7;

Figure 9 is a side perspective view of the palpometer shown in Figure 7;

Figure 10 is a sectional perspective view of the palpometer variation of Figure 7, taken along the axial midline, having a proximal probe end which is axially displaceable between a rest position (not shown) and an application position; and

Figure 11 is plan view of the sectional illustration shown in Fig. 10.

[0011] Corresponding reference numerals indicate corresponding parts throughout the several figures of the drawings. It is to be understood that the drawings are for illustrating the concepts set forth in the present disclosure and are not to scale.

[0012] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the fol-

lowing description or illustrated in the drawings.

DETAILED DESCRIPTION

[0013] The following detailed description illustrates the invention by way of example and not by way of limitation. The description enables one skilled in the art to make and use the present disclosure, and describes several embodiments, adaptations, variations, alternatives, and uses of the present disclosure, including what is presently believed to be the best mode of carrying out the present disclosure.

[0014] Turning to the Figures, a palpometer device (10) of the present disclosure for assisting an examiner to evaluate deep pain sensitivity in a patient is shown generally. The palpometer device (10) consists of a housing (12) internally supporting an axially displaceable spring-biased probe (14) for axial displacement through openings (18, 28) at opposite axial ends of the housing. The housing preferably has outer dimensions which are sized for a comfortable one-handed grip by an examiner, such as a cylindrical form (10) shown in Figures 1-5, or an alternate rounded rectangular form (100) shown in Figures 7-11, and may be formed from any suitable material such as colored plastic or metal. Other than the external shape of the housing 110, the embodiments shown in Figures 7-11 is substantially identical to that shown in Figures 1-5, and corresponding parts in the exemplary alternate embodiment will be designated with reference numbers incremented by 100.

[0015] Suitable surface coatings to facilitate comfort, appearance, or antimicrobial properties may be applied as required. Color applied to the housing (12, 112) or probe (14, 114) may be utilized to indicate palpometers (10, 110) configured to apply different predetermined forces. As shown in the Figures, the housing (12, 112) is preferably formed in two halves (12A, 12B, 112A, 112B), joined along a longitudinal axis and secured together by a plurality of fasteners (13, 113). However, those of ordinary skill in the art will recognize that the housing may be formed from any suitable material and from any number of parts without departing from the scope of the invention.

[0016] The interior of the housing (12, 112), as best seen in Figures 4, 5, 10, and 11 is generally hollow between the proximal end surface (20, 120) and distal axial end surface (30, 130). In order to support the spring-biased probe axially within the housing, a proximal buttress (32, 132) and a distal buttress (34, 134) are transversely disposed within the interior of the housing. Each buttress includes an axial opening for receiving the spring-biased probe.

[0017] The spring-biased probe (14, 114) consists of a generally cylindrical body (14A, with the proximal end (16, 116) defining a probe surface disposed external to the housing, and the distal end (26, 126) defining a reduced-diameter indicator. The probe surface at the proximal end (16, 116) is adapted for contact with a patients body, and may be coated or uncoated. Preferably, the proximal end of the probe includes rounded edges (16R, 116R) and has a surface area equal to 1 cm^2, however, those of ordinary skill in the art will recognize that different configurations and sizes for the proximal end of the probe (14, 114) may be utilized according to the particular application of the palpometer (10, 110).

[0018] The probe body (14, 114) further includes the annular flange (22, 122) or shoulder disposed generally medially between the proximal and distal ends, for axial positioning between the proximal (32, 132) and distal (34, 134) buttresses of the housing (12, 112). A bias spring (24, 124) is coaxially disposed within the housing and surrounds the probe body, between the annular flange or shoulder (22, 122) and the distal buttress (34, 134) of the housing. In a rest position, the bias spring exerts a minimal axial bias force between the annular flange or shoulder and the distal buttress of the housing, maintaining the proximal end (16, 116) of the probe in an extended position. Axial movement of the probe proximal end (16, 116) towards the extended position is limited by interference between the annular flange or shoulder (22, 122) and the proximal buttress (32, 132) within the housing.

[0019] The bias spring (24, 124) is selected to resist axial displacement of the probe (14, 114) upon the application of an axial load to probe proximal end (16, 116). Axial loads on the probe proximal end will compress the bias spring between the annular flange or shoulder (22, 122) and the distal buttress (34, 134) within the housing, displacing the probe proximal end (16, 116) axially towards the housing. Correspondingly, the axial displacement of the probe relative to the housing will cause the probe distal end (26, 126) to be axially displaced within the housing towards the opening (28, 128) in the housing distal surface (30, 130). Preferably, the bias spring is selected such that a predetermined axial load must be applied to the proximal end of the probe in order for the indicator at the distal end (26, 126) of the probe to become flush with the housing distal surface (30, 130). Excessive axial loads will result in the indicator extending axially outward from the housing distal surface, providing a tactile and visual warning to the examiner that the predetermined axial load has been exceed. Conversely, an applied axial load which is less than the predetermined axial load will not sufficiently displace the indicator at the distal end of the probe to reach the housing distal surface.

[0020] Those of ordinary skill in the art will recognize that the specific predetermined axial load may be selected in accordance for the intended use of the palpometer. For example, axial loads on the order of 0.5 kg and 1.0 kg at the proximal end of the probe may be suitable for use when evaluating stimulus-response functions on the temporalis and masseter muscles and on the temporomandibular joint, while axial loads on the order of 2.0 kg are better suitable for evaluating arthritic patients. Axial loads on the order of 4.0 kg are suitable for patients being evaluated for fibromyalgia. In order to indicate the application of the desired axial load on the probe proximal

end, the bias spring (24, 124) may be selected to have the necessary characteristics, and/or the range of axial displacement for the probe (14, 114) may be altered by varying the length of the probe body (14A, 114A), as well as the relative axial positions of the annular flange or shoulder (22, 122) and the internal buttresses (32, 34, 132, and 134) within the housing (12, 112). Alternatively, an adjustable bias spring (not shown) may be utilized to allow for selection of different axial loads as required.

