



## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b>  <b>A61B 5/14</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 92/04866</b>  <b>(43) International Publication Date:</b> 2 April 1992 (02.04.92)
<b>(21) International Application Number:</b> PCT/DK91/00289 <b>(22) International Filing Date:</b> 25 September 1991 (25.09.91)  <b>(30) Priority data:</b> 2316/90 25 September 1990 (25.09.90) DK  <b>(71) Applicant (for all designated States except US):</b> NOVO NORDISK A/S [DK/DK]; Novo Allé, DK-2880 Bagsvaerd (DK).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only) :</b> POULSEN, Jens, Ulrik [DK/DK]; Meinungsgade 10, I. t.v., DK-2200 Copenhagen N. (DK). LARSEN, Andre [DK/DK]; Skovengen 3, DK-2791 Dragoer (DK). MØLLER-JENSEN, Jens [DK/DK]; Nyhavn 39, DK-1051 Copenhagen K. (DK).		<b>(74) Common Representative:</b> NOVO NORDISK A/S; Patent Department, Novo Allé, DK-2880 Bagsvaerd (DK).  <b>(81) Designated States:</b> AT (European patent), AU, BB, BE (European patent), BF (OAPI patent), BG, BJ (OAPI patent), BR, CA, CF (OAPI patent), CG (OAPI patent), CH (European patent), CI (OAPI patent), CM (OAPI patent), CS, DE (European patent), DK (European patent), ES (European patent), FI, FR (European patent), GA (OAPI patent), GB (European patent), GN (OAPI patent), GR (European patent), HU, IT (European patent), JP, KP, KR, LK, LU (European patent), MC, MG, ML (OAPI patent), MR (OAPI patent), MW, NL (European patent), NO, PL, RO, SD, SE (European patent), SN (OAPI patent), SU <sup>+</sup> , TD (OAPI patent), TG (OAPI patent), US.  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> LANCET UNIT AND TOOL FOR HANDLING THEREOF  <div data-bbox="802 1160 1201 1776" data-label="Image"> </div> <b>(57) Abstract</b>  <p>A lancet unit has a finger plate (1) with an opening (10) and a stiletto (4) with a pointed front end and a rear end (5) upon which an impact may be imparted to make the pointed end shoot out through the opening (10) in the finger plate (1). The stiletto (4) is suspended behind the finger plate (1) in a meandering leaf spring (14, 15, 16) guiding its displacement perpendicularly to the finger plate (1). A tool for operation of the lancet unit is shaped as a pencil and may be loaded by twisting its front end carrying the lancet unit in relation to the rest of the housing (21). A multifunction button (22), which may be pressed or rotated, will when pressed trigger an impact on the stiletto when the tool is loaded; or eject the lancet unit when the tool is unloaded, and will when rotated define the pricking depth of the stiletto. The double press button function is obtained by centering a hammer (30) in the housing (21) when the tool is loaded, which hammer in the unloaded status is oblique in relation to the axis of the housing (21).</p>		

# + DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

## *FOR THE PURPOSES OF INFORMATION ONLY*

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	ES	Spain	MG	Madagascar
AU	Australia	FI	Finland	ML	Mali
BB	Barbados	FR	France	MN	Mongolia
BE	Belgium	GA	Gabon	MR	Mauritania
BF	Burkina Faso	GB	United Kingdom	MW	Malawi
BG	Bulgaria	GN	Guinea	NL	Netherlands
BJ	Benin	GR	Greece	NO	Norway
BR	Brazil	HU	Hungary	PL	Poland
CA	Canada	IT	Italy	RO	Romania
CF	Central African Republic	JP	Japan	SD	Sudan
CG	Congo	KP	Democratic People's Republic of Korea	SE	Sweden
CH	Switzerland	KR	Republic of Korea	SN	Senegal
CI	Côte d'Ivoire	LI	Liechtenstein	SU <sup>+</sup>	Soviet Union
CM	Cameroon	LK	Sri Lanka	TD	Chad
CS	Czechoslovakia	LU	Luxembourg	TG	Togo
DE	Germany	MC	Monaco	US	United States of America
DK	Denmark				

# LANCET UNIT AND TOOL FOR HANDLING THEREOF

The invention concerns an equipment for taking out blood samples, and more specified a lancet unit for piercing the skin on the location where the sample should be taken and  
5 a tool for operating the lancet unit.

By medical examinations it is often necessary to take out small amounts of blood of the order of a single droplet. These samples are provided by piercing the skin of the patient so that a single drop of blood trickles out.

10 Preferred for this purpose is a tool by which a stiletto or a needle by an impact is quickly forced through the skin and by which the needle before and after the operation is hidden to the patient, as this may be an advantage seen from a psychological point of view. The retraction of the needle also  
15 prevents the user from scratching himself or other persons with the used needle, which may be infected.

Some patients e.g. patients suffering from diabetes or from haemophilia have to take out blood samples from themselves frequently to estimate their need for medication.  
20 For such patients it is of importance that the samples can be taken in a simple way without pain using a tool with a neutral appearance, and which is simple to handle.

A tool is known having the appearance of a cigarette lighter in which a needle unit may be placed and by a loading  
25 motion set under influence of a compressed spring which may be released by pressing a button, whereby the needle is driven through an opening in a finger plate on which the patient has positioned his finger. Thereby the finger is perforated by the needle to a depth regulated by the choice of interchangeable  
30 finger plates. After use the needle can be ejected from the tool by pressing another button.

With the latest attention to blood transferred diseases, it is desirable to make it possible to throw away after use parts which may have been in contact with blood. The  
35 disposal of the relevant parts should be possible without

touching such parts. By the lighter model these demands are met as to the rejection of the needle, whereas the finger plates are not intended to be disposable.

