



- (51) International Patent Classification:
A61B 5/15 (2006.01)
- (21) International Application Number:
PCT/US2014/041563
- (22) International Filing Date:
9 June 2014 (09.06.2014)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
61/833,090 10 June 2013 (10.06.2013) US
- (71) Applicant: **FACET TECHNOLOGIES, LLC** [US/US];
112 Town Park Drive, Suite 300, Kennesaw, GA 30144 (US).
- (72) Inventor: **SEIFERT, Kevin, J.**; 68 Captain Miles Lane,
Concord, MA 01742 (US).
- (74) Agent: **GROFF, Bradley, K.**; Gardner Groff Greenwald &
Villanueva, PC, 2018 Powers Ferry Road, Suite 800, At-
lanta, GA 30339 (US).
- (81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,

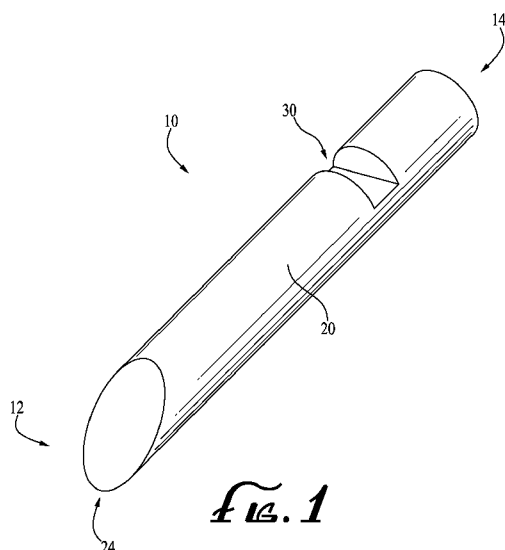
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR,
KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME,
MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ,
OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA,
SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM,
ZW.

- (84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,
KM, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

- (54) Title: LANCET NEEDLE WITH ALIGNMENT AND RETENTION NOTCH



(57) Abstract: A lancet needle (10) with an alignment and engagement notch (30), with material of the lancet body extending into the notch to more securely retain the needle to the lancet body, whereby a shorter needle can be utilized than with typical lancets. The notch optionally also provides a registration point for rotational and/or axial alignment of the needle during overmolding to form the lancet body, for example to maintain consistent positioning of the needle's beveled point.

LANCET NEEDLE WITH ALIGNMENT AND RETENTION NOTCH

Cross-Reference to Related Application

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 61/833,090 filed June 10, 2013, the entirety of which is hereby incorporated herein by reference for all purposes.

Technical Field

[0002] The present invention relates generally to the field of medical devices, and more particularly to lancet needles or cannulas, lancets and lancing devices for blood sampling and testing.

Background

[0003] Lancets and lancing devices are utilized for penetrating the skin of a human or animal subject at a lancing site to obtain a sample of blood or other body fluid for medical testing, as in blood-typing or blood-glucose testing. Known lancing devices commonly include a housing containing a drive mechanism, a charging mechanism for energizing the spring or other drive means of the drive mechanism, and a release mechanism for releasing the drive mechanism upon actuation. A lancet is typically propelled by the drive mechanism from a retracted position shielded within the housing to an extended position wherein a sharp tip portion of the lancet projects from the housing to prick the subject's skin at a desired lancing site. An ejection mechanism can optionally be included for discharge of a used lancet from the lancing device.

[0004] The lancet may be a disposable component that is removably mounted into a receiver or lancet carrier portion of the drive mechanism of a lancing device. A used lancet typically is removed from the lancet carrier after sampling for disposal. A new, sterile lancet is then replaced into the lancet carrier for further sampling. Lancets typically comprise a sharp metal tip in the form of an elongate needle or blade, for example formed

of stainless steel. The needle or blade is typically embedded in a plastic body that has a size and shape configured for releasable engagement with the receiver or lancet carrier of a lancing device. The sharp tip of the lancet is commonly embedded in a removable plastic endcap to maintain sterility and prevent inadvertent sticks prior to use. The endcap may be replaceable onto the lancet after use to re-cover the sharp lancet tip for safety and hygienic purposes.

[0005] In alternate “single-use” embodiments, the lancet is not intended for removal and replacement, and the entire lancing device and lancet are disposed of after a single use. Single use devices commonly include re-use prevention mechanisms to resist attempts to utilize the device for more than one sampling procedure.

[0006] In order to retain the lancet needle securely in place in the lancet body during de-capping, when twisting and pulling forces are commonly imparted on the lancet needle, lancet needles traditionally have a length that corresponds to the length of the plastic lancet body and the distance to which the tip of the lancet needle extends beyond the lancet body, so that the needle has enough contact surface area within the lancet body to resist detachment or loosening of the needle from the plastic body. Also, typical lancet manufacturing processes utilize longitudinally spaced contact points for holding the lancet needle within the mold during molding of the lancet body and maintaining proper axial alignment of the lancet needle. As such, it has until now been considered counterintuitive to those of ordinary skill in the art to seek to significantly reduce the length of the lancet needle within a lancet.

[0007] Continuing needs exist for improvements to lancet technology. It is to the provision of improved lancet needles and lancets that the present invention is primarily directed.