[0021] A method for applying a selected and repeatable force against a patient's body using a manually actuated palpometer device (10, 110) set forth in the present disclosure requires first placing the proximal end (16, 116) of the palpometer probe (14, 114) in contact with a selected area on the patent's body. Grasping the palpometer housing (12, 112) in one hand, an examiner places a thumb over the opening (28, 128) in the distal axial face (30, 130) of the housing, urging the housing axially towards the patent's body with an axial bias force. As the bias force on the housing is increased, the internally contained bias spring (24, 124) is compressed between the distal buttress (34, 134) in the housing and the annular flange or shoulder (22, 122) on the probe body, and the distal end (26, 126) of the probe with the indicator tip is displaced towards the opening (28, 128) in the distal axial face (30, 130) of the housing. Upon application of the predetermined amount of bias force, the distal end of the probe with the indicator tip is sufficiently displaced axially within the housing to a position which is flush with the housing distal axial face, providing the examiner with a tactile sensation of contact to the thumb covering the opening. By relying upon the tactile sensation caused by the displacement of the indicator tip at the distal end of the probe, the examiner can maintain the predetermined amount of bias force against the patient's body, and may easily apply repetitions of the same predetermined amount of bias force as required during testing of the patient's tactile or pain sensitivity, such as to establish stimulus-response functions on the temporalis and masseter muscles and on the temporomandibular joint.

[0022] Those of ordinary skill in the art will recognize that the applied force may be increased slowly or quickly to reach the predetermined level of force between the proximal end and the patient's body, as is required for the particular testing regime being carried out. For example, the force may be applied quickly, reaching the predetermined limit on the order of 1-2 seconds, or slowly, over 5-10 seconds as desired by the examiner.

[0023] Tests were conducted to compare test-retest variation between manual palpation, the palpometer of the present disclosure, and a commercial electronic pressure algometer and to establish stimulus-response functions (S-R) on the temporalis and masseter muscles and temporomandibular joint (TMJ).

[0024] The test procedures involved sixteen volunteers (19-36 years) without TMD according to the RDC/TMD criteria. Manual palpation per the RDC/TMD was performed on three locations and the test subjects scored palpation pressure on a 0-10 numerical rating scales (NRS). The palpometer of the present disclosure, configured with a 1 cm^2 probe proximal end, based on the bias spring with a indicator tip touching the examiners hand when the correct pressure was achieved, was applied to the same locations and subjects scored perceived pain on the NRS. Finally, pressure pain thresholds were determined with a Somedic electronic pressure algometer (1 cm^2 probe, 30 kPa/s). All techniques were repeated five times at each location with at least two minutes of elapsed time between. The coefficient of variation (CV) was compared between locations and techniques (analysis of variance). The palpometer of the present disclosure was further used to construct S-R curves from the three locations with a 0.5, 1.0 and 2.0 kg pressure and NRS scores.

[0025] The resulting data indicated that the CV ($10.4 \pm 8.6\%$) did not vary across locations ($P>0.260$) or between techniques ($P>0.087$). The S-R indicated the highest sensitivity on the TMJ ($P<0.001$) and consistent S-R functions with greater NRS scores at 2.0 kg compared to 1.0 kg and 0.5 kg ($P<0.001$). This concludes that the palpometer of the present disclosure provides low test-retest variability, and was able to detect differences in craniofacial sensitivity as well as to facilitate the construction of robust S-R curves.

[0026] As various changes could be made in the above constructions without departing from the scope of the disclosure, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

Claims

1. A palpometer device (10, 110) for use by an examiner to assess deep pain sensitivity of a patient by providing a uniform and repeatable stimulation to the patient, comprising:

   a housing (12, 112);
   a probe (14, 114) supported axially within the housing for axial movement between a first position and a second position, said probe having a proximal end (16, 116) which is extended from an axial bore (18, 118) in said housing in both said first and second positions, and a distal end (26, 126) which is contained within said housing in said first position, and which is extended from an axial bore (28, 128) in a distal surface (30, 130) of said housing opposite from said proximal end in said second position;
   a single bias means (24, 124) disposed within said housing, said bias means configured to bias said probe axially towards said first position;
   wherein the palpometer device is configured such that an axial force can be selectively ex-

erted between the probe proximal end and a patient to move the probe from said first position axially towards said second position relative to said housing;
wherein said probe (14, 114) and said bias means (24, 124) are cooperatively configured such that said distal end (26, 126) is displaced flush with said housing distal surface (30, 130) when said exerted axial force reaches a predetermined force threshold;
wherein said probe and said bias means are cooperatively configured such that said distal end (26, 126) is extended from said housing distal surface (30, 130) when said exerted axial force exceeds said predetermined force threshold;

wherein the palpometer device is adapted such that no part of the palpometer device is located in the axial bore (28, 128) in the distal surface (30, 130) in said first position of the probe (14, 114);
wherein the distal end of the probe has an indicator tip (26x, 126x);
wherein said predetermined force threshold is between 0.5 kg and 4.0 kg; and wherein said bias means (24, 124) is adjustable to select said predetermined force threshold.

2. The palpometer device of Claim 1 wherein said bias means (24, 124) is a bias spring.

3. The palpometer device of claim 2 wherein said housing includes an internal proximal buttress (32, 132) and an internal distal buttress (34, 134), each of said buttresses configured to support said probe within said housing; and
wherein said bias spring (24, 124) is coaxially disposed about said probe, between an annular flange or shoulder (22, 122) on said probe and said distal buttress.

4. The palpometer device of any of the preceding claims wherein said housing is colored, said color indicative of said predetermined force threshold.