Consequently, the object of this invention is to  
5 provide a lancet unit which makes sure that needle as well as finger plate may be disposed of after use without having to touch either of the parts.

This is obtained by a lancet unit comprising a finger plate having an opening and a stiletto having a pointed front  
10 end and a rear end, the stiletto being resiliently suspended behind the finger plate in a suspension rigidly connected with the finger plate for displacement of the stiletto in its axial direction perpendicular to the finger plate, whereby the pointed end of the stiletto by an axial impact on the rear end  
15 of the stiletto can be forced to protrude from the front side of the finger plate to thereupon being retracted to its initial position behind the finger plate when the impact influence has ceased.

By this construction with the finger plate, the  
20 stiletto and its suspension mutually rigidly connected to each other it is ensured that needle and finger plate are disposed of at the same time.

According to the invention, the resilient suspension of the stiletto may be formed by a meandering leaf spring, the  
25 elasticity of which varies along the leaf in such a way that it is ensured that the stiletto does not or only to a minor degree diverge from its direction perpendicular to the finger plate when influenced by an axial impact on its rear end. Without this precaution the stiletto may pierce the skin at an oblique  
30 angle causing a scratching instead of a pure sting, thus making the piercing more painful or insufficient.

In a preferred embodiment of the lancet unit according to the invention the stiletto is covered by a protecting cover, which is fastened to the stiletto suspension and has a  
35 finger grip accessible on the front side of the finger plate

for twisting the cover free and removing it before use when the lancet unit is placed in a tool for use.

By moulding the finger plate, suspension, and protecting cover as an integral piece, in which the stiletto is embedded by the mould procedure, the rigid fastening of the protecting cover is secured, and further the stiletto is sterilized by the heat of the embedding material during the mould procedure.

Another object of the invention is to provide a tool for operating the lancet. This tool should be neutral in its appearance and easy to operate.

These demands are met by a pencil shaped tool having a mainly rectangular cross-section and having at its one end a socket for receiving a lancet unit and having at its other end an multifunction operating button, the socket end of the tool being turnable about its length axis in relation to the rest of the tool as a loading motion making the tool ready for a piercing operation.

The multifunction operating button releases the piercing operation, when pressed after the loading motion, and ejects the lancet unit when pressed after a piercing operation. A turning of the multifunction button about its axis will adjust the piercing depth.

The invention is now described with reference to the accompanying drawings, in which

Figure 1 shows an end view of a lancet unit according to the invention.

Figure 2 shows a top plan view of the lancet unit of figure 1.

Figure 3 shows a side view of the lancet unit of figure 1.

Figure 4 shows a cross-section taken along the line IV-IV of figure 2.

Figure 5 shows the lancet unit of figure 1 seen from the bottom.

Figure 6 shows a perspective view of a tool for operating the lancet unit of figures 1-5.

Figure 7 shows the tool of figure 6 seen from the socket end.

5        Figure 8 shows a sectional view along the longitudinal axis of the tool of figure 6 along the line VIII-VIII in figure 7, the tool being shown unloaded, i.e. with its hammer in its neutral position, and carrying a lancet unit.

Figure 9 shows a sectional view as in figure 8 with  
10 the hammer in its neutral position, but with certain details omitted.

Figure 10 shows a sectional view as in figure 9 with the hammer in a loaded position ready to be released.

Figure 11 shows a sectional view as in figure 9 with  
15 the hammer released impacting the stiletto of the lancet unit, and

Figure 12 shows a sectional view as in figure 9 with the hammer serving an ejection function.

Reference is now made to figures 1-5 illustrating a  
20 lancet unit according to the invention. A finger plate 1 is connected to a suspension frame 2 through side walls 3. In the suspension frame 2 the stiletto 4 is suspended, but in figures 1 and 3 only the rear end 5 of this stiletto 4 is seen, the pointed end being covered by a protecting cover 6, which by a  
25 weakened part 7 is fastened to the embedment 8, where the stiletto 4 is embedded in its suspension. At the front side of the finger plate 1 the protecting cover 6, extending through an opening 10 in the finger plate 1, is provided with a finger grip 9, by which the cover may be twisted to break the weakened  
30 part 7 to remove the cover from the stiletto. This removal of the cover is not performed until the lancet unit is placed with its suspension frame and its side walls in a socket in an operating tool, the insertion in the socket being limited by the rear side of the finger plate abutting the front edge of  
35 the socket and lateral play being prevented by guiding projections 19 abutting the inner wall of the socket.

Figure 4 illustrates a section along the line IV-IV in figure 2 showing the stiletto 4 in its embedment 8 in the suspension. As can be seen, the stiletto 4 has a recess 11 in its embedded part, whereby it is ensured that the stiletto is not twisted out of its embedment 8 when the protecting cover 6 is twisted to break the weakened part 7.

As can also be seen from figure 4, the pointed end of the stiletto lies ready in a position behind the finger plate 1 when the protecting cover has been removed. An impact on the rear end 5 of the stiletto will force the point of the stiletto up through the opening 10 in the finger plate 1 to pierce a finger placed on this plate. After the piercing, when the impact influence on the rear end 5 of the stiletto 4 has ceased, the spring effect of the suspension will retract the stiletto to a position with its pointed end behind the front side of the finger plate 1.

Figure 5, showing the lancet unit seen from the bottom, illustrates the suspension of the stiletto which is embedded in the embedment 8. Through a connecting part 12 this embedment is connected to the middle of a beam 13 having its ends connected through leaf springs 14 each to an end of two connection beams 15, the other ends of which are connected through other leaf springs 16 parallel with the first pair of leaf springs 14 to the part of the suspension frame 2 adjacent to the first beam.