Summary

[0008] In example embodiments, the present invention provides a notched lancet needle for a lancet, an improved lancet including such a lancet needle, and/or a plurality of such lancets forming a multi-lancet strip or array. Advantageously, the provision of a notch or recess within the side surface of a lancet needle allows for both increased integrity of the engagement of the lancet needle within the lancet body, as well as rotational alignment control of the lancet needle's position relative to the lancet body.

[0009] In one aspect, the present invention relates to a lancing needle for a lancet including a generally elongate body, a bevel and a notch. The elongate body extends along a longitudinal axis from a first end to a second end. The bevel or grinding is formed on at least one end of the body to form a sharp lancing tip. The notch is formed on at least a portion of the body between the first end and the second end. Consistent registration is optionally maintained between the rotational positions of the bevel and the notch, such that rotational alignment of the needle tip's sharpening angle relative to the lancet body can be controlled during the molding process.

[0010] In another aspect, the invention relates to a lancet including a lancet body and a lancet needle. The lancet body has a first end and a second end, defining a length therebetween. The lancet needle has a needle body including a sharp lancing tip and a notch. The sharp lancing tip projects from the first end of the lancet body. The notch is formed on the needle body and is engaged with a portion of the lancet body between the first and second end thereof. The lancet needle has a length substantially less than the length of the lancet body.

[0011] In still another aspect, the invention relates to a multi-lancet strip or array including at least two or more lancets coupled together. Each lancet includes a lancet body and a lancet needle. The lancet body extends from a forward end to a distal end. The lancet needle has a sharp lancing tip extending from the forward end of the lancet

body, and a notch spaced a distance from the tip which is embedded within the lancet body. The sharp lancing tip forms a bevel and projects from the first end of the lancet body. The notch is formed on the needle body and is engaged with a portion of the lancet body between the first and second end thereof. Preferably, a consistent registration is maintained between the alignment of the bevel relative to a location of the notch on the needle body among all lancets of the multi-lancet strip.

[0012] In another aspect, the invention relates to a method for manufacturing a lancet. The method includes providing a lancet needle having a generally elongate body extending along a longitudinal axis from a first end to a second end, the first end comprising a bevel forming a sharp tip portion, and a notch formed in a portion of the elongate body between the first and second ends, the bevel having a first orientation and the notch having a second orientation relative to the first orientation; aligning the notch of the lancet needle within a mold; and molding a lancet body within the mold and around the lancet needle while maintaining the alignment of the notch within the mold, wherein aligning the notch of the lancet needle within the mold aligns the bevel forming the sharp tip portion relative to the lancet body.

[0013] These and other aspects, features and advantages of the invention will be understood with reference to the drawing figures and detailed description herein, and will be realized by means of the various elements and combinations particularly pointed out in the appended claims. It is to be understood that both the foregoing general description and the following brief description of the drawings and detailed description of the invention are exemplary and explanatory of preferred embodiments of the invention, and are not restrictive of the invention, as claimed.

Brief Description of the Drawings

[0014] **FIGURE 1** shows a perspective view of a lancet needle according to an example embodiment of the present invention.

[0015] **FIGURE 2** shows a side view of the lancet needle of **Figure 1**.

[0016] **FIGURE 3A** shows a top view of the lancet needle of **Figure 1**.

[0017] **FIGURE 3B** shows a cross sectional view of the lancet needle of **Figure 3A** taken along line 3A-3A.

[0018] **FIGURE 4** shows a lancet according to an example embodiment of the present invention, with the needle of **Figure 1** projecting therefrom.

[0019] **FIGURE 5** shows a top view of the lancet of **Figure 4**, showing a notch of the needle of **Figure 1** engaged within a body portion of the lancet.

[0020] **FIGURE 6** shows a multi-lancet strip or array according to another example embodiment of the present invention.

Detailed Description of Example Embodiments

[0021] The present invention may be understood more readily by reference to the following detailed description of the invention taken in connection with the accompanying drawing figures, which form a part of this disclosure. It is to be understood that this invention is not limited to the specific devices, methods, conditions or parameters described and/or shown herein, and that the terminology used herein is for the purpose of describing particular embodiments by way of example only and is not intended to be limiting of the claimed invention. Any and all patents and other publications identified in this specification are incorporated by reference as though fully set forth herein.

[0022] Also, as used in the specification including the appended claims, the singular forms “a,” “an,” and “the” include the plural, and reference to a particular numerical value includes at least that particular value, unless the context clearly dictates otherwise. Ranges may be expressed herein as from “about” or “approximately” one particular value and/or to “about” or “approximately” another particular value. When such a range is

expressed, another embodiment includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms another embodiment.

[0023] With reference now to the drawing figures, wherein like reference numbers represent corresponding parts throughout the several views, **Figures 1-3** show a lancet cannula or needle 10 according to an example embodiment of the present invention. The lancet needle 10 includes an elongate body 20 extending from a first or proximal end 12 to a second or distal end 14 along a longitudinal axis 16, and defining a lancet needle length between the first and second ends. A bevel or ground point 24 is formed at the first end 12 wherein a sharp lancing tip portion 26 is defined, and a notch or cut-out 30 is formed along a portion of the body 20 between the first and second ends 12, 14, generally proximal the second end.

