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(52) Domestic classification (Edition J):

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GB 0690823**

(58) Field of search

**B4W
G1W
Selected US specifications from IPC sub-classes A61B
A61C G01L B25B**

(54) **Tension measuring forceps**

(57) Each of the limbs 14 comprise a piston within a cylinder such that when the forceps are used the cylinder moves a measureable reproducible distance allowing the tension created in the substance being worked upon to be; measured or reproduced or limited during the procedure, even if the field of view is very limited.

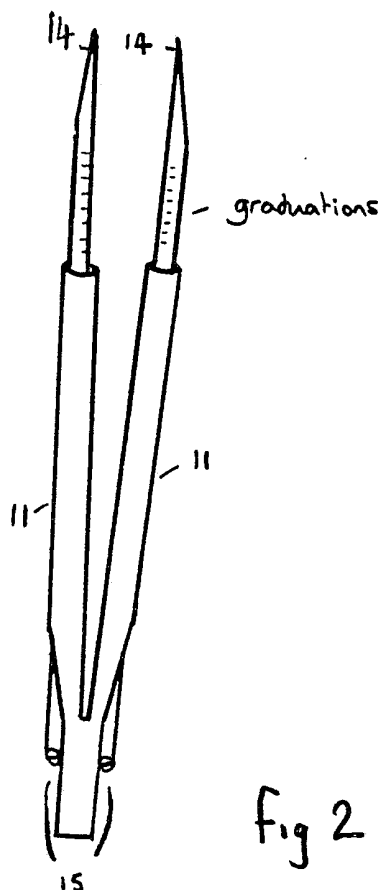


Fig 2

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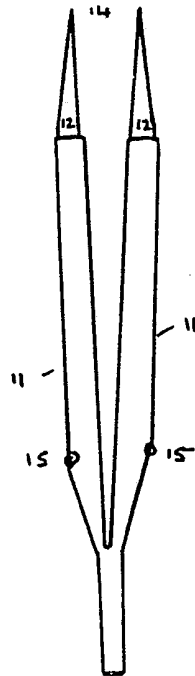


fig 1

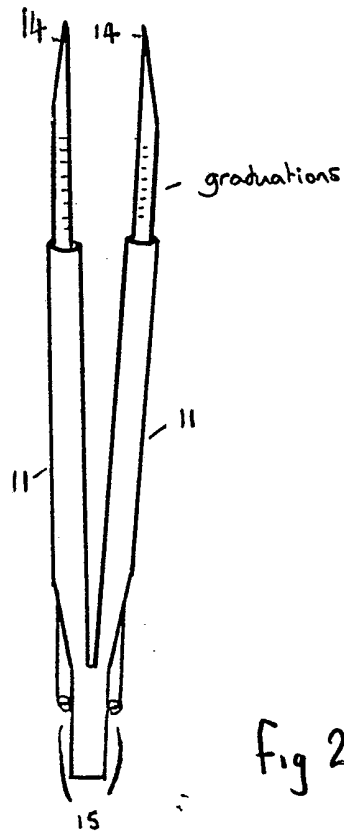


fig 2

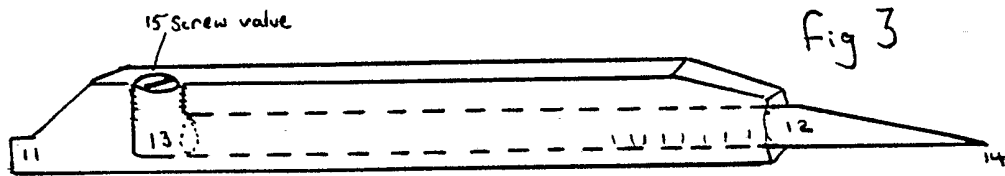
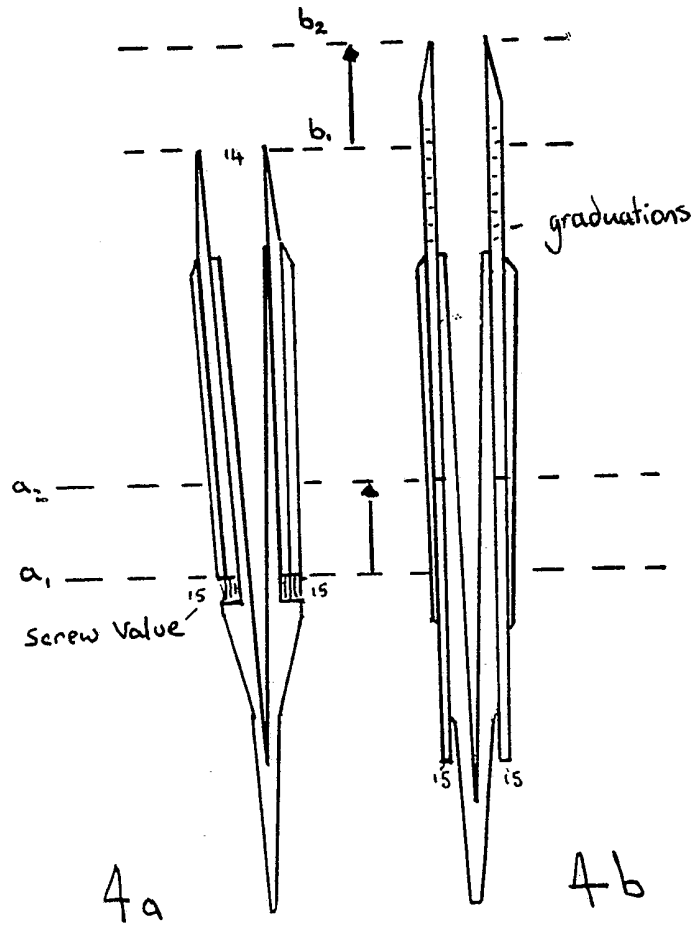


