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(54) **Central venous catheter with heat exchange properties**

Zentralvenöser Katheter mit Wärmetauscheigenschaften

Cathéter veineux central doté de propriétés d'échange de chaleur

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Description

FIELD OF THE INVENTION

[0001] The present invention relates generally to apparatus for cooling patients for therapeutic purposes, and more particularly to systems for establishing central venous access while providing a means for cooling a patient.

BACKGROUND

[0002] It has been discovered that the medical outcome for a patient suffering from severe brain trauma or from ischemia caused by stroke or heart attack is degraded if the patient's body temperature rises above normal (38°C). It is further believed that the medical outcome for many such patients might be significantly improved if the patients were to be cooled relatively quickly for a short period, e.g., 24-72 hours. Apart from the therapeutic benefits of hypothermia, the outcomes for brain trauma or ischemia patients that develop fevers is worse than for patients that do not develop fevers. Consequently, temperature management for such patients is important, even when hypothermia is not to be used to treat the patients. Moreover, prophylactic short-term hypothermia might help patients undergoing minimally invasive heart surgery and aneurysm surgery.

[0003] The affected organ, in any case, is the brain. Accordingly, systems and methods have been disclosed that propose cooling blood flowing to the brain through the carotid artery. An example of such systems and methods is disclosed in U.S. pat. app. serial no. 09/063,984, filed April 21, 1998, owned by the present assignee and published as US-6 126 684. In the referenced application, various catheters are disclosed which can be advanced into a patient's carotid artery and through which coolant can be pumped in a closed circuit, to remove heat from the blood in the carotid artery and thereby cool the brain. The referenced devices have the advantage over other methods of cooling (e.g., wrapping patients in cold blankets) of being controllable, relatively easy to use, and of being capable of rapidly cooling and maintaining blood temperature at a desired set point.

[0004] As recognized in U.S. pat. app. serial no. 09/133,813, filed August 13, 1998, owned by the present assignee and published as US-6 338 727, the above-mentioned advantages in treating brain trauma/ischemic patients by cooling can also be realized by cooling the patient's entire body, i.e., by inducing systemic hypothermia. The advantage of systemic hypothermia is that, as recognized by the present assignee, to induce systemic hypothermia a cooling catheter or other cooling device need not be advanced into the blood supply of the brain, but rather can be easily and quickly placed into the relatively large vena cava of the central venous system.

[0005] Moreover, since many patients already are intubated with central venous catheters for other clinically

approved purposes anyway, providing a central venous catheter that can also cool the blood, if only to manage temperature and thereby ameliorate fever spikes, requires no additional surgical procedures for those patients.

[0006] The invention provides a central venous access system includes a multi-lumen catheter, at least one heat exchange membrane or balloon located distally on the catheter and communicating with at least one coolant lumen of the catheter, and a heat exchange system communicating with at least the coolant lumen as claimed in claim 1. Coolant is circulated between the heat exchange system and the membrane or balloon to effect heat exchange with a patient. Preferred embodiments are disclosed in the dependent claims. At least one holder is engageable with the catheter to hold the catheter onto a patient. Also, a central venous system communicates with at least one lumen of the catheter.

[0007] The details of the present invention, both as to its structure and operation, can best be understood in reference to the accompanying drawings, in which like reference numerals refer to like parts, and in which:

BRIEF DESCRIPTION OF THE DRAWINGS

[0008]

Figure 1 is an exploded perspective view of a first example of an entry sheath for a venous catheter, schematically showing a cooling system in communication with the catheter;

Figure 1A is a longitudinal cross-section as would be seen along the line 1A-1A in Figure 1, of an alternate balloon configuration for the catheter shown in Figure 1;

Figure 2 is a perspective view of a second example of the entry sheath, configured for providing cooling capability in a patient's central venous system;

Figure 3 is a cross-sectional view as seen along the line 3-3 in Figure 2;

Figure 3A is a cross-sectional view of an alternate sheath that includes a distal cooling balloon, as would be seen along the line 3-3 in Figure 2;

Figure 4 is a perspective view of a so-called jugular bulb catheter configured for cooling a patient, schematically showing various jugular bulb components and a cooling system connected to the catheter;

Figure 5 is a cross-sectional view as seen along the line 5-5 in Figure 4;

Figure 6 is a perspective view of a dialysis catheter configured for cooling a patient, schematically showing various dialysis components and a cooling system connected to the catheter;

Figure 7 is a cross-sectional view as seen along the line 7-7 in Figure 6;

Figure 8 is a perspective view of a Foley catheter configured for cooling a patient, schematically showing various Foley catheter components and a cooling

system connected to the catheter; and

Figure 9 is a cross-sectional view as seen along the line 9-9 in Figure 8.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0009] Referring initially to Figure 1, a therapeutic catheter system, generally designated 10, is shown for establishing and maintaining hypothermia in a patient, or for attenuating a fever spike in a patient and then maintaining normal body temperature in the patient, or for returning a hypothermic patient to normothermic. Commencing the description of the system 10 at the proximal end, as shown the system 10 includes a cooling system 12 that can be a water-bath system or a TEC-based system such as either of the systems disclosed in U.S. patent application serial no. 09/220,897, filed December 24, 1998 and published as US-6 146 411, or U.S. patent application serial no. 09/260,950, filed March 2, 1999, published as US-6 019 783. In any case, the coolant system 12 provides coolant such as saline water through a coolant supply line 14, and coolant is returned to the source 12 via a coolant return line 16. A catheter, generally designated 18, includes respective coolant supply and return lumens that communicate with the lines 14, 16 to establish a closed circuit coolant path between the catheter 18 and coolant source 12.