5. The palpometer device of any of the preceding claims wherein said probe proximal end (16, 116) has a surface area of approximately 1 cm^2.

6. The palpometer device of any of the preceding claims wherein said housing is formed from plastic.

7. The palpometer device of any of the preceding claims wherein the indicator tip (26x, 126x) is configured to provide tactile sensation in response to said exerted axial force exceeding said predetermined force threshold.

8. A method for repeatable testing of pain sensitivity in a patient using the palpometer device (10, 110) of Claim 1, comprising:

positioning the probe proximal end (16, 116) in contact with the patient at a selected testing location;
exerting an increasing axial force on the selected testing location through said probe proximal end, whereby said probe proximal end is axially displaced towards the housing (12, 112);
monitoring the housing distal surface (30, 130) to detect displacement of the distal end (26, 126) of the probe relative to the housing conducted by tactile sensation; and
responsive to the distal end of the probe becoming flush with said housing distal surface indicating achievement of a predetermined threshold of exerted force, holding said exerted axial force at said predetermined threshold for a selected duration or terminating said exertion of said axial force; and
monitoring a response from said patient to said achievement of said predetermined threshold of exerted force.

9. The method of Claim 8 further including repeating, at least once, the steps of exerting axial force, monitoring the probe distal end, holding or terminating the exerted axial force, and monitoring the patient's response.

10. The method of Claim 8 or 9 wherein said predetermined threshold of exerted force is selected in a range including 0.5 kg to 4.0 kg of exerted force.

Patentansprüche

1. Palpometervorrichtung (10, 110) zur Verwendung durch einen Untersucher, um tiefe Schmerzempfindlichkeit bei einem Patienten zu beurteilen, indem dem Patienten eine einheitliche und wiederholbare Stimulation bereitgestellt wird, Folgendes umfassend:

ein Gehäuse (12, 112);
eine Sonde (14, 114), die axial in dem Gehäuse zur axialen Bewegung zwischen einer ersten Position und einer zweiten Position gelagert ist, wobei die Sonde ein proximales Ende (16, 116), das sich von einem axialen Bohrloch (18, 118) in dem Gehäuse sowohl in der ersten als auch in der zweiten Position erstreckt, und ein distales Ende (26, 126) aufweist, das in dem Gehäuse in der ersten Position enthalten ist und das sich von einem axialen Bohrloch (28, 128) in eine distale Fläche (30, 130) des Gehäuses gegenüber dem proximalen Ende in der zweiten Posi-

tion erstreckt;
ein einzelnes Vorspannmittel (24, 124), das in dem Gehäuse angeordnet ist, wobei das Vorspannmittel dazu konfiguriert ist, die Sonde axial in Richtung der ersten Position vorzuspannen;
wobei die Palpometervorrichtung derart konfiguriert ist, dass eine Axialkraft selektiv zwischen dem proximalen Ende der Sonde und einem Patienten ausgeübt werden kann, um die Sonde aus der ersten Position axial in Richtung der zweiten Position relativ zu dem Gehäuse zu bewegen;
wobei die Sonde (14, 114) und das Vorspannmittel (24, 124) zusammenwirkend konfiguriert sind, sodass das distale Ende (26, 126) bündig mit der distalen Fläche des Gehäuses (30, 130) verschoben wird, wenn die ausgeübte Axialkraft einen vorbestimmten Kraftschwellenwert erreicht;
wobei die Sonde und das Vorspannmittel zusammenwirkend konfiguriert sind, sodass das distale Ende (26, 126) sich von der distalen Fläche des Gehäuses (30, 130) erstreckt, wenn die ausgeübte Axialkraft den vorbestimmten Kraftschwellenwert überschreitet;
wobei die Palpometervorrichtung derart ausgebildet ist, dass kein Teil der Palpometervorrichtung sich in dem axialen Bohrloch (28, 128) in der distalen Fläche (30, 130) in der ersten Position der Sonde (14, 114) befindet;
wobei das distale Ende der Sonde eine Anzeigespitze (26x, 126x) aufweist;
wobei der vorbestimmte Kraftschwellenwert zwischen 0,5 kg und 4,0 kg liegt; und
wobei das Vorspannmittel (24, 124) einstellbar ist, um den vorbestimmten Kraftschwellenwert auszuwählen.

2. Palpometervorrichtung nach Anspruch 1, wobei das Vorspannmittel (24, 124) eine Vorspannfeder ist.

3. Palpometervorrichtung nach Anspruch 2, wobei das Gehäuse eine innere proximale Stütze (32, 132) und eine innere distale Stütze (34, 134) beinhaltet, wobei jede der Stützen dazu konfiguriert ist, die Sonde in dem Gehäuse zu lagern; und
wobei die Vorspannfeder (24, 124) koaxial um die Sonde angeordnet ist, zwischen einem ringförmigen Flansch oder einer Schulter (22, 122) an der Sonde und der distalen Stütze.

4. Palpometervorrichtung nach einem der vorangehenden Ansprüche, wobei das Gehäuse farbig ist, wobei die Farbe den vorbestimmten Kraftschwellenwert anzeigt.

5. Palpometervorrichtung nach einem der vorangehenden Ansprüche, wobei das proximale Ende der Sonde (16, 116) eine Oberfläche von etwa 1 cm^2 aufweist.

6. Palpometervorrichtung nach einem der vorangehenden Ansprüche, wobei das Gehäuse aus Plastik gebildet ist.

7. Palpometervorrichtung nach einem der vorangehenden Ansprüche, wobei die Anzeigespitze (26x, 126x) dazu konfiguriert ist, als Reaktion darauf, dass die ausgeübte Axialkraft den vorbestimmten Kraftschwellenwert überschreitet, eine taktile Empfindung bereitzustellen.