Bending one pair of the leaf springs out of their plane will cause a tilting of the stiletto away from its position perpendicular to the finger plate, whereas bending of the other pair of leaf springs will cause a tilting in the opposite direction. By an appropriate dimensioning of the elasticity of the springs, recognizing that the springs have different lengths, it is ensured that the movement of the stiletto is a pure axial movement.

The shown lancet unit is moulded with the side walls 3 lying in horizontal continuation of the suspension frame 2 with a half part of the finger plate extending upwards of the

outer end of each side wall perpendicular to the respective side wall. The connection of the side walls to the suspension frame 2 is formed as hinges 17 permitting the side walls to be folded upwards to make the finger plate halves meet and snap together by a snap lock 18 provided along the meeting edges.

The rear end of the stiletto is preferably blunt, but may have a sharp edge by being cut off by a wire cutter. In another embodiment not shown the rear end of the stiletto may not project from the embedment whereby the plastic material of this embodiment serves as an anvil for an impact mechanism.

The lancet unit may be moulded into its final shape so that the finger plate appears as an integral surface instead of a surface formed by meeting halves.

Further, the protecting cover may be omitted and the lancet units may be packed individually in sterile packages.

The lancet unit according to the invention is operated using a pencil-shaped tool as shown in figures 6-12. The tool comprises a housing 21 having a mainly rectangular cross-section and having at one end a socket 20 for receiving the lancet unit and at the other end a button 22, which may be pressed or turned for different operation purposes.

The end involving the socket 20 can be turned about its axis, and a turning of this end 180° in relation to the rest of the housing will tighten a shot spring 35 for shooting a hammer 30 against the rear end of the stiletto of a lancet unit inserted in the socket 20. When the shot spring 35 is tightened, the button 22 serves as a trigger for releasing the hammer, but when the shot spring 35 is not tightened the button 22 ejects the lancet unit when pressed.

Turning the button 22 about its axis will adjust how far the hammer will be shot, and the piercing depth of the stiletto may thus be adjusted by turning the button to point at one of a number of marks 24 representing various selectable positions. The end of the button has a rectangular cross-section and may thus function as an arrow pointing at the mark corresponding to the chosen position.



The hammer 30 is shaped as a rod extending through the centre of the housing guided at one end in a tube 31 and at about its middle in central openings in two bushings 32 and 33, transferring the forces of a retraction spring 34 and a shot  
5 spring 35, respectively, to the hammer 30 by influencing the respective sides of a ring 36 fastened to the hammer 30 at an oblique angle. The bushings 32 and 33 are guided in a tubular lining 48 in the housing.

The tube 31 has in its wall two opposite slots 41  
10 guiding the respective ends of a pin 37 going through the hammer 30 perpendicular to its axis and secured in the hammer 30 in such a way that its ends protrude equally through each side of the tube 31, when the hammer 30 is centred with its axis identic with the axis of the housing.

15 Turnable on the tube 31 is mounted a tightening block 38 having slots 40 corresponding to the slots 41 of the tube 31, but passing over into a helical ramp 42 extending half way around the block beginning at the position of the pin 37 when the hammer 30 is in its neutral position defined by the ring 36  
20 lying abreast of stops 39 for the bushings 32, 33.

When in its neutral position the hammer 30 will, due to the influence on the ring 36, adapt an oblique position in a plane defined by the slots 41 in the tube. In the directions perpendicular to this plane the position of the hammer is  
25 unvariably defined by the openings in the bushings 32, 33, and the pin 37 sliding in the slots 41 in the tube 31.

In its oblique position the hammer will at its one end be adjacent to an edge of an ejector 43 and at its other end be adjacent to an edge of the inner end of the operation  
30 button 22, and will consequently transfer an axial movement of the button 22 to the ejector 43 and force this ejector against the suspension frame 2 of a lancet unit in the socket 20 to eject this lancet unit when the button 22 is pressed.

When the turnable tightening block 38 is turned 180°  
35 to tighten the shot spring 35, the hammer will initially be centred in the housing, as guides at the beginning of the ramp

42 position the pin with equal protruding parts on each side of the tube 31. Thereupon the pin 37 is moved along the slots by the ramps 42 and the shot spring 35 is tightened by the hammer 30 being moved in the direction towards the operation button. 5 The hammer, now being centred in the housing, will pass with its end into a bore 44 in the operation button 22 and by a pawl mechanism 53 be kept in its position with the shot spring 35 tightened.

When the operation button is now pressed it will 10 release the pawl mechanism 53, and the shot spring will move the hammer 30 towards its neutral position. Due to its momentum the hammer will pass this position, and now being centred it will shoot out through an opening 45 in the ejector 43 and impart an impact on the rear end of the stiletto of a lancet 15 unit inserted in the socket 20 of the tool.

Shooting past its neutral position the hammer 30 will tighten the retraction spring 34 by the ring 36 abutting the bushing 32, and this spring will finally retract the hammer to its neutral position.

20 The shot spring 35, exerting at its one end a force on the hammer through the bushing 33, abuts at its other end a plate 46 at one end of a sleeve 47, which fits rotably into the tubular lining 48 in the housing. At the other end of the sleeve 47 the inner end of the operation button fits into a 25 guidance, permitting an axial motion of the button, but which guidance ensures that a turning of the button about its axis will impart a turning of the sleeve 47 in the lining 48.

At a position between the ends of the sleeve its wall is cut away leaving a partly roundgoing opening 49, into which 30 a stop pin 50 protrudes inserted through the lining 48 and secured in the housing to prevent the sleeve 47 from being driven out by the force of the shot spring 35. The edge 52 of the opening 49, against which the stop pin 50 abuts, in a plane perpendicular to the axis of the sleeve, is at intervals along 35 its length provided with rounded depressions mating the abutting part of the stop pin 50. When the shot spring 35

acting on the end of the sleeve 47 forces the edge 52 against the stop pin 50, the depressions will, when the tube is rotated, define fixed rotary positions for the sleeve 47.

