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<p>(21) International Application Number: PCT/US99/04081</p> <p>(22) International Filing Date: 25 February 1999 (25.02.99)</p> <p>(30) Priority Data: 60/075,860 25 February 1998 (25.02.98) US</p> <p>(71) Applicant: TRACENET TECHNOLOGIES, INC. [US/US]; Suite 4040, 80 South Eighth Street, Minneapolis, MN 55402 (US).</p> <p>(72) Inventors: DAVIS, Langdon; Suite 4040, 80 South Eighth Street, Minneapolis, MN 55402 (US). BUFFUM, Michael, R.; Suite 4040, 80 South Eighth Street, Minneapolis, MN 55402 (US). HARMS, Garyld, J.; Suite 4040, 80 South Eighth Street, Minneapolis, MN 55402 (US). CAMERON, Doyle, L.; Suite 4040, 80 South Eighth Street, Minneapolis, MN 55402 (US).</p> <p>(74) Agents: PATTERSON, James, H. et al.; Patterson & Keough, P.A., 4800 IDS Center, 80 South 8th Street, Minneapolis, MN 55402-2100 (US).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p>
<p>(54) Title: TRANSPONDER INSERTION DEVICE AND METHOD</p>		
<p>(57) Abstract</p> <p>A system for simply, and effectively introducing transponders (10) into human or animal recipients is disclosed. A transponder (10), such as a micro-chip, is coated with a degradable coating, and shaped so that it may be pushed through the recipient's skin. An insertion tool (20) is used as indicated by the type of recipient. The tool (20) receives the transponder (10), protects the transponder (10) while it is pushed into the skin, and releases the transponder (10) when rotated.</p>		

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TRANSPONDER INSERTION DEVICE AND METHOD

Related Application

This application claims the benefit of U.S. Provisional Application No. 60/075,860, filed February 25, 1998.

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Background of the Invention1. Field Of The Invention

The invention relates to human and animal location, identification, and retrieval systems, and particularly to systems of transponder insertion.

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2. Background

Transponders implanted within a human or animal recipient have many uses. For instance, transponders are useful for tracking and monitoring animals and for managing recipient information. For instance, the position and identity of animals may be tracked with an implanted transponder. Convenient, inexpensive, sterile, and efficient implantation techniques, however, are needed. Such techniques, for instance, can include surgical procedures or syringe-based injection.

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The present invention sets forth a system for simple and effective introduction of a transponder into a recipient. In some embodiments the system requires use of an insertion tool. The tool has a recessed opening with a shape configured for use with the transponder unit described herein, and is used in combination with a rotational step.

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Summary of the Invention

A system for implanting a transponder is described. The system allows the transponder to be manually pushed through the skin into an animal recipient. The system includes an insertion tool that is helpful for recipients that have resilient skin. The transponder is preferably a chip-type transponder.

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In the first embodiment, a coated transponder is made by substantially covering a transponder with a degradable coating. The coated

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transponder unit is made with a sharp end and a blunt end. The sharp end of the unit is placed against the skin and the user pushes on the blunt end to force the unit through. The unit's sharpness may be derived from the coating or from the transponder. The stiffness of the unit may be provided by either the transponder or the coating. The unit preferably has a bullet-shape but may have a variety of shapes; for instance, a beveled sharp end and a rounded blunt end.

The coating is made of a degradable material. The material is preferably a water-soluble starch but may also be a simple sugar or protein coating. Natural or synthetic, biodegradable, and hydrolytically degradable materials may be used. The coating may be soft or could be stiff. A stiff coating may be made rigid so that it deforms slightly upon impact so that the transponder is shielded from blows or forces applied to the unit during implantation. The coating may include therapeutic agents, for instance, antibiotics.

The unit is sterilely packaged. The packaging should be easily opened by the user and the sterile inside surface of the package may be configured to provide a surface useful for gripping the unit. Thus a user may open the package and, without directly touching the unit, push it into the recipient.