[0024] The bevel 24 formed at the first end 12 defines an angle α relative to a side of the body 20, which is generally laterally offset from the longitudinal axis 16 (see **Figure 2**). Preferably, the angle α is in the range of between about 5 – 10 degrees, but other angles may be used as desired. Typically, the angle α being in the range of between about 5 – 10 degrees provides that the sharp tip portion 26 is sufficient to penetrate the skin of a human or animal subject with minimal sensation of pain. Optionally, two or more bevels may be formed at the first end 12 in any desired orientation to form a sharp lancing tip.

[0025] The notch 30 generally forms a void or indentation within a side surface of the body 20 wherein a notch axis 32 and a notch depth D are defined. In one form, the notch axis 32 is generally transverse to the longitudinal axis 16, and the notch depth D is generally less than about one-half the width or thickness of the body 20. Optionally, the notch axis 32 can be oriented relative to the longitudinal axis 16 as desired, for example, substantially parallel or at an angle relative thereto. The depth D of the notch 30 is also preferably chosen as desired. Optionally, two or more notches may be formed along the

body 20 between the first and second ends 12, 14. The cross-sectional geometry of the notch 30 of the depicted embodiment is generally rectangular when viewed from the side (see Fig. 2), but in alternate embodiments may be triangular or V-shaped, rounded or U-shaped, or various other geometries all within the scope of the present invention. The configuration of the notch is optionally matched to cooperative mold tooling used to hold the needle during manufacturing, whereby interengagement of the mold tooling and the notch assists in maintaining alignment of the lancet needle during manufacturing. The notch may be formed by grinding, stamping, embossing, cutting or other fabrication methods. In alternate embodiments, two or more notches may be provided, for example spaced along the length of the needle, and/or offset at different angular positions about the periphery of the needle's sides.

[0026] **Figures 4 and 5** show a lancet 50 including the lancet needle 10 partially embedded within a lancet body 52. Generally, the lancet body 52 defines a length L_B , extending between a first end 54 to a second end 56, and has a size and a shape configured for releasable engagement with the receiver or lancet carrier of a corresponding cooperative lancing device. The first end 12 of the needle 10 projects from the first end 54 of the lancet body 52 such that the bevel 24 having the sharp tip portion 26 is exposed. The second end 14 of the needle 10 is embedded within the lancet body 52. Preferably, the notch 30 is engaged with a portion of the lancet body 52 such that the material of the body 52 at least partially fills the void of the notch 30. For example, when manufacturing the lancet 50, the lancet body 52 (generally formed from plastic) is preferably overmolded around the lancet needle 10, which allows the lancet body 52 to substantially engage the lancet needle 10 and fill the void of the notch 30. Thus, with the void at least partially filled during molding, the notch 30 provides adequate surface area for securely mounting the lancet needle 10 to the lancet body 52, thereby providing a better hold between the lancet needle 10 and the lancet body 52. As such, the lancet needle 10 having at least one notch 30 formed thereon preferably reduces the overall length (defined between the first and

second ends 12, 14) of the needle 10 that is typically required for manufacturing lancets, thereby reducing material costs.

[0027] In example forms, the lancet needle 10 has an overall needle length L_N , of which an embedded length L_M portion is embedded within the lancet body 52, and an extended length portion L_X extends beyond the proximal end 54 of the lancet body. In example forms, the needle length L_N is no more than about 75% the length L_B of the lancet body, preferably no more than about 67% the length L_B , and still more preferably no more than about 50% the length L_B . Otherwise defined, in example embodiments the embedded length L_M of the lancet needle is no more than about 50% the length L_B , preferably no more than about 33% the length L_B , and still more preferably no more than about 25% the length L_B . In further example forms, the retention and alignment notch 30 is positioned approximately midway along the embedded length L_M of the lancet needle (i.e., about $0.5 \times L_B$ from the proximal end 54 of the lancet body).

[0028] **Figure 6** shows a multi-lancet strip 100 according to another example embodiment of the present invention. The multi-lancet strip comprises a plurality of lancets 50 removably coupled together to form an array of lancets. The lancets 50 are generally removably coupled together by frangible or separable engagement members 110. Preferably, the engagement members 110 are formed to maintain engagement between the lancets 50 until they are desired to be separated from the array. For example, lancing devices using the multi-lancet strip or cartridge (forming an array of lancets) generally operate in a manner that indexes the strip or cartridge along as the device is being used, and enables tearing or disengaging the engagement members 110 so that a new lancet can be used to prick the subject at a lancing site for each sequential lancing procedure. Optionally, other forms of removably coupling the lancets together may be used as desired.

[0029] In example forms, the notch 30 can be used as an identifier or indication feature during manufacture to maintain registration of the needle and align the bevel 24 of each needle 10 relative to the lancet body 52 (see Figures 5-6) consistently across all

lancets in the array. Preferably, the orientation of the notch 30 relative to the orientation of the bevel 24 is known such that the indication feature (e.g., notch) can be oriented properly within the mold, which ensures that the bevel 24 is properly aligned relative to the lancet body 52. For example, as depicted in **Figure 6**, the notch 30 of each needle 10 is similarly aligned (each notch shown on right side of needle) and thereby provides that the bevel 24 of each needle 10 is consistently aligned relative to its respective lancet body 52. Consistent alignment of the bevel in every lancet of the array may permit more consistent positioning and more precise control of the lancing procedure, for example enabling more precise depth control and/or a lower sensation of pain.