When the hammer 30 is released and is shooting in the direction towards a lancet unit inserted in the socket 20 of the tool, the movement of the hammer 30 is restricted by a pin 54 on the hammer inside the sleeve 47 hitting the plate 46 on its side facing the inner of the sleeve 47.

The circular inner side of the plate 46 is provided with a stepped face, the angular length of each step being equal to the angular distance between the depressions along the edge 52 of the opening 49 in the sleeve 47. The steps progressively restrict the length of the movement of the hammer 30 by providing abutments for a pin 54 secured in the hammer 30 perpendicularly to its axis and projecting from one side of the hammer. In this way it is made possible to adjust the piercing depth for the stiletto of a lancet unit inserted in the tool.

Figures 9-12 illustrate various statuses of a tool with a lancet unit mounted. For the sake of clearness, some details, e.g. the shot spring and retracting spring, are omitted.

Figure 9 shows the tool in its neutral status. The not shown springs force the bushings 32 and 33 against the stops 39. The ring 36 will be forced to adapt a position perpendicular to the housing axis and consequently the hammer 30 will be forced to an oblique position with its one end facing the edge of the inner end of the operation button 22 and the other facing the ejector 43 away from its central opening 45. In this neutral status the tool may receive a lancet unit in its socket.

In figure 10 the socket end of the housing has been twisted 180° relative to the rest of the housing. Thereby the pin 37 has been passed along the ramps 42 and the hammer 30 is passed to the right. Sliding in the axial slots 41 the pin 37 is maintained in an axial plane in the housing. Guided by not shown guides the pin is moved in this axial plane to center the

hammer before passing it to the right. So centered the hammer may be passed into the bore 44 of the operation button 22 and the pawl 53 may engage a stop preventing the shot spring from passing the hammer back to its neutral position.

5 In figure 11 the button 22 is pressed and the pawl 53 has been forced away from the stop. The shot spring has forced the bushing 33 back to its position abutting the stop 39. Thereby the hammer has been imparted a momentum driving it further to the left to a position in which it hits the rear end  
10 of the stiletto of the lancet unit mounted in the socket and forces the stiletto 4 to shoot out through the opening in the finger plate 1. The movement of the hammer is stopped by the pin 54 abutting the bottom plate 46 of the depth setting mechanism. As the momentum of the stiletto and its suspension  
15 is negligible the movement of the hammer will define the pricking depth.

After the impact the retraction spring will move the hammer back to its neutral position and the status of figure 9 is reestablished. If the button 22 is now pressed the situation  
20 shown in figure 12 occurs where the movement of the button 22 via the oblique hammer is transferred to the ejector 43 which is also moved to the left ejecting the lancet unit from the socket.

**CLAIMS**

1. Lancet unit, **characterized** in that it comprises a finger plate (1) having an opening (10) and a stiletto (4) having a pointed front end and a rear end (5), the stiletto (4) being resiliently suspended behind the finger plate (1) in a suspension rigidly connected with the finger plate (1) for displacement of the stiletto (4) in its axial direction perpendicular to the finger plate (1), whereby the pointed end of the stiletto (4) by an axial impact on the rear end (5) of the stiletto (4) can be forced to protrude from the front side of the finger plate (1) to thereupon being retracted to its initial position behind the finger plate (1) when the impact influence has ceased.

2. Lancet unit according to claim 1, **characterized** in that the resilient suspension of the stiletto (4) is formed by a meandering leaf spring (14,15,16), the elasticity of which varies along the leaf in such a way that it is ensured that the stiletto (4) does not or only to a minor degree diverge from its direction perpendicular to the finger plate (1) when influenced by an axial impact on its rear end (5).

3. Lancet unit according to claim 1 or 2, **characterized** in that the stiletto (4) is covered by a protecting cover (6) which is fastened to the stiletto suspension and has a finger grip (9) accessible at the front side of the finger plate (1) for twisting the cover (6) free and removing it before use, preferably after the lancet unit is placed in a tool.

4. Lancet unit according to any of the preceding claims, **characterized** in that the finger plate (1), suspension and protecting cover (6) are moulded as an integral piece, in which the stiletto (4) is embedded by the mould procedure.

5. Tool for operating the lancet unit according to claims 1-4, **characterized** in that it has a pencil-shaped housing (21) with a mainly rectangular cross-section and at its one end has a socket (20) for receiving the lancet unit, and at its other end has a multifunction operation button (22), the socket end being turnable about its length axis in relation to the rest of the tool as a loading motion making the tool ready for a piercing operation.

6. Tool according to claim 5, **characterized** in that the loading motion consists in a 180° turning of the socket end in relation to the rest of the tool.

7. Tool according to claim 5 or 6, **characterized** in that the multifunction button (22) is made as a combined pressable and turnable button.

8. Tool according to claim 7, **characterized** in that the multifunction button (22) is made to release the piercing operation when pressed after a loading motion and to eject the lancet unit when pressed after a piercing operation.

9. Tool according to claim 7 or 8, **characterized** in that the button (22) is made to adjust the piercing depth when turned to one of a number of selectable rotary positions.