The system allows for quick, sterile, and simple insertion of the transponder. The procedure can be performed after little or no training. In most cases the transponder unit is pushed directly into the recipient; the optimal place is usually the loose skin located between the shoulder blades in the direct midline of the back. The skin may be grasped between thumb and forefinger and pulled up into a "tent." The transponder unit is pushed directly through the skin until it disappears. In animals with resilient skin, such as dogs and cats, the insertion tool may be needed.

In another embodiment, the system includes an insertion tool. This tool comprises a handle attached to a rod-shaped cylinder that has a receptacle for receiving the transponder unit. A sleeve fits over the

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cylinder and reversibly slides over the cylinder and over the transponder in the receptacle. The transponder unit is placed in the receptacle of the tool with its sharp end forward, the sleeve is pushed over it, and the cylinder is pushed through the skin. The sleeve is pulled down so that the
5 transponder is exposed. The cylinder is then rotated so that the transponder separates from the receptacle. The insertion tool is removed and the transponder is left behind under the skin. Prior to its use, the insertion tool should be sterilized by autoclave, sterilizing solution, or other suitable means. Care should be taken not to blunt the sharp end of
10 the tool.

The shape of the cylinder and receptacle are designed to minimize trauma to tissue upon insertion and removal. Further, the receptacle may be coated with a low-tack material that gently holds the transponder unit in place until the rotation step. The tool may be
15 weighted for optimal comfort by, for instance, adjusting the size of the handle. The tool may be rotated by twisting the handle or by incorporating an optional rotatable joint. Other joints may be introduced to the device to enhance deposition of the transponder; for instance, a flex-joint could be introduced below the receptacle so that the cylinder could be bent after
20 pulling back the sleeve.

These embodiments are for illustrative purposes and are not intended to limit the scope of the invention. This invention encompasses many other embodiments that will be obvious to one skilled in these arts after reading this disclosure.

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Brief Description of the Drawings

Fig. 1a is a side elevational view depicting the transponder introduction system, including a coated transponder unit in a sterile package and an insertion tool;

30 Fig. 1b is a side elevational view depicting an alternative configuration of the coated transponder unit;

Fig. 2a is a fragmentary, side elevational view depicting an

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alternative configuration of the insertion end of the insertion tool;

Fig. 2b is a fragmentary, side elevational view depicting another alternative embodiment of the cylindrical part of the insertion tool; and

5 Fig. 3 is an enlarged, fragmentary, side elevational view depicting the insertion end.

Detailed Description of the Drawings

Fig. 1a shows coated transponder unit 10 with sharp pointed
10 end 12 and opposing flat blunt end 13. Coated transponder unit 10 may be grasped by the user with pointed end 12 resting on the recipient's skin and pushed at blunt end 13 through the skin of the recipient. The unit 10 is depicted in Fig. 1a packaged in a sterile package. The degradable capsule will protect the transponder during implantation, but later erode to
15 maximize transponder function. The transponder unit is delivered to the user in sterile packaging (not shown) that optionally may be configured to be helpful for sterile gripping of the transponder unit.

Insertion tool 20 comprises handle 21, sliding sleeve 22, and
cylinder 23. Cylinder 23 includes a sharp end 24, a front slope 25, a back
20 slope 26, a receptacle 27 for the transponder unit, a rear slope 28, and a diameter 29. Transponder unit 10 or 12 is inserted into receptacle 27 and sliding sleeve 22 slides forward to cover receptacle 27. Insertion tool 20 is pushed through a recipient's skin and sleeve 22 is moved back to uncover
25 receptacle 27. The user grips handle 21 and rotates the insertion tool so that the transponder unit is separated. The tool is withdrawn.

The shape of the cylinder may be varied; front slope 25, back
slope 26, rear slope 28, and diameter 29 may be resized or adjusted to
achieve a wide variety of shapes. Adjusting these parameters is helpful for
achieving a tool with optimum characteristics for minimizing trauma and
30 perfecting separation of the transponder unit from the cylinder. Other joints, locks, and features described above may also be incorporated.