8. Verfahren zum wiederholten Testen von Schmerzempfindlichkeit bei einem Patienten unter Verwendung der Palpometervorrichtung (10, 110) nach Anspruch 1, Folgendes umfassend:

Positionieren des proximalen Endes der Sonde (16, 116) in Kontakt mit dem Patienten an einer ausgewählten Teststelle;
Ausüben einer zunehmenden Axialkraft an der ausgewählten Teststelle durch das proximale Ende der Sonde, wobei das proximale Ende der Sonde axial in Richtung des Gehäuses (12, 112) verschoben wird;
Überwachen der distalen Fläche des Gehäuses (30, 130), um ein Verschieben des distalen Endes (26, 126) der Sonde relativ zu dem Gehäuse zu erfassen, das durch taktile Empfindung geleitet wird; und
als Reaktion darauf, dass das distale Ende der Sonde mit der distalen Fläche des Gehäuses bündig wird, was anzeigt, dass ein vorbestimmter Schwellenwert der ausgeübten Kraft erreicht wurde, Halten der ausgeübten Axialkraft auf dem vorbestimmen Schwellenwert für eine ausgewählte Zeitdauer oder Beenden der Ausübung der Axialkraft; und
Überwachen einer Reaktion des Patienten auf das Erreichen des vorbestimmten Schwellenwerts der ausgeübten Kraft.

9. Verfahren nach Anspruch 8, ferner beinhaltend Wiederholen, mindestens einmal, der Schritte des Ausübens der Axialkraft, des Überwachens des distalen Endes der Sonde, des Haltens oder Beendens der ausgeübten Axialkraft und des Überwachens der Reaktion des Patienten.

10. Verfahren nach Anspruch 8 oder 9, wobei der vorbestimmte Schwellenwert der ausgeübten Kraft aus einem Bereich ausgewählt wird, der 0,5 kg bis 4,0 kg ausgeübter Kraft beinhaltet.

Revendications

1. Dispositif dolorimètre (10, 110) destiné à être utilisé par un examinateur pour évaluer la sensibilité à la douleur profonde d'un patient en fournissant au patient une stimulation uniforme et pouvant être répétée, comprenant :

   un boîtier (12, 112) ;
   une sonde (14, 114) supportée axialement à l'intérieur du boîtier pour un mouvement axial entre une première position et une seconde position, ladite sonde ayant une extrémité proximale (16, 116) qui s'étend à partir d'un alésage axial (18, 118) dans ledit boîtier à la fois dans lesdites première et seconde positions, et une extrémité distale (26, 126) qui est contenue à l'intérieur dudit boîtier dans ladite première position et qui s'étend à partir d'un alésage axial (28, 128) dans une surface distale (30, 130) dudit boîtier opposée à ladite extrémité proximale dans ladite seconde position ;
   un moyen de sollicitation unique (24, 124) disposé à l'intérieur dudit boîtier, ledit moyen de sollicitation étant configuré pour solliciter ladite sonde axialement vers ladite première position ;
   dans lequel le dispositif dolorimètre est configuré de sorte qu'une force axiale peut être sélectivement exercée entre l'extrémité proximale de sonde et un patient pour déplacer la sonde de ladite première position axialement vers ladite seconde position par rapport audit boîtier ;
   dans lequel ladite sonde (14, 114) et ledit moyen de sollicitation (24, 124) sont configurés de manière coopérative de sorte que ladite extrémité distale (26, 126) est déplacée au même niveau que ladite surface distale de boîtier (30, 130) lorsque ladite force axiale exercée atteint un seuil de force prédéfini ;
   dans lequel ladite sonde et ledit moyen de sollicitation sont configurés de manière coopérative de sorte que ladite extrémité distale (26, 126) est étendue à partir de ladite surface distale de boîtier (30, 130) lorsque ladite force axiale exercée dépasse ledit seuil de force prédéfini ;
   dans lequel le dispositif dolorimètre est adapté de sorte qu'aucune partie du dispositif dolorimètre n'est située dans l'alésage axial (28, 128) dans la surface distale (30, 130) dans ladite première position de la sonde (14, 114) ;
   dans lequel l'extrémité distale de la sonde a une pointe d'aiguille (26x, 126x) ;
   dans lequel ledit seuil de force prédéfini est compris entre 0,5 kg et 4,0 kg ; et
   dans lequel ledit moyen de sollicitation (24, 124) est réglable pour sélectionner ledit seuil de force prédéfini.

2. Dispositif dolorimètre selon la revendication 1, dans lequel ledit moyen de sollicitation (24, 124) est un ressort de sollicitation.

3. Dispositif dolorimètre selon la revendication 2, dans lequel ledit boîtier comprend un contrefort proximal interne (32, 132) et un contrefort distal interne (34, 134), chacun desdits contreforts étant configuré pour supporter ladite sonde à l'intérieur dudit boîtier ; et
   dans lequel ledit ressort de sollicitation (24, 124) est disposé coaxialement autour de ladite sonde, entre une bride ou un épaulement annulaire (22, 122) situé sur ladite sonde et ledit contrefort distal.

4. Dispositif dolorimètre selon l'une quelconque des revendications précédentes, dans lequel ledit boîtier est coloré, ladite couleur indiquant ledit seuil de force prédéfini.

5. Dispositif dolorimètre selon l'une quelconque des revendications précédentes, dans lequel ladite extrémité proximale de sonde (16, 116) a une surface d'environ 1 cm^2.

6. Dispositif dolorimètre selon l'une quelconque des revendications précédentes, dans lequel ledit boîtier est formé à partir de matière plastique.

7. Dispositif dolorimètre selon l'une quelconque des revendications précédentes, dans lequel la pointe d'aiguille (26x, 126x) est configurée pour fournir une sensation tactile en réponse à ladite force axiale exercée dépassant ledit seuil de force prédéfini.