10. Tool according to claims 5-9, **characterized** in that it comprises a rod-shaped hammer (30) guided in a tube (31) coaxial with the housing (21) and having a diameter allowing the hammer rod (30) to lie obliquely in relation to the axis of the tube (31); a loading mechanism forcing the hammer (30) away from the socket end of the housing (21) against the force of a shot spring (35) to a position centred in the tube (31) with the shot spring (35) tightened and held by a releasable pawl mechanism (53) with an end of the hammer (30) inserted in a bore (44) in the multifunction operation

button (22) coaxial with the housing (21) at the end opposite the socket; an ejector (43) inside the socket (20) comprising a block covering the orifice of the tube (31) at the end facing the socket (20) and having a central opening (45), through which the hammer (30) may just pass when centred in the tube (31); means for forcing the hammer (30) into an oblique position in the tube (31) with one end adjacent to the ejector block (43) beside its opening, and the other end adjacent to the inner end of the operation button (22) beside its bore (44); and adjustable means for restricting the lengthwise movement of the hammer (30) when it is released for impacting the rear end (5) of the stiletto (4) of a lancet unit inserted in the socket.

11. Tool according to claim 10, characterized in that the loading mechanism comprises a block (38) rotably mounted on the tube end facing the socket (20) and having an outer contour mating with an inner contour in an independent part of the housing comprising the socket (20) to be turned with this part of the housing, the tube (31) being provided at opposite sides with slots (41), into which protrude the ends of a pin (37) through the hammer (30), perpendicular to its axis and secured in the hammer with equal parts protruding at each side of the hammer, and the block (38) being provided with corresponding slots (40), each of which at the position for the pin (37), when the hammer (30) is in its neutral position, pass over into a helical ramp (42) extending half the way around the block (38), the first part of the ramp (42) having guides for influencing the pin (37) in its longitudinal direction to centre the hammer (30) in the tube (31) before it is moved against the force of the shot spring (35) by the ends of the pin sliding upwards the ramps (42) when the block (38) is rotated on the tube (31).

12. Tool according to claim 10, characterized in that the means for bringing the hammer (30) into an oblique position

in the tube (31) comprises a ring (36) mounted obliquely on the hammer (30), over which ring (36) the forces of the shot spring (35) and a retraction spring (34) over respective intermediary bushings (32,33) are transmitted to the hammer (30).

5           13. Tool according to claim 12, **characterized** in that the bushings (32,33) have the shape of cups with the springs (34,35) acting on the inner bottoms of the cups, and the outer bottoms of the cups acting on the obliquely mounted ring (36), the hammer (30) passing with a small clearance through the  
10 bottoms of the cups.

          14. Tool according to claim 10, **characterized** in that the adjustable means for limiting the movement of the hammer comprise a sleeve (47) rotably mounted in the housing (21) coaxial with this housing at the end opposite the socket (20),  
15 the sleeve (47) being coupled to the button (22) to be rotated by turning this button and having a stop mechanism (50) to keep it in a selected rotary position, and that a bottom plate (46) is provided at the inner end of the sleeve (47), through which bottom plate the hammer (30) passes, this bottom plate (46)  
20 having on its side facing the inner of the sleeve (47) an angular stepped face with progressively increasing height of the steps, which face cooperates with a stop pin (50) on the hammer (30) inside the sleeve (47) to restrict the movement of the hammer (30) when released, each step corresponding to a  
25 selectable rotary position of the sleeve (47).