[0010] In one preferred embodiment, the catheter 18 is any one of the catheters disclosed in the above-referenced applications. For example, the catheter 18 can be the catheter disclosed in U.S. patent application serial no. 09/253,109, filed February 19, 1999, which catheter includes a holder 18a to hold the catheter onto a patient for long-term intubation. The above-referenced application discloses an exemplary anchor that can establish the holder 18a. In addition to the structure disclosed in the above-referenced application, the in-growth flange set forth in U.S. Pat. No. 4,578,063 can be used as the present holder, or the anchoring systems set forth in U.S. Pat. Nos. 5,693,032 or 5,192,274 can be used, or the anchoring tape set forth in U.S. Pat. No. 3,677,250 can be used, or suture thread can be wound around the catheter body and attached to the patient to establish the holder. Also, one or more central venous delivery or monitoring systems 19 communicate with one or more lumens of the catheter 18 via respective tubes 19a (only a single system 19 shown for clarity). The central venous delivery or monitoring system 19 can be, e.g., a source of medicament to be infused into a patient's central venous system, or a syringe or other device for extracting central venous blood from a patient, or a pressure monitoring or blood gas monitoring or temperature monitoring system.

[0011] Alternatively, the catheter 18 can be the modified catheter 20 shown in Figure 1A, which in all essential respects is identical to the two-balloon catheter set forth in U.S. patent application serial no. 09/305,613, filed May 5, 1999, published as US-6 368 304, with the following

exceptions.

[0012] As shown in Figure 1A, each of the two cooling balloons (only a single cooling balloon 22 is shown for clarity of disclosure) of the catheter 2D surrounds a respective inflation balloon 24. Coolant from a cooling system 26 or other coolant source enters each cooling balloon 22 through a coolant supply lumen 28 and coolant supply port or ports 30 and exits the cooling balloon 22 through a coolant exit port or ports 32 and coolant return lumen 34.

[0013] Additionally, inflation fluid such as air can be directed into the inflation balloon 24 from an air source 36 through an inflation lumen 38 and air port or ports 40 to inflate the inflation balloon 24. Air can be exhausted from the inflation balloon 24 back through the inflation lumen 38 to collapse the inflation balloon 24. With this structure, the inflation balloon 24 can be selectively moved between an inflated configuration (shown), wherein the inflation balloon 24 causes coolant to flow near the outer surface of the respective cooling balloon 22 and thereby effect relatively greater heat exchange with the blood, and a deflated configuration, wherein coolant tends to flow through the cooling balloon 22 with a laminar flow characteristic nearer the body of the catheter 20 than the outer surface of the catheter.

[0014] Referring back to Figure 1, the catheter 18 can be introduced into a patient through an elongated hollow plastic introducer sheath 42 having a hollow body 42A and a side port 43 connected to the body 42A. The sheath 42 preferably is coated with an anti-microbial agent, and it can also be coated with an anti-clotting substance such as heparin.

[0015] As shown, the sheath 42 includes a proximal end 44 and an open distal end 46, it being understood that a working lumen through which the catheter 18 (or other catheter, conventional or otherwise) can be advanced extends between the proximal end 44 and distal end 46 of the sheath 42. A barrier 48 such as a septum or hemostasis valve or other barrier selectively blocks the working lumen. The catheter 18 can be advanced through the barrier 48, with the barrier 48 sealing against the catheter 18. Upon removal of the catheter 18, the barrier 48 closes to prevent backflow through the working lumen out of the proximal end 44 of the sheath 42.

[0016] In the example shown, a temperature sensor 50 is mounted on the sheath 42 at or near the distal end 46 to sense the temperature of blood flowing past the distal end 46. The sensor 50 can be a thermistor or thermocouple or other suitable temperature sensing device. In any case, the sensor 50 is operably connected to the cooling system 12 as schematically indicated by the dashed line 52, to provide temperature feedback to the system 12. This connection can be made by wireless transmission or through a wire or fiber that extends through the wall of the sheath 42. The sensor 50 can be mounted on the sheath 42 by solvent bonding or disposed in a lumen of the sheath 42, or attached to a wire that is disposed in a lumen of the sheath 42, with the sensor

hanging outside the sheath 42.

[0017] Figure 2 shows that instead of a cooling catheter 18/20, a non-cooling catheter 54 such as a conventional central venous catheter or a Swan-Ganz catheter not according to the invention, as exemplified in U.S. Patent No. 3,995,623 can be provided. In this case, a sheath 56 which is in all essential respects identical to the sheath 42 shown in Figure 1, with the following exceptions, can be provided. The sheath 56 includes a central working lumen 58 (Figure 3) for receiving the catheter 54 therein in slidable engagement, and at least along a distal segment of the sheath 56 coolant supply and return lumens 60, 62 surround the working lumen 58 to establish a distally-located heat transfer region. Accordingly, in the example shown in Figures 2 and 3 a heat transfer region is established by at least one distally-located fluid passageway (e.g., either or both of the lumens 60, 62) that is formed in the body 66 of the sheath 56.