8. Procédé pour tester de manière répétée la sensibilité à la douleur chez un patient en utilisant le dispositif dolorimètre (10, 110) de la revendication 1, comprenant :

   le positionnement de l'extrémité proximale de sonde (16, 116) en contact avec le patient à un emplacement de test sélectionné ;
   l'exercice d'une force axiale croissante sur l'emplacement de test sélectionné par l'intermédiaire de ladite extrémité proximale de sonde, moyennant quoi ladite extrémité proximale de sonde est déplacée axialement vers le boîtier (12, 112) ;
   la surveillance de la surface distale de boîtier (30, 130) pour détecter le déplacement de l'extrémité distale (26, 126) de la sonde par rapport au boîtier effectué par sensation tactile ; et
   en réponse à l'extrémité distale de la sonde affleurant ladite surface distale de boîtier indiquant l'atteinte d'un seuil prédéfini de force exercée, le maintien de ladite force axiale exercée audit seuil prédéfini pendant une durée sélec-

tionnée ou l'interruption dudit exercice de ladite force axiale ; et
la surveillance d'une réponse dudit patient à ladite atteinte dudit seuil prédéfini de force exercée.

9. Procédé selon la revendication 8, comprenant en outre la répétition, au moins une fois, des étapes d'exercice d'une force axiale, de surveillance de l'extrémité distale de sonde, de maintien ou d'interruption de la force axiale exercée et de surveillance de la réponse du patient.

10. Procédé selon la revendication 8 ou 9, dans lequel ledit seuil prédéfini de force exercée est sélectionné dans un intervalle allant de 0,5 kg à 4,0 kg de force exercée.