1/5

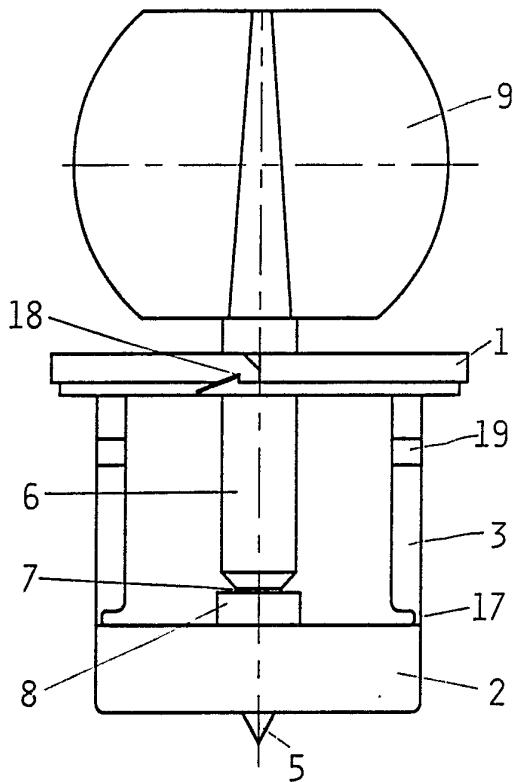


Fig. 1

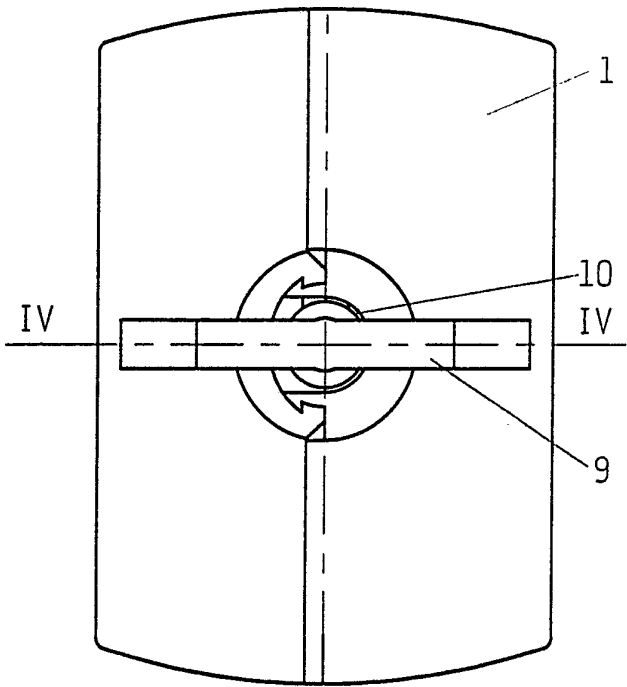


Fig. 2

2/5

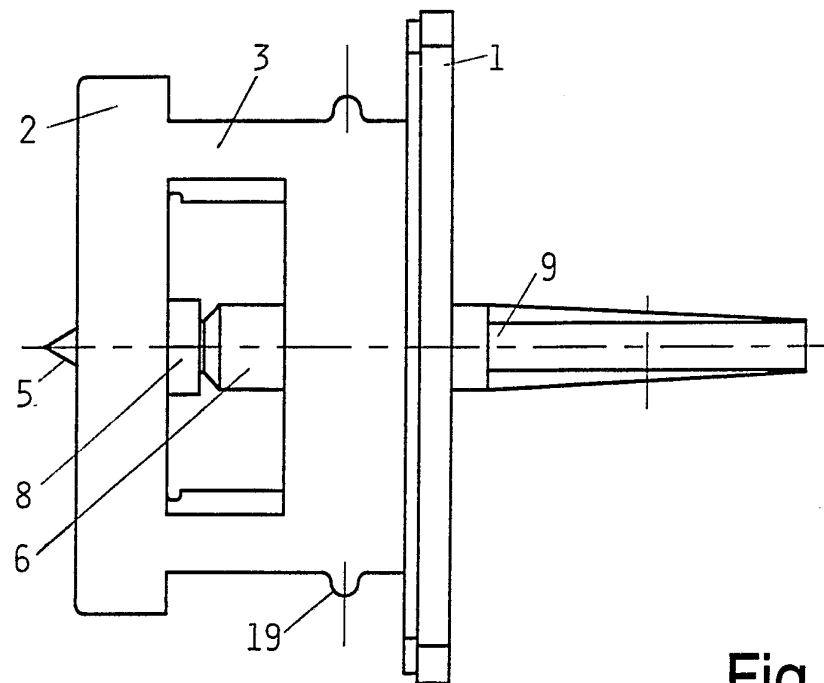


Fig. 3