Fig. 2a shows another embodiment of the shape of cylinder;

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in this embodiment, front slope 25 differs from that of Fig. 1 and a flat portion 30 is introduced. Fig. 2b shows another slope for front slope 25 and demonstrates how receptacle 27 may have first side wall 33 and second side wall 32 with varying heights. This feature is potentially useful for enhancing separation of the transponder unit from the receptacle.

Fig. 3 shows a particular embodiment of the cylinder 23. Cylinder diameter 50 is 0.148 inches. Length 51 is 3.5 inches. Angle 55 for the rear slope 28 is 16 degrees. Receptacle opening rear height 52 is 0.0855 inches and receptacle opening forward height 53 is 0.0625 inches. The distance 54 from receptacle opening rear height 52 to flat portion 30 is 1.11 inches. Flat portion 30 width is 0.03125 inches. The angle 56 for back slope 26 is 30 degrees. The angle 57 for the sharp end is 16 degrees.

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WHAT IS CLAIMED IS:

1 1. An implantable transponder system that may be implanted
2 within a recipient, the implantable transponder system comprising:
3 a transponder;
4 a degradable capsule that substantially covers the
5 transponder;
6 a first portion comprising a sharp tip whereby the skin
7 of the recipient may be penetrated; and
8 a second portion comprising a surface adapted for being
9 pushed.

1 2. The system of claim 1 wherein the transponder is a
2 microchip-type transponder.

1 3. The system of claim 2 wherein the degradable capsule
2 incorporates the sharp tip of the first portion, wherein the degradable
3 capsule is sharp and rigid.

1 4. The system of claim 2 wherein the transponder includes a
2 transponder case incorporating the sharp tip of the first portion.

1 5. The system of claim 2 wherein the degradable capsule
2 includes the second portion.

1 6. The system of claim 5 wherein the second portion is a flat
2 surface.

1 7. The system of claim 5 wherein the second portion is a
2 concave surface.

1 8. The system of claim 6 wherein the first and the second
2 portions are substantially opposite each other, whereby the sharp tip may

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3 be placed against the skin of the recipient and penetrate the skin as a result
4 of force applied directly to the flat surface.

1 9. The system of claim 4 wherein the first and the second
2 portions are substantially opposite each other, whereby the sharp tip may
3 be placed against the skin of the recipient and penetrate the skin as a result
4 of force applied directly to the flat surface.

1 10. The system of claim 1 wherein the degradable capsule
2 comprises a starch based compound.

1 11. The system of claim 1 wherein the degradable capsule
2 comprises a water-soluble degradable material.

1 12. The system of claim 1 wherein the degradable capsule
2 comprises a sugar compound.

1 13. The system of claim 1 wherein the system includes sterile
2 packaging, the packaging adapted for use in sterilely grasping the
3 encapsulated transponder.

1 14. The system of claim 13 wherein the sterile packaging includes
2 a wrapper with a sterile inner surface that may be used to touch the
3 encapsulated transponder.

1 15. The system of claim 1 wherein the recipient is a member of
2 the group consisting of: dogs, cats, pet animals, farm animals, humans, zoo
3 animals, exotic animals, and wild animals.

1 16. An implantable transponder system that may be implanted
2 within a recipient, the implantable encapsulated transponder system
3 comprising:

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4 an encapsulated transponder comprising a microchip-
5 type transponder substantially encased within a degradable
6 capsule that substantially covers the transponder, wherein
7 the encapsulated transponder has a first end that is sharp and
8 a substantially flat second end opposed from the first end.

1 17. The system of claim 16 wherein the degradable capsule has a
2 rigid outer structure that prevents the process of pushing the transponder
3 system through the skin from communicating forces to the transponder
4 inside the capsule, whereby the capsule is protected from the forces
5 generated by implantation.

1 18. A tool for implanting an implantable transponder within a
2 recipient, the tool comprising:
3 a handle;
4 a delivery cylinder operably coupled to the handle;
5 a cylinder including a receptacle adapted to receive the
6 transponder; and
7 a sliding sleeve shiftably received by the cylinder,
8 the sliding sleeve shiftable across the cylinder while
9 the transponder is in the receptacle means.