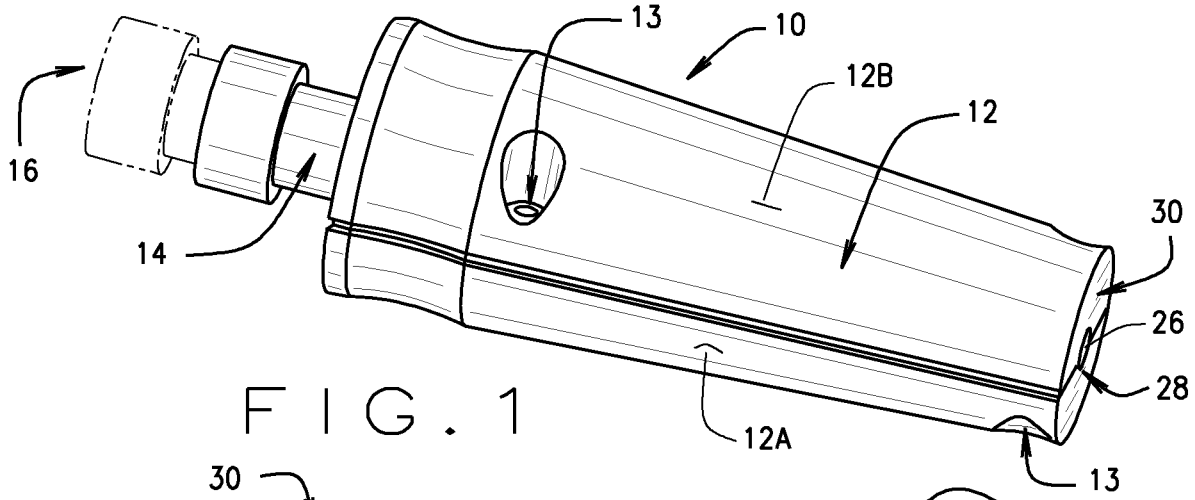


FIG. 1

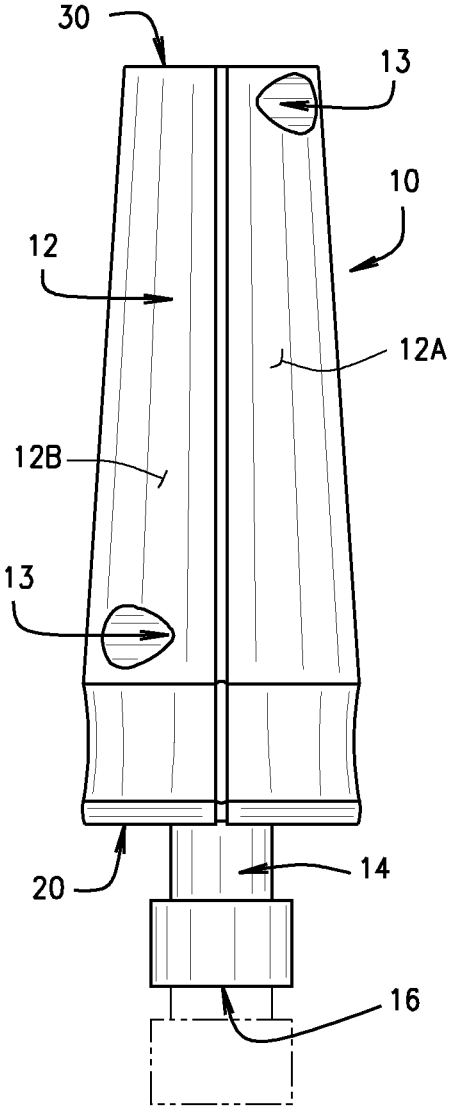


FIG. 2

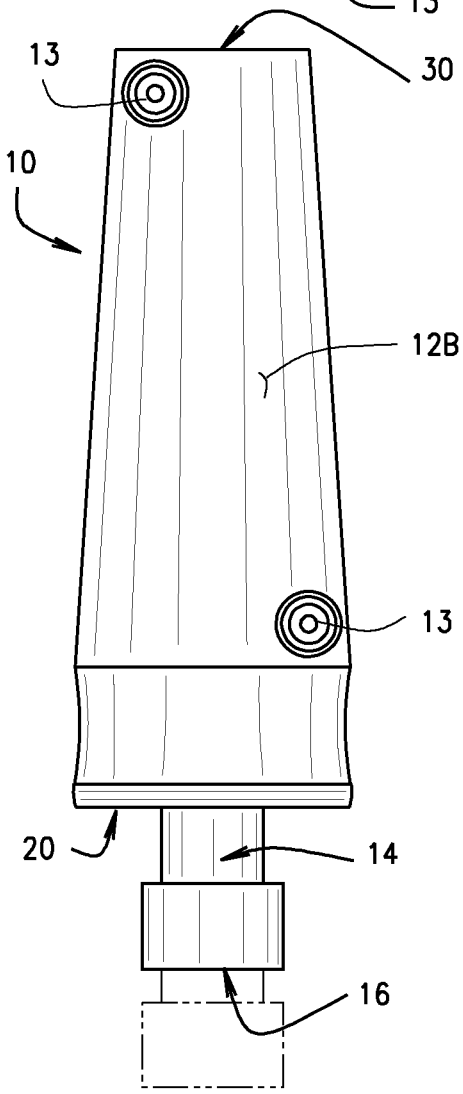
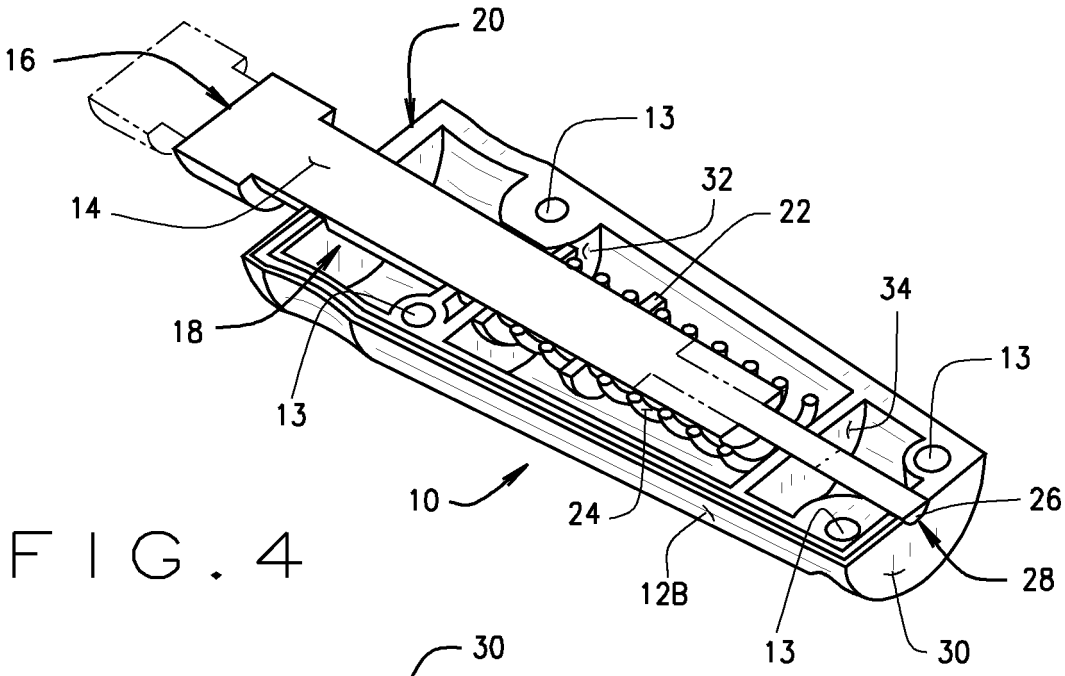


FIG. 3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12B
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FIG. 4

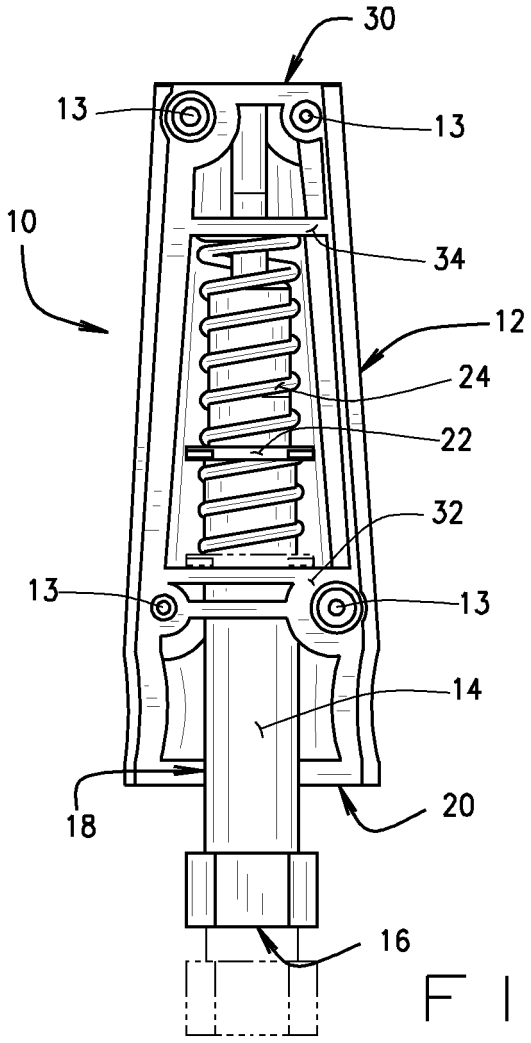
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FIG. 5