[0030] The present invention further includes improved methods of manufacturing a lancet. In one form, the method includes providing a lancet needle comprising a generally elongate body extending along a longitudinal axis from a first end to a second end, the first end comprising a bevel forming a sharp tip portion, and a notch formed in a portion of the elongate body between the first and second ends, the bevel having a first orientation and the notch having a second orientation relative to the first orientation; aligning the notch of the lancet needle within a mold; and molding a lancet body within the mold and around the lancet needle while maintaining the alignment of the notch within the mold, wherein aligning the notch of the lancet needle within the mold aligns the bevel forming the sharp tip portion relative to the lancet body. Thus, since the first orientation of the bevel and the second orientation of the notch are known, the notch can be aligned accordingly within the mold to ensure the bevel is properly aligned relative to the lancet body.

[0031] While the invention has been described with reference to preferred and example embodiments, it will be understood by those skilled in the art that a variety of modifications, additions and deletions are within the scope of the invention, as defined by the following claims.

What is Claimed is:

1. A lancing needle for a lancet comprising:
 - a generally elongate body extending along a longitudinal axis from a first end to a second end;
 - a sharp tip formed on at least one end of the body; and
 - a notch formed on at least a portion of the body between the first end and the second end.
2. The lancing needle of Claim 1, wherein the needle body defines a thickness and the notch defines a notch depth of less than one-half the needle body thickness.
3. The lancing needle of Claim 1, wherein the notch defines a notch axis generally transverse to a longitudinal axis of the elongate needle body.
4. The lancing needle of Claim 1, wherein the sharp tip comprises a bevel.
5. The lancing needle of Claim 4, wherein a specified registration is maintained between the notch and the bevel.
6. A lancet comprising:
 - a lancet body comprising a first end and a second end;
 - a lancet needle comprising a needle body having a sharp lancing tip and a notch, the sharp lancing tip projecting from the first end of the lancet body, and the notch formed on the needle body and engaged with a portion of the lancet body between the first and second end thereof.
7. The lancet of Claim 6, wherein the lancet needle has an overall needle length L_N , of which an embedded length L_M portion is embedded within the lancet body, and an extended length portion L_X of the lancet needle extends beyond the first end of the lancet

body, and wherein the overall needle length L_N is no more than about 75% the length L_B of the lancet body.

8. The lancet of Claim 7, wherein the overall needle length L_N is no more than about 67% the length L_B of the lancet body.

9. The lancet of Claim 7, wherein the overall needle length L_N is no more than about 50% the length L_B of the lancet body.

10. The lancet of Claim 7, wherein the embedded length L_M of the lancet needle is no more than about 50% the length L_B of the lancet body.

11. The lancet of Claim 10, wherein the embedded length L_M of the lancet needle is no more than about 33% the length L_B of the lancet body.

12. The lancet of Claim 10, wherein the embedded length L_M of the lancet needle is no more than about 25% the length L_B of the lancet body.

13. The lancet of Claim 6, wherein the notch is positioned approximately midway along an embedded length L_M of the lancet needle.

14. The lancet of Claim 6, wherein the lancet needle defines a needle body thickness and the notch defines a notch depth of less than one-half the needle body thickness.

15. The lancet of Claim 6, wherein the notch defines a notch axis generally transverse to a longitudinal axis of the lancet needle.

16. The lancet of Claim 6, wherein the sharp lancing tip comprises a bevel.

17. The lancet of Claim 16, wherein a specified registration is maintained between the notch and the bevel.

18. A multi-lancet strip comprising at least two lancets removably coupled together forming an array of lancets, each lancet comprising a lancet body and a lancet needle, the lancet body extending from a first end to a second end, the lancet needle comprising a needle body having a sharp lancing tip and a notch, the sharp lancing tip forming a bevel and projecting from the first end of the lancet body, and the notch formed on the needle body and engaged with a portion of the lancet body between the first and second end thereof, and wherein a consistent registration is maintained between the alignment of the bevel relative to a location of the notch on the needle body among all lancets of the multi-lancet strip.