[0018] As shown best in Figure 3, the working lumen 58 is defined by a central lumen wall 64, with the supply and return lumens 60, 62 being established between the wall 64 and an outer wall 66 of the sheath 56. Separator ribs 68, 70 extend laterally between the walls 64, 66 along the length of the coolant supply and return lumens 64, 66 to separate the coolant supply and return lumens 60, 62.

[0019] The coolant supply and return lumens 60, 62 communicate, via a side port 72 having supply and return tubes 74, 76, with a cooling system 78 that is in all essential respects identical to the system 12 shown in Figure 1. If desired, a temperature sensor 80 can be mounted on the sheath 56 to provide temperature feedback to the cooling system 78 in accordance with principles set forth above.

[0020] Alternatively, as shown in Figure 3A a thin-walled cooling balloon or membrane 82 can surround a distal segment of the outer wall 66 of the sheath 56, to establish a cooling chamber 84 between the outer wall 66 and the balloon or membrane 82. The embodiment of the sheath 56 shown in Figure 3A would then function essentially analogously to the cooling catheters disclosed in the above-referenced patent applications, with the coolant from the system 78 entering and exiting the chamber 84 through respective coolant supply and return passageways in the sheath 56. In the example shown in Figure 3A, the distally-located heat transfer region is established by the balloon or membrane 82.

[0021] Now referring to Figures 4 and 5, a jugular vein catheter system, generally designated 100, includes a jugular catheter body 102 bearing an oxygen sensor, shown schematically at 104. The jugular catheter can be the fiberoptic intravascular catheter sold under the trademark "Opticath" by Abbot Critical Care Systems, or a jugular catheter made by Baxter international, with the exceptions noted below.

[0022] An optical fiber 106 is connected to the oxygen sensor 104, and the fiber 106 terminates in an optical connection 108. In turn, the connector 108 can be con-

nected to an oxygen measuring system 110. Further, a temperature sensor, shown schematically at 112, is supported by the body and is operably connected through a sensor lumen 113 (Figure 5) with a monitoring system 114. Both the oxygen and temperature sensor connecting lines can extend through the sensor lumen 113. Moreover, a pressure sensor, shown schematically at 116, is supported on the body 102, and the pressure sensor 116 communicates via a pressure/infusion lumen 118 and luer-like fitting 120 with a pressure sensing system 122 or with a drug infusion device 124, such as a syringe or IV bag.

[0023] Unlike conventional jugular bulb catheters, however, the catheter 102 shown in Figures 4 and 5 includes a distally-located balloon or membrane 126. The balloon or membrane 126 is attached to the catheter body and communicates with coolant supply and return lumens 128, 130 that are formed in the catheter body. In turn, the coolant lumens 128, 130 communicate via coolant supply and return lines 132, 134 with a cooling system 136. With this structure, coolant can be circulated in the balloon or membrane 126 to effect heat exchange with a patient's body.

[0024] In addition to the above heat exchange structures, an arterial catheter system, generally designated 150 in Figures 6 and 7, can be provided to effect heat exchange with a patient. The system 150 includes an arterial catheter body 152. In accordance with arterial catheter principles, the body 152 includes a blood supply lumen 154 and a blood return lumen 156, both of which communicate with a dialysis blood source 158 via blood supply and return tubes 160, 162 for undertaking dialysis of a patient's blood.

[0025] The arterial catheter system 150 also includes a heat exchange region associated with a distal segment of the catheter body 152. The body 152 includes coolant supply and return lumens 164, 166 that communicate with a cooling system 168 via supply and return tubes 170, 172, with the lumens 164, 166 establishing the heat exchange region. Or, the heat exchange region can be established by at least one distally-located balloon or membrane 174 that communicates with the supply and return lumens 166, 168 in accordance with present principles.

[0026] Figures 8 and 9 show a Foley catheter, generally designated 200, that is adapted for use for cooling the interior of a patient's bladder, to effect patient cooling. As shown, the catheter 200 includes a flexible resilient catheter body 202 terminating in a central fluid drainage tube 204 that communicates with a urine drainage lumen 206 (Figure 9) in the body 202. The drainage tube 204 can be connected to a fluid collection receptacle 208 in accordance with Foley catheter principles known in the art. Also, the body 202 terminates in a temperature connector tube 210, and a temperature lead 212 extends through the connector tube 210 and a temperature lead lumen 214 (Figure 9) for connecting a temperature sensor 216 that is distally located on the body 202 with a

temperature monitor system 218. Moreover, a drug infusion tube 220 can be connected to a drug infusion source 222 to infuse drugs into the bladder of a patient through the drug infusion tube 220 and a drug infusion lumen 224 that communicates with the drug infusion tube 220.