1 19. The tool of claim 18 wherein the cylinder comprises a sharp
2 end whereby the cylinder may be pushed through the skin of the recipient.

1 20. The tool of claim 19 wherein the receptacle means comprises
2 an opening.

1 21. The tool of claim 20 wherein the opening has beveled edges.

1 22. The tool of claim 20 wherein the opening comprises a first
2 edge parallel to a first plane and a second edge parallel to a second plane,

3 wherein the first edge is closer to the sharp end than the second edge and
4 the first plane forms an angle between 0 and 85 degrees that is
5 perpendicular to the longitudinal central axis of the cylinder, and the
6 second plane forms an angle between 0 and 85 degrees with the reference
7 plane.

1 23. The tool of claim 22 wherein the first plane defines an angle
2 of approximately 60 degrees from the reference plane and the second plane
3 defines an angle of approximately 74 degrees from the reference plane.

1 24. The tool of claim 20 wherein the opening comprises a shape
2 that only partially conforms to the shape of the transponder whereby the
3 transponder may be more easily separated from the opening after insertion
4 of the cylinder beneath the skin.

1 25. The tool of claim 20 wherein the opening comprises a shape
2 that minimizes trauma to the skin during insertion and removal from the
3 recipient.

1 26. The tool of claim 20 wherein the sliding sleeve comprises a
2 lip whereby the sliding sleeve may be more easily manipulated by a user.

1 27. The tool of claim 20 wherein the sliding sleeve comprises a
2 reversible locking mechanism whereby the sliding sleeve may be
3 reversibly locked in a forward position that covers the receptacle means
4 such that the user may lock the sliding sleeve prior to piercing the
5 recipient's skin and subsequently unlock the sliding sleeve.

1 28. The tool of claim 27 wherein the locking mechanism
2 comprises a nut threadedly connected to the cylinder between the handle
3 and the sliding sleeve whereby the nut may be tightened prior to piercing
4 the skin and loosened afterwards.

1 29. The tool of claim 20 wherein the handle comprises means for
2 adjusting the weight of the tool whereby the tool may be comfortably held
3 and manipulated by the user.

1 30. The tool of claim 20 further comprising at least one joint
2 whereby the cylinder may be rotated relative to the handle.

1 31. The tool of claim 20 wherein the receptacle is coated with a
2 substance that enhances the sticking of the encapsulated transponder.

1 32. The tool of claim 31 wherein at least one joint comprises a
2 ratchet.

1 33. The tool of claim 31 wherein at least one joint comprises
2 means for lateral movement of the tip of the tool relative to the handle
3 whereby the tip may be wiggled to enhance release of the transponder
4 from the opening.

1 34. An implantable transponder system that may be implanted
2 within a recipient, the implantable transponder system comprising:

3 a transponder;

4 a degradable capsule substantially covering the
5 transponder;

6 a tool for implanting the transponder, the tool
7 comprising:

8 a handle, a delivery cylinder, and a sliding
9 sleeve, wherein:

10 the delivery cylinder is attached to the
11 handle and the cylinder comprises a receptacle
12 means to receive the transponder,

13 the sliding sleeve fits over the cylinder

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14 and is configured to slide back and forth across
15 the cylinder, and
16 wherein the sliding sleeve slides back and
17 forth across the cylinder while the degradable
18 capsule is in the receptacle means.

1 35. The system of claim 34 wherein the cylinder of the tool
2 comprises a sharp end whereby the cylinder may be pushed through the
3 skin of the recipient.

1 36. The system of claim 34 wherein the receptacle means comprises an
2 opening.

1 37. The system of claim 36 comprising sterile packaging adapted
2 for sterilely gripping the transponder after the transponder has been
3 removed from the packaging.

1 38. The system of claim 34 wherein the degradable capsule
2 comprises at east one antibiotic.