19. The multi-lancet strip of Claim 14, wherein the notch of each needle is angularly aligned with the bevel.

20. A method for manufacturing a lancet comprising:

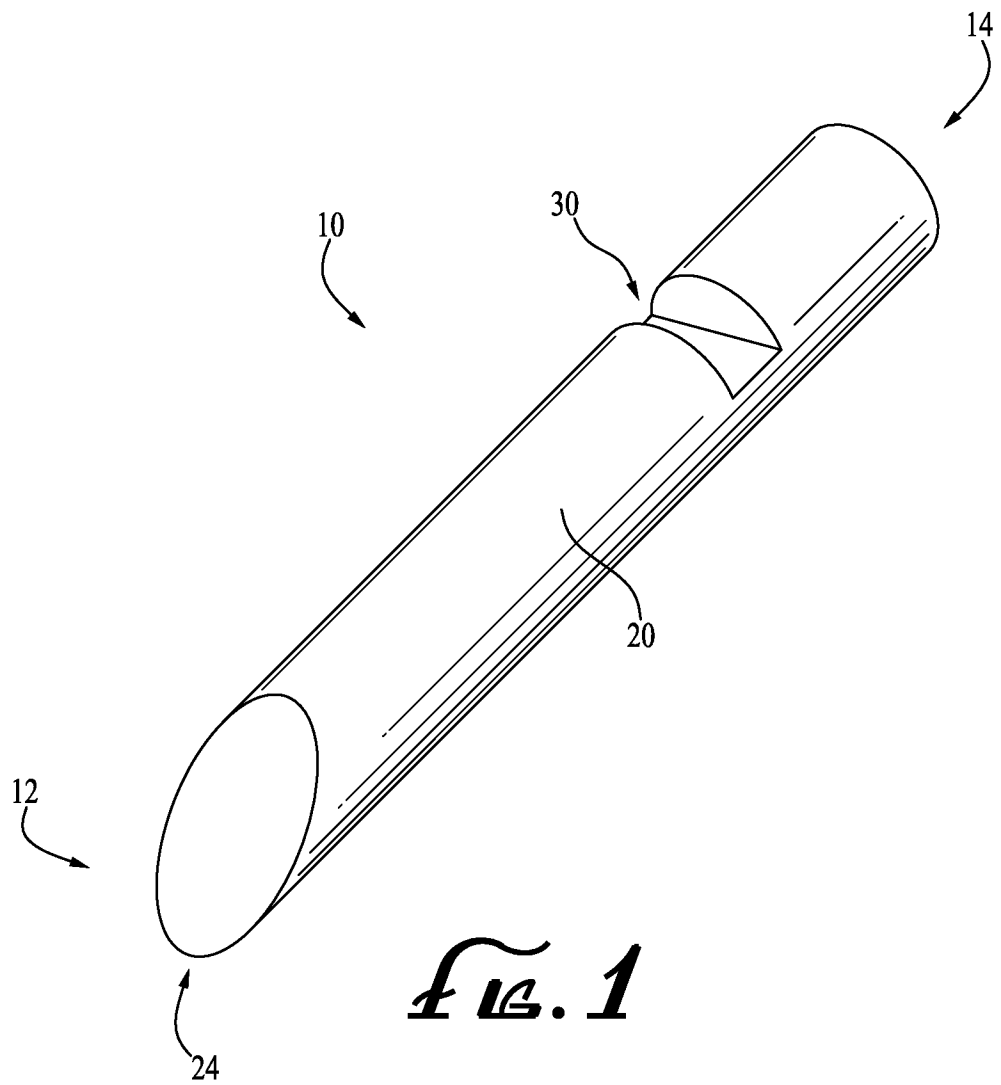
providing a lancet needle comprising a generally elongate body extending along a longitudinal axis from a first end to a second end, the first end comprising a bevel forming a sharp tip portion, and a notch formed in a portion of the elongate body between the first and second ends, the bevel having a first orientation and the notch having a second orientation relative to the first orientation;

aligning the notch of the lancet needle within a mold; and

molding a lancet body within the mold and around the lancet needle while maintaining the alignment of the notch within the mold,

wherein aligning the notch of the lancet needle within the mold aligns the bevel forming the sharp tip portion relative to the lancet body.