[0027] In addition to the conventional Foley catheter structure described above, the catheter 200 shown in Figures 8 and 9 includes coolant supply and return lumens 226, 228 that communicate with at least one balloon or membrane 230 that is distally located on the catheter body 202 in accordance with principles set forth above. Coolant such as saline from a cooling system 232 is circulated through coolant supply and return lines 234, 236, coolant lumens 226, 228, and balloon or membrane 230 in a closed loop to remove heat from a bladder of a patient into which the catheter 200 has been advanced. It is to be understood that while Figure 9 illustrates one lumen design layout, other layouts can be used. It is to be further understood that the cooling system 232 is in all essential respects identical in operation and construction to the above-described cooling systems. If desired, the temperature monitor system 218 can be connected to the cooling system 232 as indicated at the line 236 to provide temperature feedback to the cooling system 232.

[0028] While the particular CENTRAL VENOUS CATHETER WITH HEAT EXCHANGE PROPERTIES as herein shown and described in detail is fully capable of attaining the above-described objects of the invention, it is to be understood that it is the presently preferred embodiment of the present invention and is thus representative of the subject matter which is broadly contemplated by the present invention, that the scope of the present invention fully encompasses other embodiments which may become obvious to those skilled in the art, and that the scope of the present invention is accordingly to be limited by nothing other than the appended claims, in which reference to an element in the singular is not intended to mean "one and only one" unless explicitly so stated, but rather "one or more". All structural and functional equivalents to the elements of the above-described preferred embodiment that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the present claims. Moreover, it is not necessary for a device or method to address each and every problem sought to be solved by the present invention, for it to be encompassed by the present claims. Furthermore, no element or component in the present disclosure is intended to be dedicated to the public regardless of whether the element or component, is explicitly recited in the claims.

Claims

- 1. A central venous access system, comprising:
 - a multi-lumen catheter (18);

at least one heat exchange membrane or balloon (22) located distally on the catheter and communicating with a coolant supply lumen and a coolant return lumen of the catheter, wherein coolant circulates in a closed circuit coolant path that includes the supply lumen, heat exchange membrane or balloon, and return lumen;
 a heat exchange system (12) communicating with at least one of the coolant lumens, coolant being circulated between the heat exchange system and the heat exchange membrane or balloon to effect heat exchange with a patient;
 a central venous delivery or monitoring system comprising either a source of medicament to be infused into a patient's central venous system, or a syringe, or a blood gas monitoring system, or a temperature monitoring system; and
 at least one through lumen of the catheter in fluid communication with the bloodstream of the patient and the central venous system.

- 2. The central venous access system of claim 1, wherein the heat exchange system is cooling system located proximally on the catheter body, and comprising a coolant supply line and a coolant return line in communication with the coolant supply and coolant return lumens of the catheter to establish a closed circuit coolant path between the catheter body and the cooling system.
- 3. The central venous access system of claim 1 wherein the central venous system is in fluid communication with the bloodstream of the patient through tubes communicating with one or more lumens of the catheter.
- 4. The central venous access system of claim 1, further comprising at least one holder engageable with the catheter to hold the catheter onto a patient.
- 5. The central venous access system of claim 4, wherein the holder comprises a suture anchor, or an ingrowth flange, or an anchoring tape, or a suture.
- 6. The central venous access system of claim 1, wherein the central venous system comprises a source of medicament to be infused into a patient's central venous system.
- 7. The central venous access system of claim 1, wherein the central venous system comprises a syringe.
- 8. The central venous access system of claim 1, wherein the central venous system comprises a blood gas monitoring system.
- 9. The central venous access system of claim 1, wherein the central venous system comprises a tempera-

ture monitoring system.

10. The central venous access system of any preceding claim, further comprising:

an inflation balloon (24) disposed within the heat exchange membrane or balloon such that the heat exchange membrane or balloon surrounds the inflation balloon; and
 an inflation lumen (38) for supplying an inflation fluid to the inflation balloon;
 whereby the inflation balloon can be moved between an inflated configuration, in which the inflation balloon causes coolant to flow near the outer surface of the heat exchange membrane or balloon to effect greater heat exchange with the blood, and a deflated configuration, in which coolant tends to flow through the heat exchange element with a laminar flow characteristic nearer a body of the catheter.

11. A central access system as defined in any one of claims 1 to 9 for use in cooling a patient for a therapeutic purpose.

12. The central access system for use according to claim 11 wherein the therapeutic purpose is for inducing hypothermia in a patient having brain trauma, ischemia, minimally invasive heart surgery or aneurysm surgery.

Patentansprüche

1. Zentralvenen-Zugangssystem, das umfasst:

einen Multilumen-Katheter (18);
 wenigstens eine/n Wärmeaustausch-Membran oder -Ballon (22), die/der sich distal an dem Katheter befindet und mit einem Kühlmittelzuführ-Lumen sowie einem Kühlmittelrückführ-Lumen des Katheters in Verbindung steht, wobei Kühlmittel in einem geschlossenen Kühlmittel-Kreislaufweg zirkuliert, der das Zuführlumen, die/den Wärmeaustausch-Membran oder -Ballon und das Rückführ-Lumen einschließt;
 ein Wärmeaustauschsystem (12), das mit wenigstens einem der Kühlmittel-Lumen in Verbindung steht, wobei Kühlmittel zwischen dem Wärmeaustauschsystem und der/dem Wärmeaustausch-Membran oder -Ballon zirkuliert, um Wärmeaustausch mit einem Patienten zu bewirken;
 ein Zentralvenen-Verabreichungs- oder Überwachungssystem, das entweder eine Quelle eines Medikaments, das in das Zentralvenensystem eines Patienten infundiert werden soll, oder eine Spritze oder ein Blutgas-Überwa-

chungssystem oder ein Temperatur-Überwachungssystem umfasst; und
 wenigstens ein Durchgangs-Lumen des Katheters, das in Fluidverbindung mit dem Blutstrom des Patienten und dem Zentralvenensystem steht.