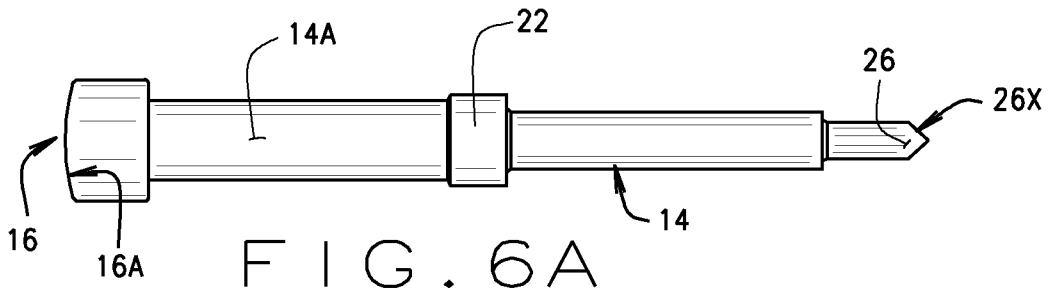

FIG. 6A

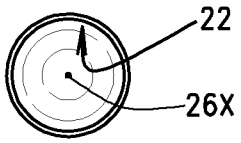

FIG. 6B

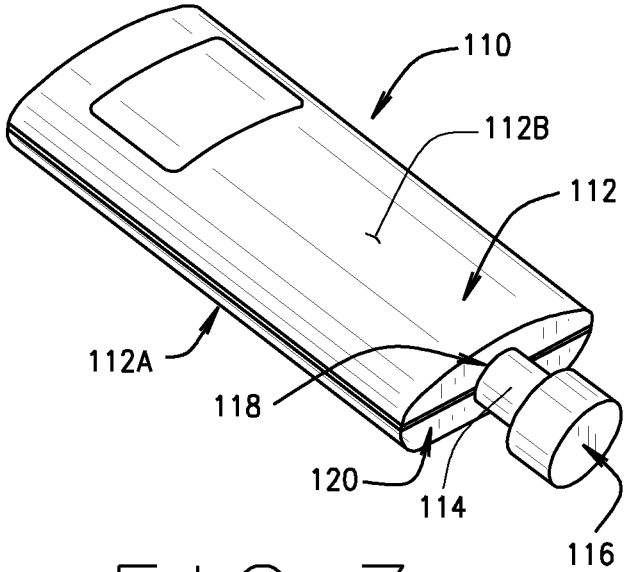

FIG. 7

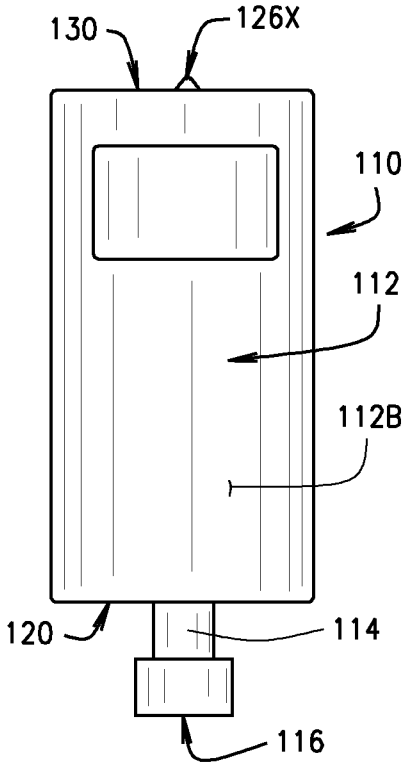

FIG. 8

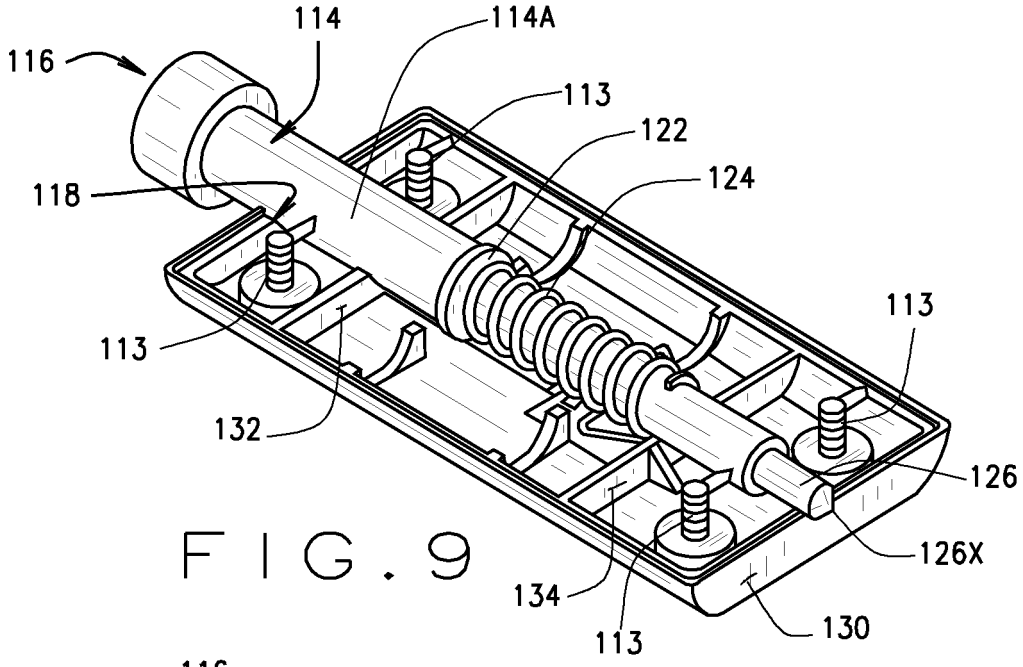

FIG. 9

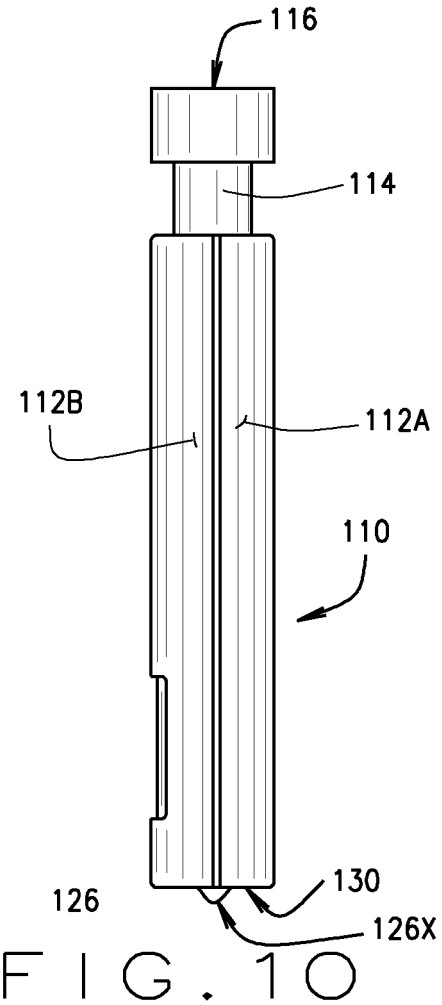

FIG. 10

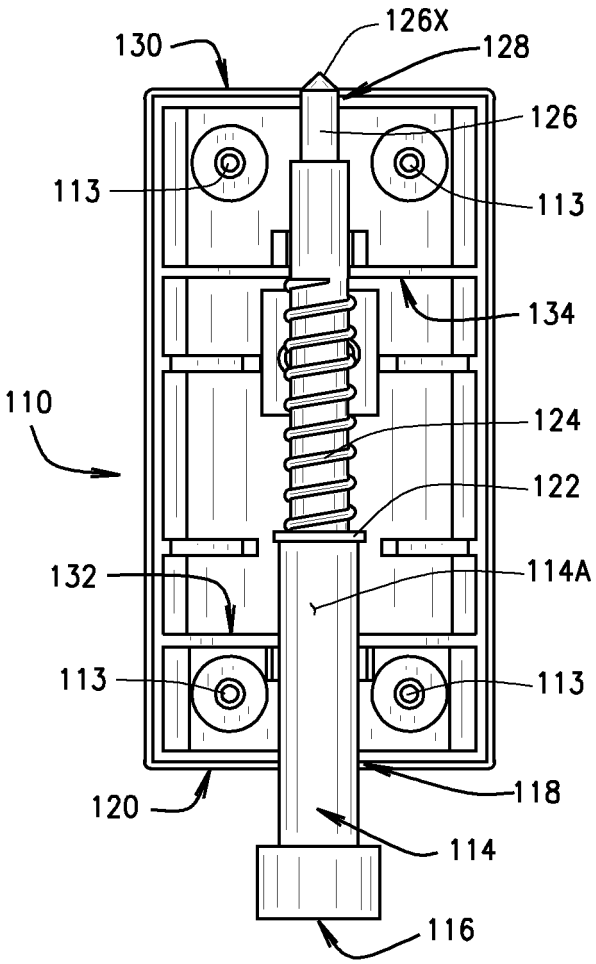

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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- JP S56109792 B **[0005]**

Non-patent literature cited in the description

- **HARDY, JAMES D.** The nature of pain. *Journal of chronic diseases,* 01 July 1956, vol. 4 (1), 22-51 **[0003]**

专利名称(译)	触诊仪		
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申请号	EP2011702570	申请日	2011-01-07