1/5



2/5

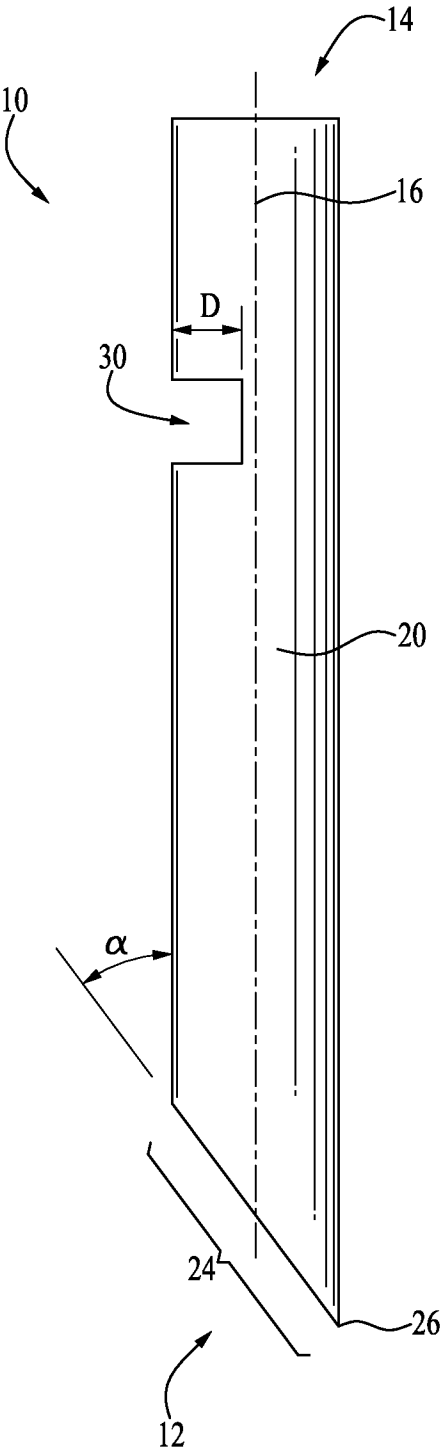


FIG. 2

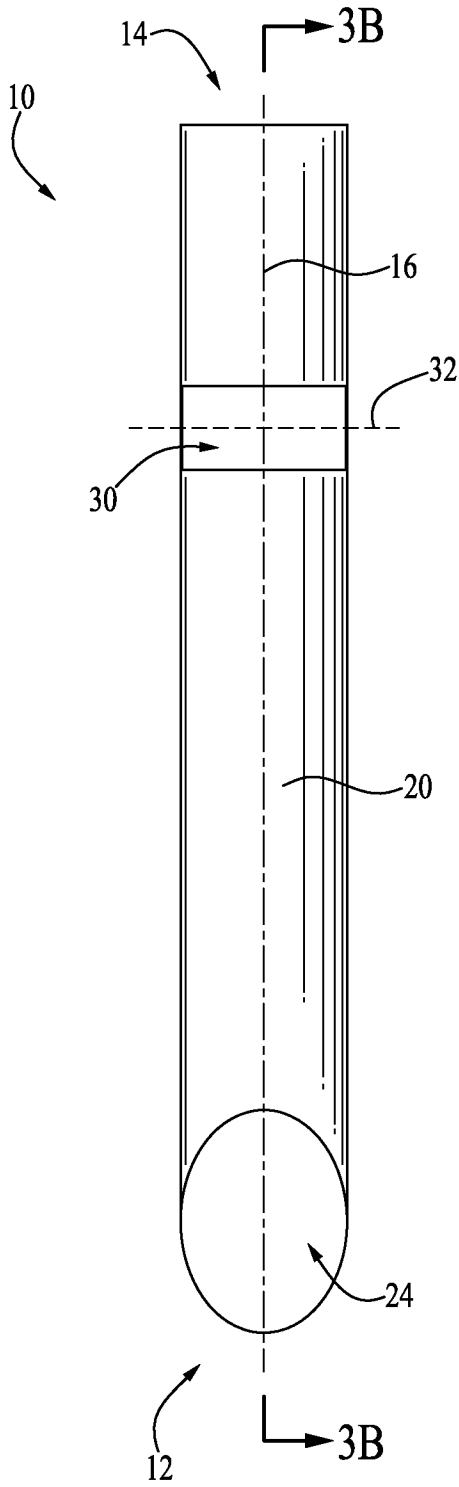


Fig. 3A