2. Zentralvenen-Zugangssystem nach Anspruch 1, wobei das Wärmeaustauschsystem ein Kühlsystem ist, das sich proximal an dem Katheterkörper befindet, und das eine Kühlmittel-Zuführleitung sowie eine Kühlmittel-Rückführleitung umfasst, die in Verbindung mit dem Kühlmittelzuführ-Lumen sowie dem Kühlmittelrückführ-Lumen des Katheters steht, um einen geschlossenen Kühlmittel-Kreislaufweg zwischen dem Katheterkörper und dem Kühlsystem herzustellen.

3. Zentralvenen-Zugangssystem nach Anspruch 1, wobei das Zentralvenensystem über Röhren, die mit einem oder mehreren Lumen des Katheters in Verbindung stehen, in Fluidverbindung mit dem Blutstrom des Patienten steht.

4. Zentralvenen-Zugangssystem nach Anspruch 1, das des Weiteren wenigstens einen Halter umfasst, der mit dem Katheter in Eingriff gebracht werden kann, um den Katheter in einem Patienten zu halten.

5. Zentralvenen-Zugangssystem nach Anspruch 4, wobei der Halter einen Fadenanker oder einen Einwachs-Flansch (in-growth flange) oder ein Fixierband oder einen Faden umfasst.

6. Zentralvenen-Zugangssystem nach Anspruch 1, wobei das Zentralvenensystem eine Quelle von Medikamenten umfasst, die in das Zentralvenensystem eines Patienten infundiert werden sollen.

7. Zentralvenen-Zugangssystem nach Anspruch 1, wobei das Zentralvenensystem eine Spritze umfasst.

8. Zentralvenen-Zugangssystem nach Anspruch 1, wobei das Zentralvenensystem ein Blutgas-Überwachungssystem umfasst.

9. Zentralvenen-Zugangssystem nach Anspruch 1, wobei das Zentralvenensystem ein Temperatur-Überwachungssystem umfasst.

10. Zentralvenen-Zugangssystem nach einem der vorangehenden Ansprüche, das des Weiteren umfasst:

einen Aufblasballon (24), der in der/den Wärmeaustausch-Membran oder -Ballon so angeordnet ist, dass die/der Wärmeaustausch-Membran oder -Ballon den Aufblasballon umgibt; und

ein Aufblas-Lumen (38) zum Zuführen eines Aufblasfluids zu dem Aufblasballon; wobei der Aufblasballon zwischen einer aufgeblasenen Form, in der der Aufblasballon bewirkt, dass Kühlmittel nahe an der Außenflächen der/des Wärmeaustausch-Membran oder -Ballons fließt, um stärkeren Wärmeaustausch mit dem Blut zu bewirken, und einer nicht aufgeblasenen Form verändert kann, in der Kühlmittel stärker mit einer Laminarströmungscharakteristik näher an einem Körper des Katheters durch das Wärmeaustauschelement fließt.

11. Zentralvenen-Zugangssystem nach einem der Ansprüche 1 bis 9 zum Einsatz beim Kühlen eines Patienten für einen therapeutischen Zweck.

12. Zentralvenen-Zugangssystem zum Einsatz nach Anspruch 11, wobei der therapeutische Zweck darin besteht, Hypothermie bei einem Patienten mit einem Hirntrauma, Ischämie, minimalinvasiver Herzchirurgie oder Aneurysma-Chirurgie zu bewirken.

Revendications

1. Système d'accès veineux central, comprenant :

un cathéter multi-lumière (18) ;
au moins une membrane ou un ballonnet d'échange de chaleur (22) situé de manière distale sur le cathéter et communiquant avec une lumière d'alimentation en fluide de refroidissement et une lumière de retour de fluide de refroidissement du cathéter, le fluide de refroidissement circulant selon une trajectoire de circuit fermé qui comprend la lumière d'alimentation, la membrane ou le ballonnet d'échange de chaleur et la lumière de retour ;

un système d'échange de chaleur (12) communiquant avec au moins l'une des lumières de fluide de refroidissement, le fluide de refroidissement circulant entre le système d'échange de chaleur et la membrane ou le ballonnet d'échange de chaleur pour réaliser un échange de chaleur avec un patient ;

un système veineux central d'administration ou de surveillance comprenant une source de médicament à perfuser dans le système veineux central d'un patient, ou une seringue, ou un système de surveillance de gaz du sang ou un système de surveillance de température ; et
au moins une lumière traversante du cathéter en communication fluïdique avec la circulation sanguine du patient et le système veineux central.

2. Système d'accès veineux central selon la revendication 1, dans lequel le système d'échange de chaleur est un système de refroidissement situé de manière proximale sur le corps du cathéter, et comprenant un conduit d'alimentation en fluide de refroidissement et un conduit de retour de fluide de refroidissement en communication avec les lumières d'alimentation en fluide de refroidissement et de retour de fluide de refroidissement du cathéter pour établir une trajectoire de fluide de refroidissement en circuit fermé entre le corps du cathéter et le système de refroidissement.