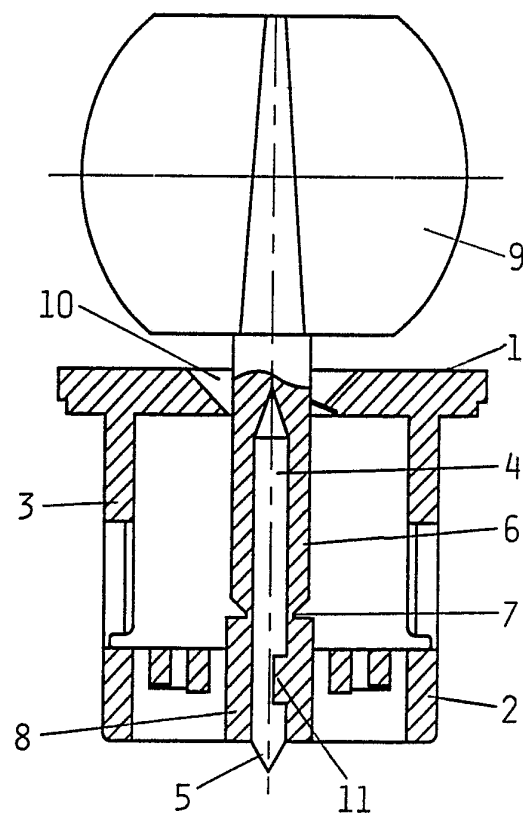


Fig. 4

3/5

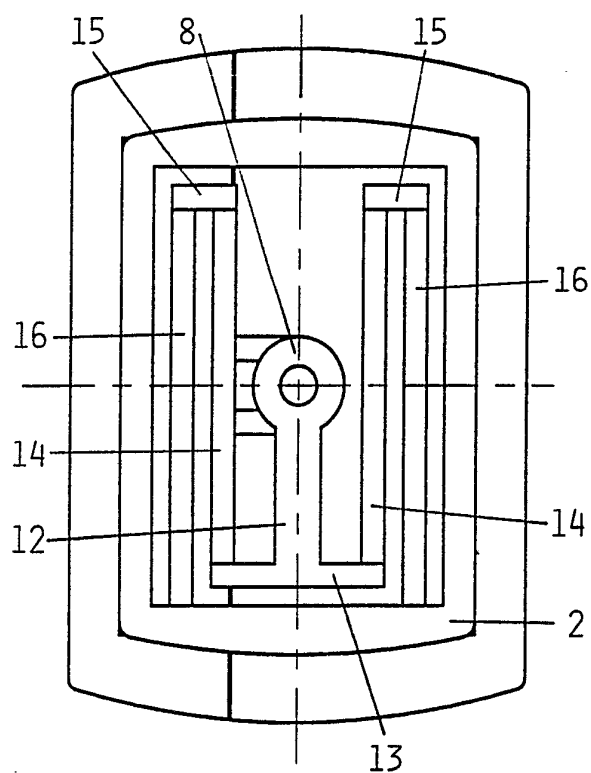


Fig. 5

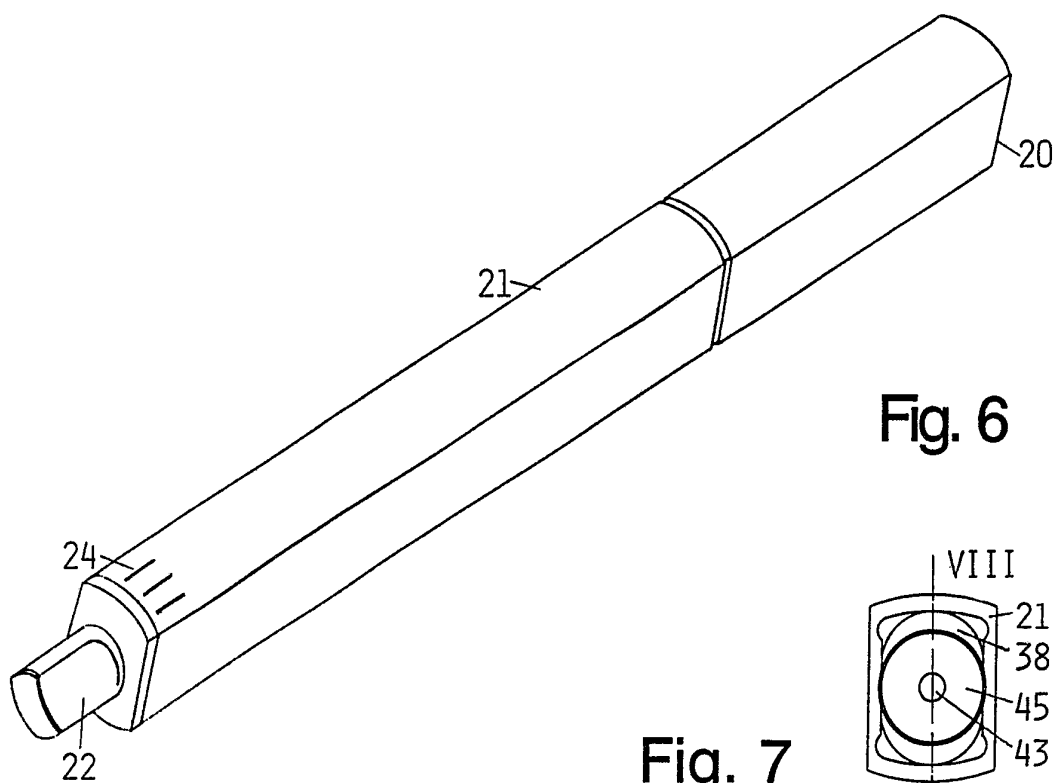
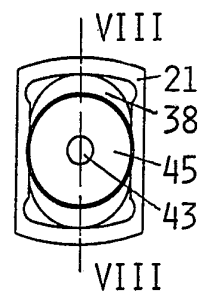