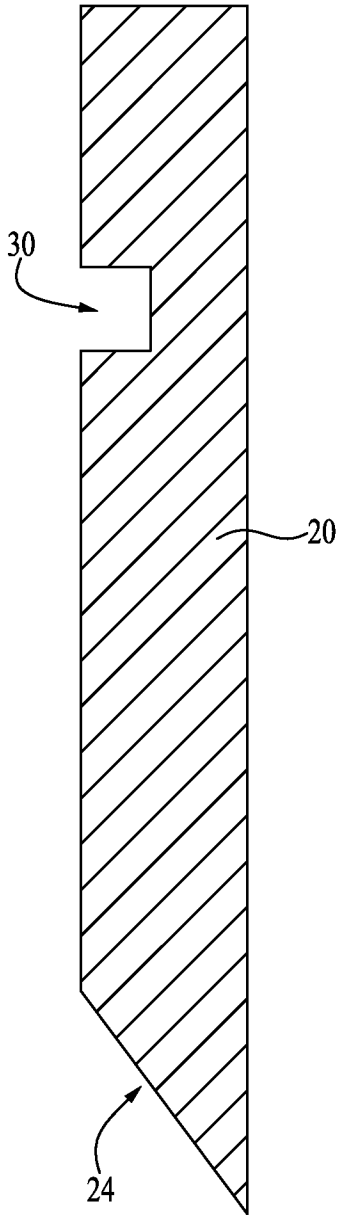
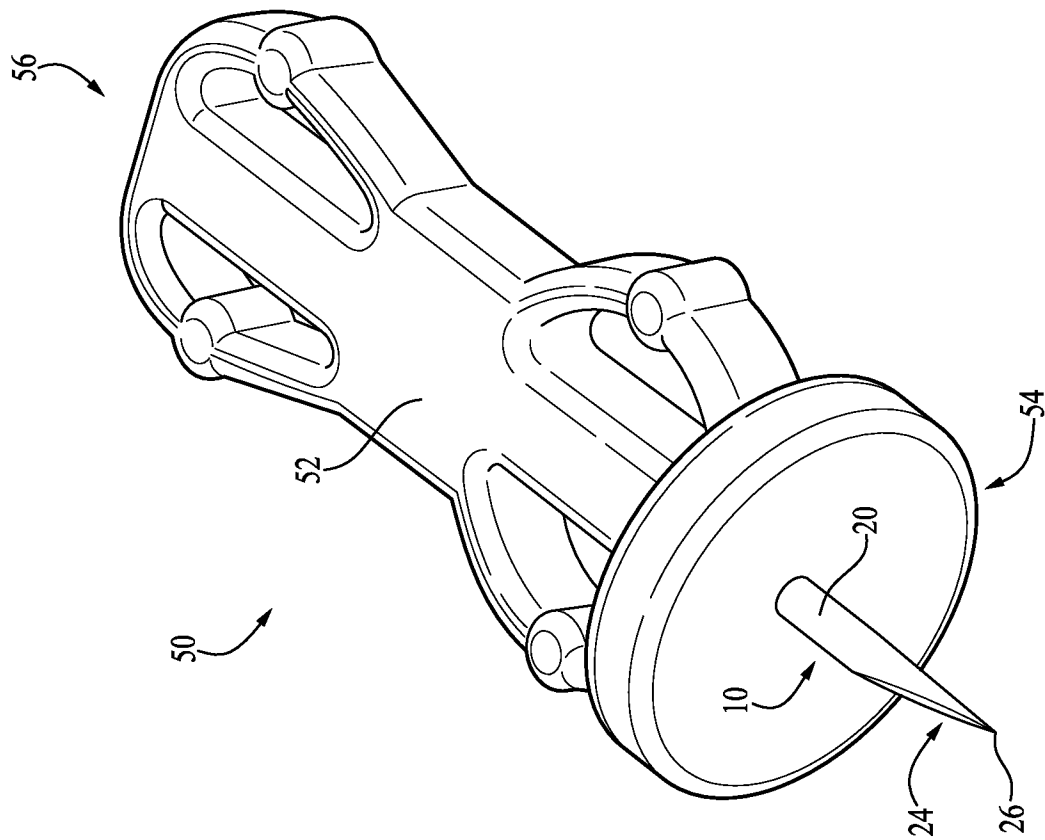
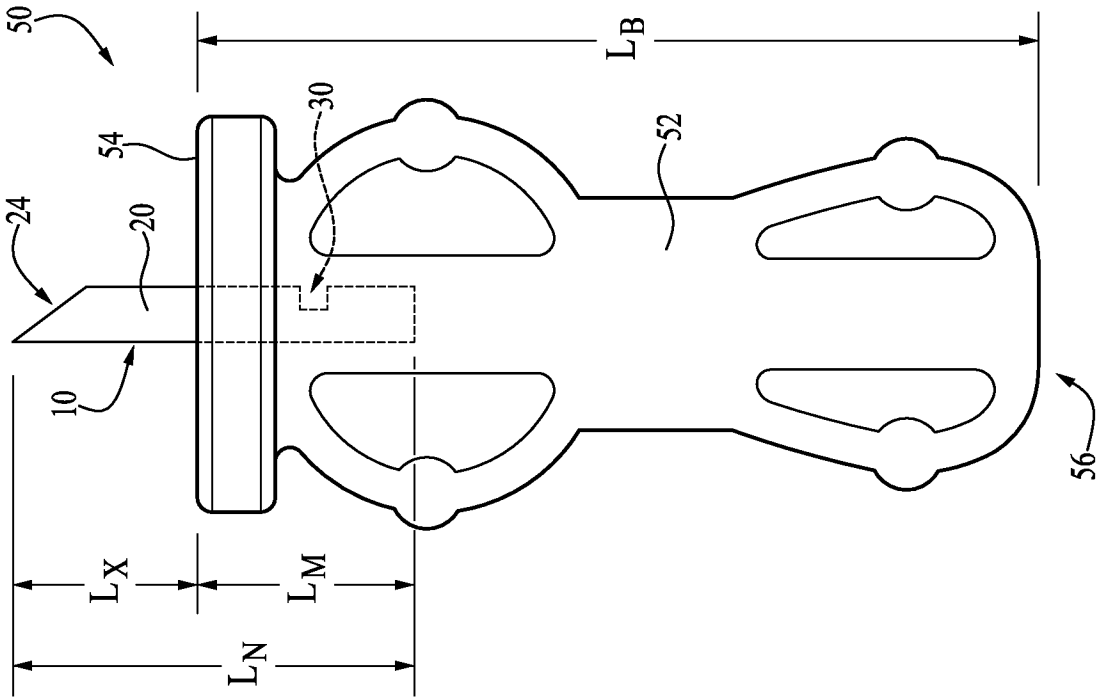