3. Système d'accès veineux central selon la revendication 1, dans lequel le système veineux central est en communication fluïdique avec la circulation sanguine du patient par le biais de tubes communiquant avec une ou plusieurs lumières du cathéter.

4. Système d'accès veineux central selon la revendication 1, comprenant en outre au moins un support qui peut s'engager avec le cathéter pour maintenir le cathéter sur un patient.

5. Système d'accès veineux central selon la revendication 4, dans lequel le support comprend une ancre de suture, ou une bride de croissance vers l'intérieur, ou une bande d'ancrage, ou une suture.

6. Système d'accès veineux central selon la revendication 1, dans lequel le système veineux central comprend une source de médicament à perfuser dans le système veineux central d'un patient.

7. Système d'accès veineux central selon la revendication 1, dans lequel le système veineux central comprend une seringue.

8. Système d'accès veineux central selon la revendication 1, dans lequel le système veineux central comprend un système de surveillance de gaz du sang.

9. Système d'accès veineux central selon la revendication 1, dans lequel le système veineux central comprend un système de surveillance de température.

10. Système d'accès veineux central selon l'une quelconque des revendications précédentes, comprenant en outre :

un ballonnet gonflable (24) disposé à l'intérieur de la membrane ou du ballonnet d'échange de chaleur de telle sorte que la membrane ou le ballonnet d'échange de chaleur entoure le ballonnet gonflable ; et
une lumière de gonflage (38) destinée à alimenter le ballonnet gonflable en fluide de gonflage ;

moyennant quoi le ballonnet gonflable peut être déplacé entre une configuration gonflée, dans laquelle le ballonnet gonflable entraîne le passage du fluide de refroidissement près de la surface extérieure de la membrane ou du ballonnet d'échange de chaleur pour réaliser un échange de chaleur plus important avec le sang, et une configuration dégonflée, dans laquelle le fluide de refroidissement a tendance à circuler à travers l'élément d'échange de chaleur avec une caractéristique de flux laminaire plus près du corps du cathéter.

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11. Système d'accès central tel que défini dans l'une quelconque des revendications 1 à 9, destiné à être utilisé pour baisser la température d'un patient dans un but thérapeutique.
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12. Système d'accès central destiné à être utilisé selon la revendication 11, dans lequel le but thérapeutique est l'induction d'une hypothermie chez un patient souffrant d'un traumatisme crânien, d'une ischémie, d'une chirurgie cardiaque très peu invasive ou d'une chirurgie d'un anévrisme.

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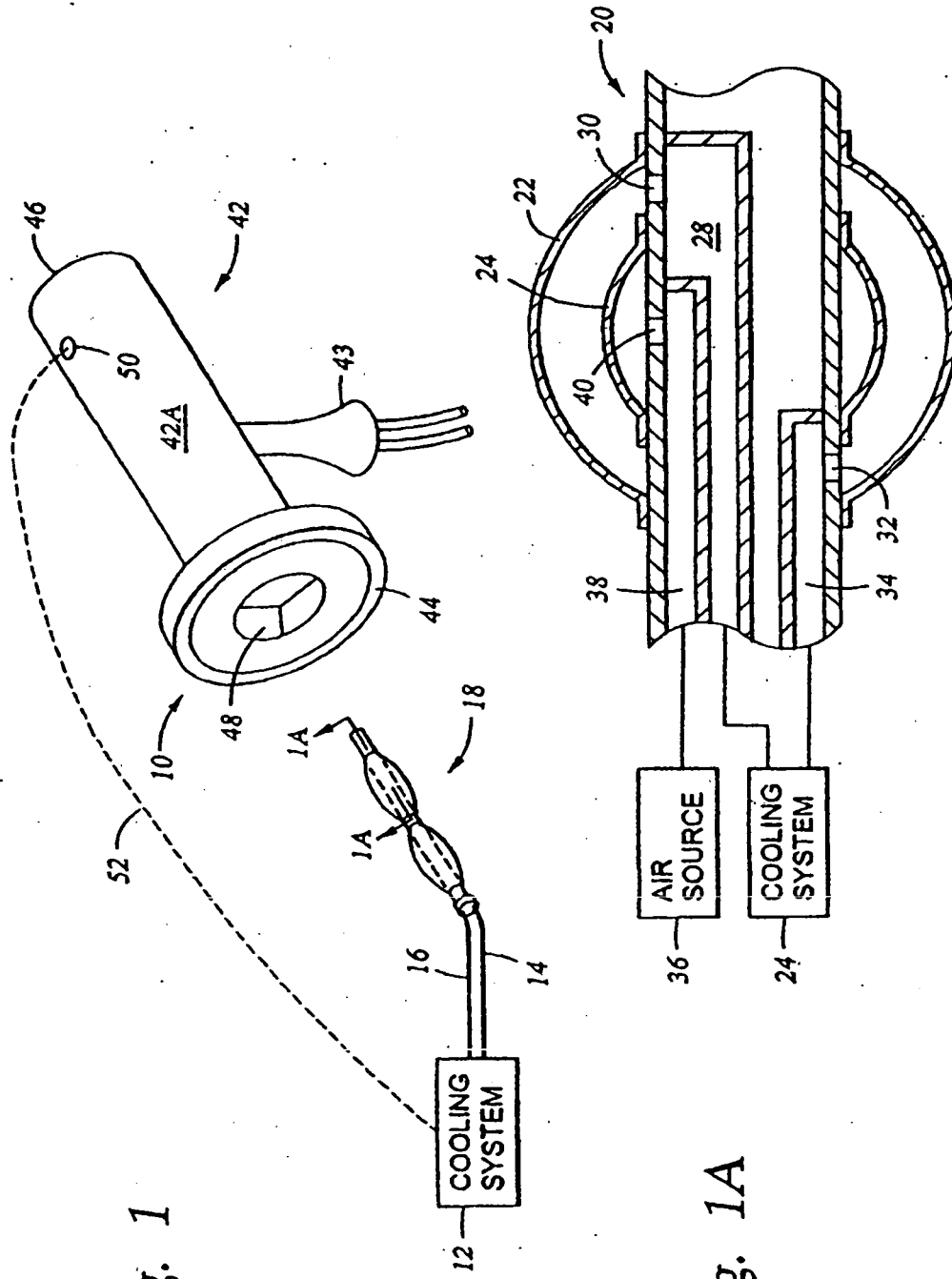