fig 3

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SPECIFICATION

Forceps

- 5 This invention relates to a pair of forceps where the tension created in a substance by them can be measured.

Forceps when applied to a substance create an unknown tension within it. The ability to measure the force acting on the substance by the forceps is desirable as feedback information to the operator so that he can:

1. Measure the force required to deform a substance in a defined manner.
 - 15 2. Re-create constant tension within the substance by increasing the force applied until the same measured point is achieved on the scale.
 3. Remain below a critical tension.
- 20 Forceps comprising of two limbs each of them being resiliently extendible, the arrangement being such that the gripping ends of the limbs are unobscured (so that measurements can be made even if the field of operation is narrow).
- 25 The extension of the limbs is a measure of the force exerted by the forceps on a body. The extension of the limbs is by means of a piston within a cylinder.

- A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing in which:-

Figure 1 shows in perspective the forceps in rest position (valve on side of limb).

- 35 *Figure 2* shows in perspective the forceps in use position with the piston drawn out (in this drawing the adjustment screw/exit valve is at the proximal end of the cylinder).

- Figure 3* illustrates the component parts of one of the two limbs of the forceps.

Figure 4 illustrates the instrument in cross section in the two positions of (a) rest and (b) use.

- Referring to the Fig. 3 the forceps comprise 45 of two limbs⁽¹¹⁾ each limb in the form of a piston⁽¹²⁾ within a cylinder⁽¹³⁾ with the gripping end⁽¹⁴⁾ of each limb being on the piston and the cylinder forming the handle end of the forceps.

- 50 The piston is introduced as far into the cylinder as possible air being vented through the exit valve⁽¹⁵⁾ in the handle. If this valve was mounted on a screw then the screw could vary the unswept volume of the cylinder (acting as fine adjustment). Secondly the 55 screw/exit valve could be removed to allow removal of the piston in order to change it for a differently finished gripping end piece⁽¹⁴⁾.

- When a deforming force is applied to a substance, being gripped by the forceps, the tension created within the substance causes the vacuum to be overcome allowing the piston to move down the cylinder a distance. The final distance moved can be used to indicate the 65 tension by reading off a scale engraved on the

side of the piston. The movement causes an increase in the vacuum, the piston stops moving when the suction force of the vacuum equals the tension within the substance (friction and gravity ignored) ie. the greater the force applied to a substance, the greater the tension created in the substance, the further the piston moves, the greater the number of engraved graduations on the piston are revealed. This position is seen in Figs. 2 and 4b.

When the forceps are not acting on a substance the vacuum within the cylinder returns the piston to its rest position (Figs. 1 and 4a).

- 80 Other means could be used to measure the piston movement such as a spring scale, a pressure transducer, a rectilinear potentiometer, a strain gauge, a hydraulic system etc. The example given is the simplest.

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CLAIMS

1. Forceps comprising of two limbs each of them being resiliently extendible, the arrangement being such that the gripping ends 90 of the limbs are unobscured (so that measurements can be made even if the field of operation is narrow). The extension of the limbs is a measure of the force exerted by the forceps on a body. The extension of the limbs is by means of a piston within a cylinder.

2. Forceps as in Claim 1 with the means to measure movement of the cylinder.

2. Forceps as in Claim 1 or Claim 2 with means to change its function. eg. by substituting a piston with a different specialized head.

4. Forceps as in Claim 1 or Claim 2 or Claim 3 with means to finely adjust the vacuum.

5. A tension measuring forcep substantially as described herein with reference to Figs. 1-5 of the accompanying drawing.

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