Fig. 3B

4/5



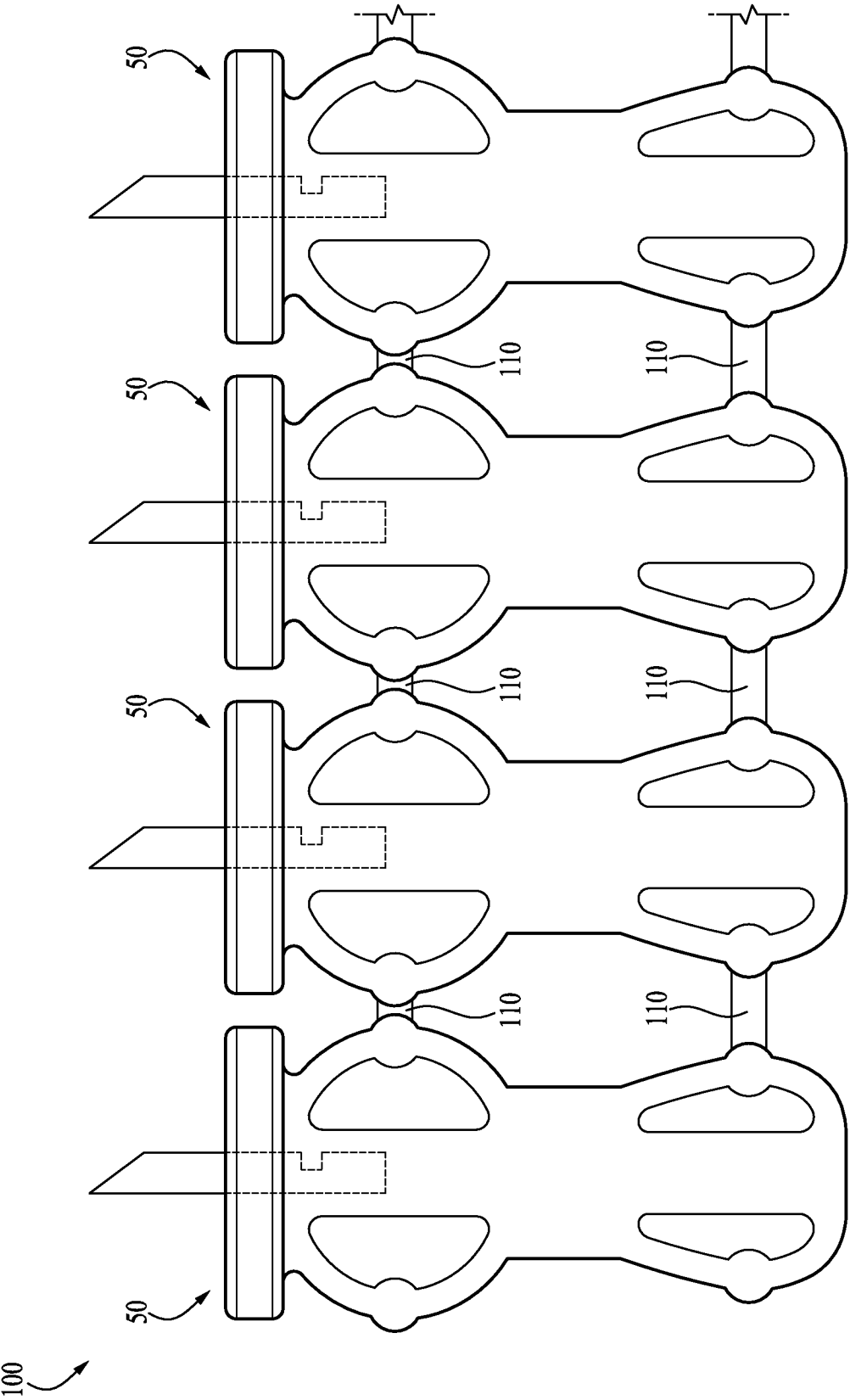


Fig. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/041563

A. CLASSIFICATION OF SUBJECT MATTER

INV. A61B5/15

ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 287 785 A1 (ROCHE DIAGNOSTICS GMBH [DE]; HOFFMANN LA ROCHE [CH]) 5 March 2003 (2003-03-05) the whole document	1-20
X	US 2009/227898 A1 (HAAR HANS-PETER [DE] ET AL) 10 September 2009 (2009-09-10) figures 2,3,6-8,10,11 abstract	1,3-12, 15-19 20
X	WO 2011/158669 A1 (ASAHI POLYSLIDER COMPANY LTD [JP]; IZUMI COSMO CO LTD [JP]; SAEKI HIDE) 22 December 2011 (2011-12-22) figures 1-5 abstract	1,2, 4-14,16, 17 18,20
A		
	----- -/-	



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"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

"&" document member of the same patent family

Date of the actual completion of the international search

6 August 2014

Date of mailing of the international search report

18/08/2014

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Schultz, Ottmar

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2014/041563

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 358 689 A (HIGGINS JOHN L) 19 December 1967 (1967-12-19)	1-4,6-16
A	column 2, lines 41-45 figures	5,18,20
A	----- US 6 589 261 B1 (ABULHAJ RAMZI F [US] ET AL) 8 July 2003 (2003-07-08) the whole document	1-20
X,P	----- WO 2013/110953 A1 (OWEN MUMFORD LTD [GB]) 1 August 2013 (2013-08-01) page 13, line 16 - page 14, line 10 figures 1-8 -----	1-12,14, 16,17,20

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2014/041563

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1287785	A1	05-03-2003	AT 347858 T 15-01-2007
			AT 406839 T 15-09-2008
			CA 2399890 A1 28-02-2003
			CA 2494895 A1 28-02-2003
			DE 10142232 A1 20-03-2003
			DK 1287785 T3 10-04-2007
			DK 1466558 T3 12-01-2009
			EP 1287785 A1 05-03-2003
			EP 1466558 A2 13-10-2004
			ES 2276877 T3 01-07-2007
			ES 2312888 T3 01-03-2009
			JP 2003153885 A 27-05-2003
			JP 2005185852 A 14-07-2005
			US 2003050573 A1 13-03-2003
			US 2005021066 A1 27-01-2005
			US 2013239390 A1 19-09-2013
US 2009227898	A1	10-09-2009	NONE
WO 2011158669	A1	22-12-2011	NONE
US 3358689	A	19-12-1967	GB 1085141 A 27-09-1967
			GB 1112059 A 01-05-1968
			US 3358689 A 19-12-1967
US 6589261	B1	08-07-2003	US 6589261 B1 08-07-2003
			US 2004039408 A1 26-02-2004
			US 2004059365 A1 25-03-2004
WO 2013110953	A1	01-08-2013	GB 2498772 A 31-07-2013
			WO 2013110953 A1 01-08-2013