Fig. 1

Fig. 1A

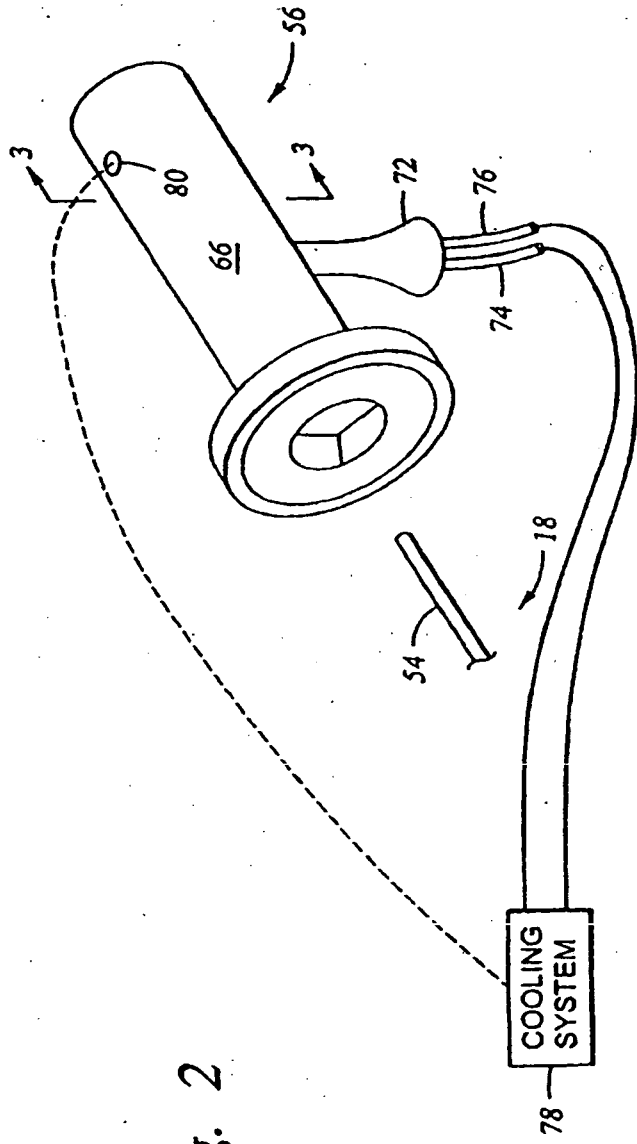


Fig. 2

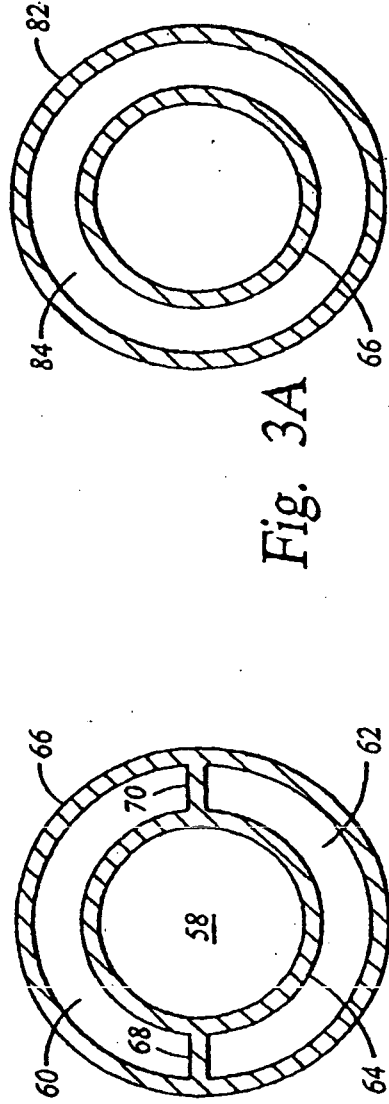


Fig. 3A

Fig. 3

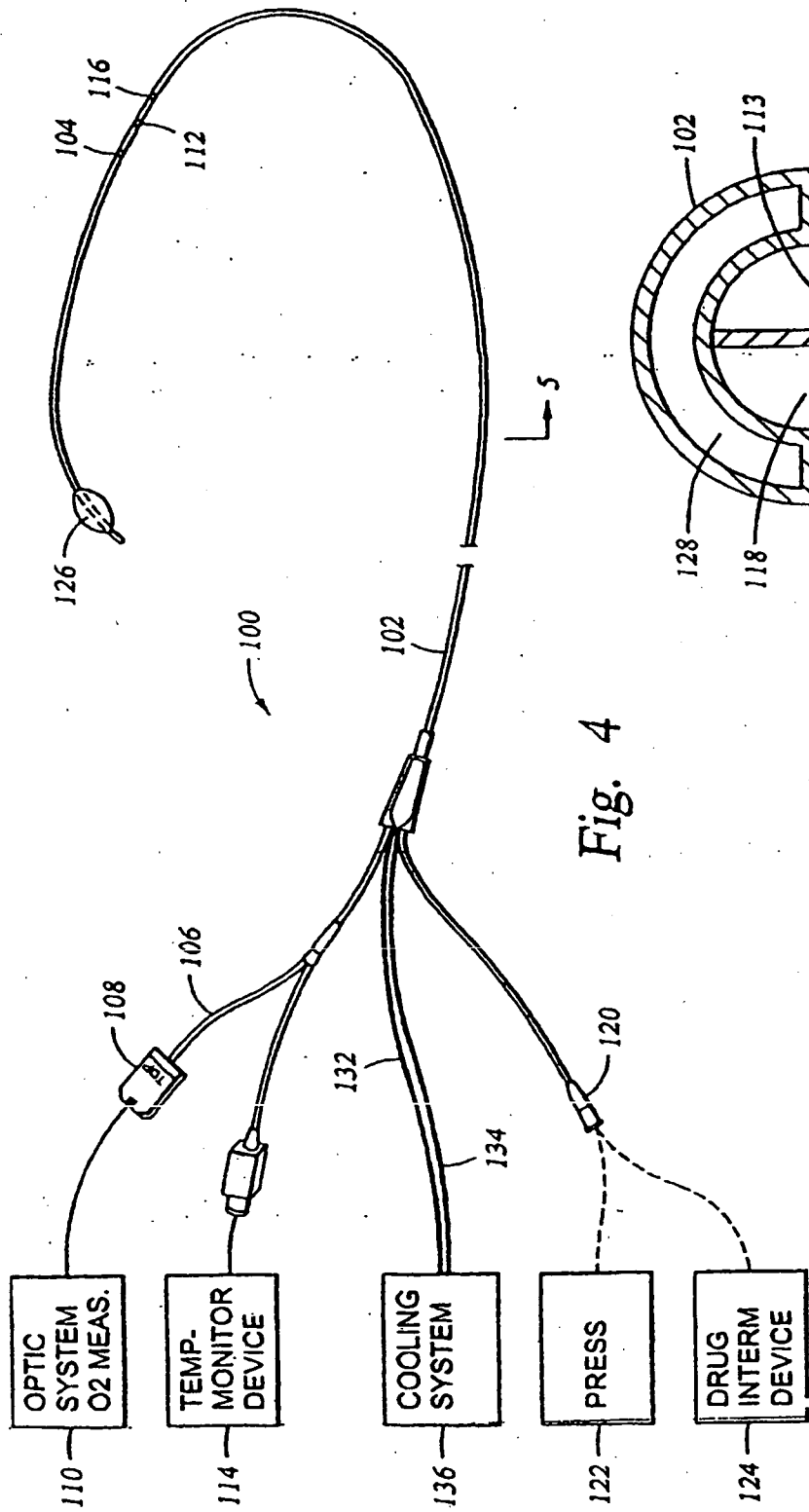


Fig. 4

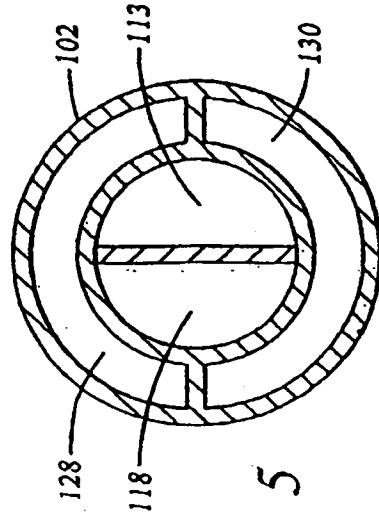


Fig. 5

REFERENCES CITED IN THE DESCRIPTION

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专利名称(译)	中心静脉导管具有热交换特性		
公开(公告)号	EP1915943B1	公开(公告)日	2012-10-24
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IPC分类号	A61B5/00 A61M25/00 A61F7/12 A61B17/00 A61B17/34 A61B18/00 A61F2/958 A61F7/10 A61M1/36 A61M5/44 A61M25/06 A61M25/14		
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优先权	09/376524 1999-08-18 US		
其他公开文献	EP1915943A1		
外部链接	Espacenet		

摘要(译)

用于中心静脉导管(54)的导引器护套(42)包括护套主体(56)和安装在主体(56)上的远端的温度传感器(80)。