Fig. 6

Fig. 7



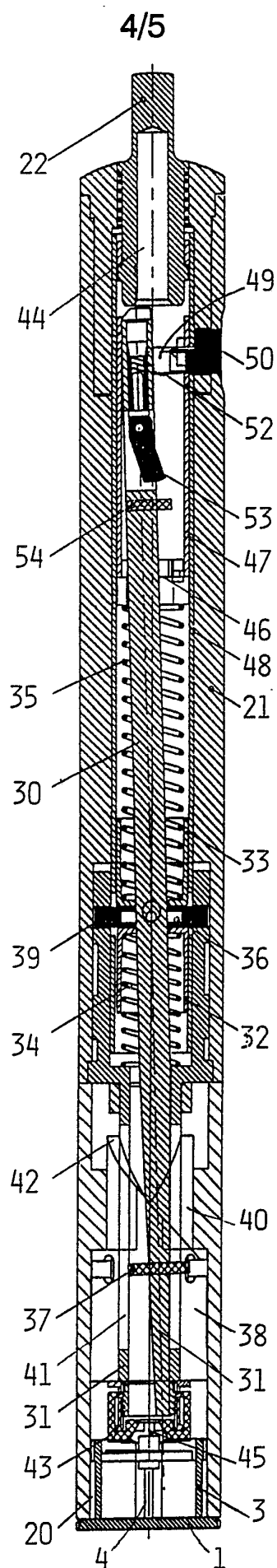


Fig. 8

5/5

Fig. 9

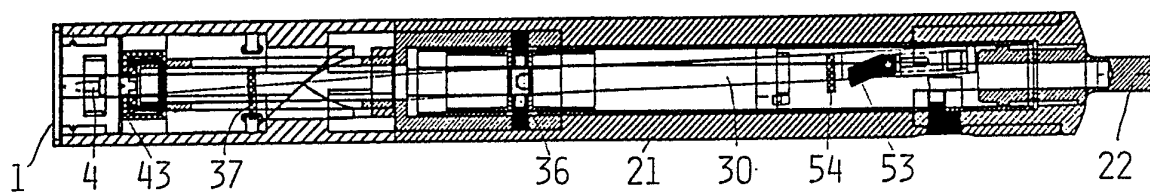


Fig. 10

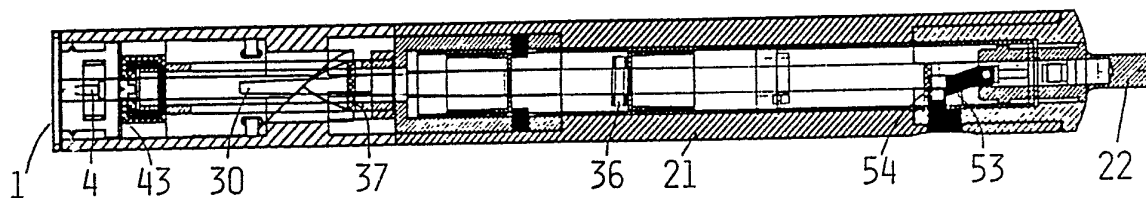


Fig. 11

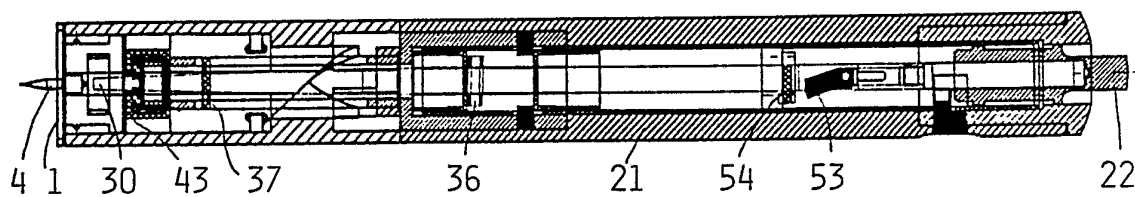
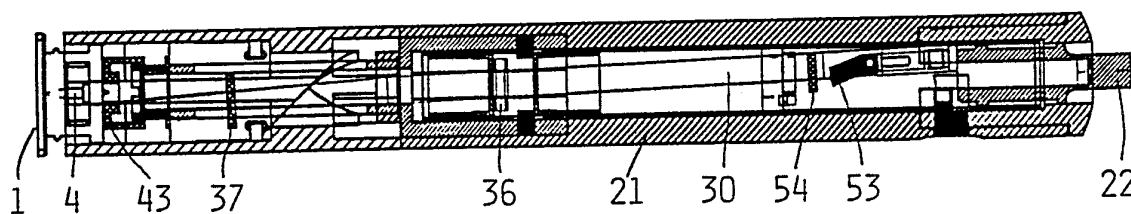
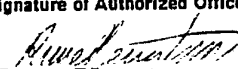


Fig. 12



# INTERNATIONAL SEARCH REPORT

International Application No **PCT/DK 91/00289**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (If several classification symbols apply, indicate all) <sup>6</sup> According to International Patent Classification (IPC) or to both National Classification and IPC <b>IPC5: A 61 B 5/14</b>		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	A 61 B	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with Indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
Y	US, A, 4553541 (J.A. BURNS) 19 November 1985, see column 4, line 20 - column 9, line 17; column 10, line 20 - column 11, line 6 see figures 2, 7-10, 12-18, 24-27 --	1-4
Y	EP, A2, 0255338 (GLYME VALLEY TECHNOLOGY LIMITED) 3 February 1988, see abstract; figures 1-6 --	1-4
Y	US, A, 4580565 (W.D. CORNELL ET AL) 8 April 1986, see column 3, line 28 - line 42; figure 4 --	3-4
P,Y	EP, A1, 0414563 (LIFESCAN, INC.) 27 February 1991, see column 3, line 28 - column 4, line 34; abstract; figures 2,6	3-4
P,A	--	5-8
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p><b>* Special categories of cited documents: <sup>10</sup></b></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"T" later document published 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</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
18th December 1991	1991 -12- 19	
International Searching Authority	Signature of Authorized Officer	
SWEDISH PATENT OFFICE	 Rune Bengtsson	

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
Y	EP, A1, 0115388 (GENETICS INTERNATIONAL, INC.) 8 August 1984, see page 3, line 16 - page 6, line 19; abstract; figures 2,3 --	5-7
Y	US, A, 4469110 (G.J. SLAMA) 4 September 1984, see abstract; figures 3,5 --	5-7
Y	US, A, 4462405 (J.C. EHRLICH) 31 July 1984, see abstract; figures 1-5 --	5-7
P,A	EP, A1, 0427406 (OWEN MUMFORD LTD.) 15 May 1991, see column 3, line 6 - line 13; figures 1,9 --	1,3-4
A	US, A, 4658821 (D.J. CHIODO ET AL) 21 April 1987, see abstract; figure 9 -- -----	8

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/DK 91/00289**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the Swedish Patent Office EDP file on 31/10/91  
The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4553541	85-11-19	AU-B- 546436	85-08-29
		AU-D- 8165782	82-09-30
		EP-A-B- 0061102	82-09-29
		JP-C- 1577710	90-09-13
		JP-B- 2001494	90-01-11
		JP-A- 57168644	82-10-18
		US-A- 4388925	83-06-21
		US-A- 4527561	85-07-09
		US-A- 4535769	85-08-20
EP-A2- 0255338	88-02-03	AU-B- 610832	91-05-30
		AU-D- 7622387	88-02-04
		US-A- 4817603	89-04-04
US-A- 4580565	86-04-08	AU-B- 549690	86-02-06
		AU-D- 8511282	83-01-06
		CA-A- 1176532	84-10-23
		EP-A-B- 0068864	83-01-05
		JP-C- 1588281	90-11-19
		JP-A- 58007260	83-01-17
		US-A- 4379456	83-04-12
		US-A- 4503856	85-03-12
EP-A1- 0414563	91-02-27	AU-D- 6123990	91-02-28
		JP-A- 3141929	91-06-17
		US-A- 4976724	90-12-11
EP-A1- 0115388	84-08-08	AU-B- 558776	87-02-05
		AU-D- 2251883	84-07-19
		CA-A- 1207557	86-07-15
		JP-A- 59160441	84-09-11
		US-E- RE32922	89-05-16
		US-A- 4517978	85-05-21
US-A- 4469110	84-09-04	AU-D- 8505782	83-01-06
		CA-A- 1198955	86-01-07
		FR-A-B- 2508305	82-12-31
		JP-A- 58025145	83-02-15
US-A- 4462405	84-07-31	NONE	
EP-A1- 0427406	91-05-15	NONE	
US-A- 4658821	87-04-21	AU-D- 5513486	87-07-28



**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO. PCT/DK 91/00289**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 31/10/91. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4658821	87-04-21	CA-A- 1266595 EP-A- 0263812 WO-A- 87/04064	90-03-13 88-04-20 87-07-16