1 39. The method of implanting transponders within a recipient,
2 the method comprising the steps of:
3 providing a transponder with a degradable coating,
4 wherein the transponder is sterile, is substantially coated by
5 the degradable coating, and comprises a sharp edge; and
6 manually pushing the transponder through the skin of
7 the recipient.

1 40. The method of implanting transponders within a recipient,
2 the method comprising the steps of:
3 providing a transponder with a degradable coating,
4 wherein the transponder is sterile, is substantially coated by

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5 the degradable coating, and comprises a sharp edge;
6 providing an insertion tool, the tool comprising:
7 a handle, a delivery cylinder, and a sliding
8 sleeve, wherein--
9 the delivery cylinder is attached to the
10 handle and the cylinder comprises a receptacle
11 means to receive the transponder; and
12 the sliding sleeve fits over the cylinder
13 and is configured to slide back and forth across
14 the cylinder;
15 inserting the coated transponder into the receptacle
16 means;
17 pushing the sleeve over the receptacle means whereby
18 the coated transponder is covered;
19 manually pushing the insertion tool through the skin
20 of the recipient;
21 sliding the sleeve back to reveal the coated
22 transponder;
23 rotating the insertion tool at least 180 degrees; and
24 removing the insertion tool.

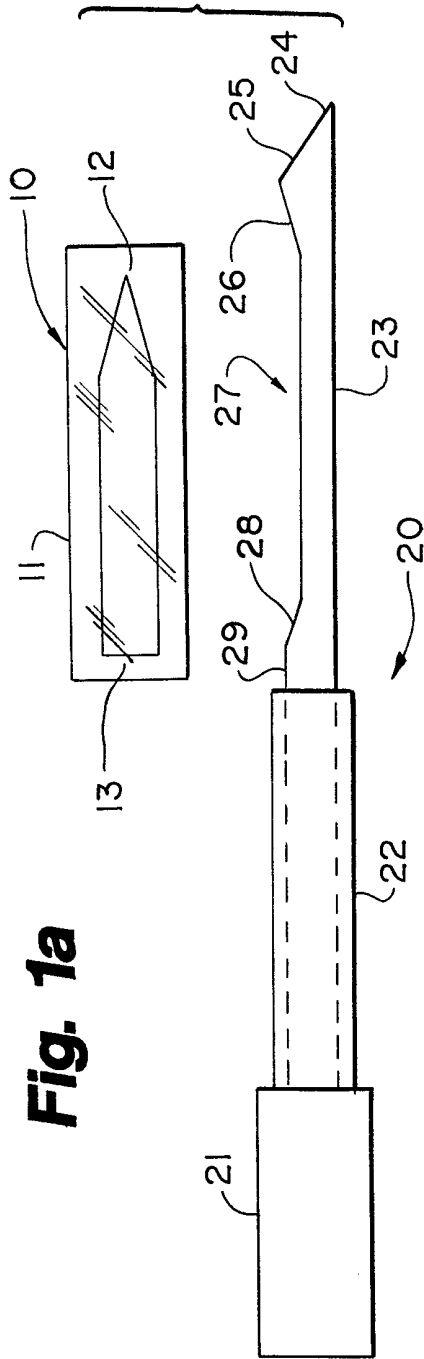


Fig. 1a



Fig. 1b

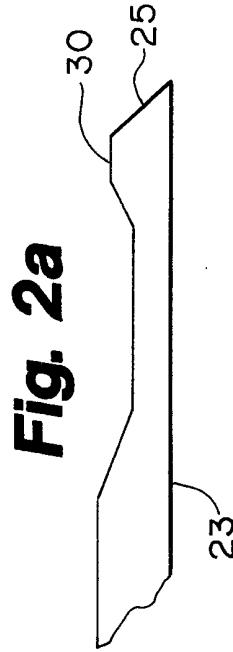


Fig. 2a

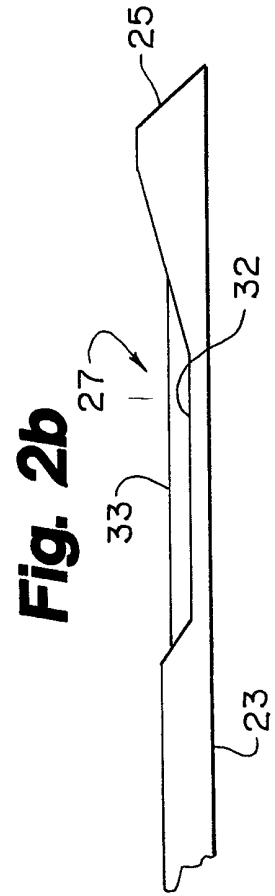
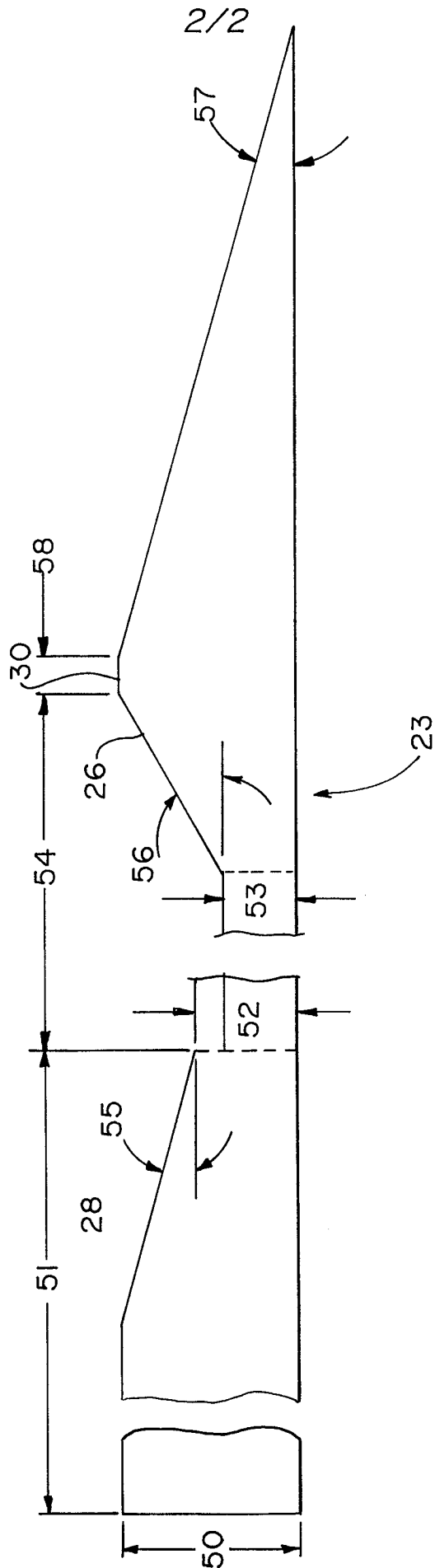


Fig. 2b

Fig. 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/US99/04081

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(6) :A61B 19/00
 US CL :128/899
 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)
 U.S. : 119/174, 215; 128/897-899; 600/302

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

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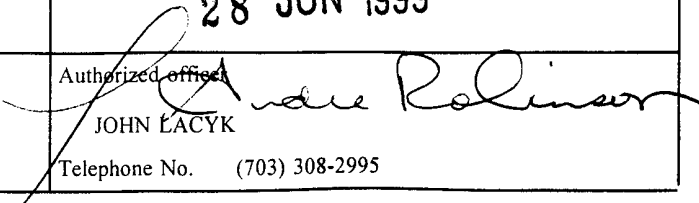
C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,211,129 A (TAYLOR et al.) 18 May 1993, entire document.	1-40
A	US 5,482,008 A (STAFFORD et al.) 09 January 1996, entire document.	1-40
A	US 5,193,540 A (SCHULMAN et al.) 16 March 1993, entire document.	1-40

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Date of the actual completion of the international search 08 JUNE 1999	Date of mailing of the international search report 28 JUN 1999
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