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申请(专利权)人(译)	MEDOTECH A / S		
当前申请(专利权)人(译)	SUNSTAR SUISSE SA		
[标]发明人	SVENSSON PETER RAVNHOLT GERT		
发明人	SVENSSON, PETER RAVNHOLT, GERT		
IPC分类号	A61B5/00		
CPC分类号	A61B5/103 A61B5/4528 A61B5/4824 A61B2560/0425 A61B5/0053 A61B5/4827		
优先权	61/293299 2010-01-08 US		
其他公开文献	EP2521486A1		
外部链接	Espacenet		

摘要(译)

一种用于帮助检查者评估患者的深部疼痛敏感性的触诊仪设备，包括壳体，该壳体支撑轴向可移动的弹簧偏置的探针，该探针的近端从壳体的近侧轴向面上的轴向孔延伸，并适于与壳体的近端轴向接触。患者。在壳体内，弹簧偏置的探针包括环形凸缘，该环形凸缘用于与同轴布置在壳体内的偏置弹簧的一端接合。当探针的近端与患者的身体接触时，在将偏压力手动施加到壳体时，偏压弹簧围绕探针同轴地设置，以抵抗壳体朝向探针的近端的轴向位移。

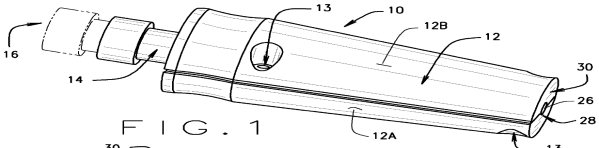

FIG. 1

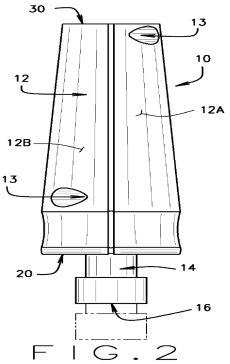

FIG. 2

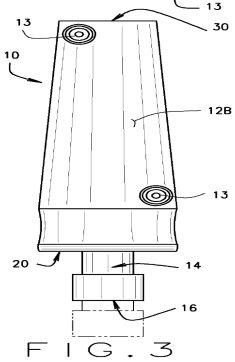

FIG. 3