PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 :		(11) International Publication Number: WO 94/05353
A61M 5/00	A1	(43) International Publication Date: 17 March 1994 (17.03.94)

(21) International Application Number: PCT/US93/08339

(22) International Filing Date: 3 September 1993 (03.09.93)

(30) Priority data:
941,351 4 September 1992 (04.09.92) US

(71) Applicant: DEKNATEL TECHNOLOGY CORPORATION [US/US]; 300 Delaware Avenue, Wilmington, DE 19801 (US).

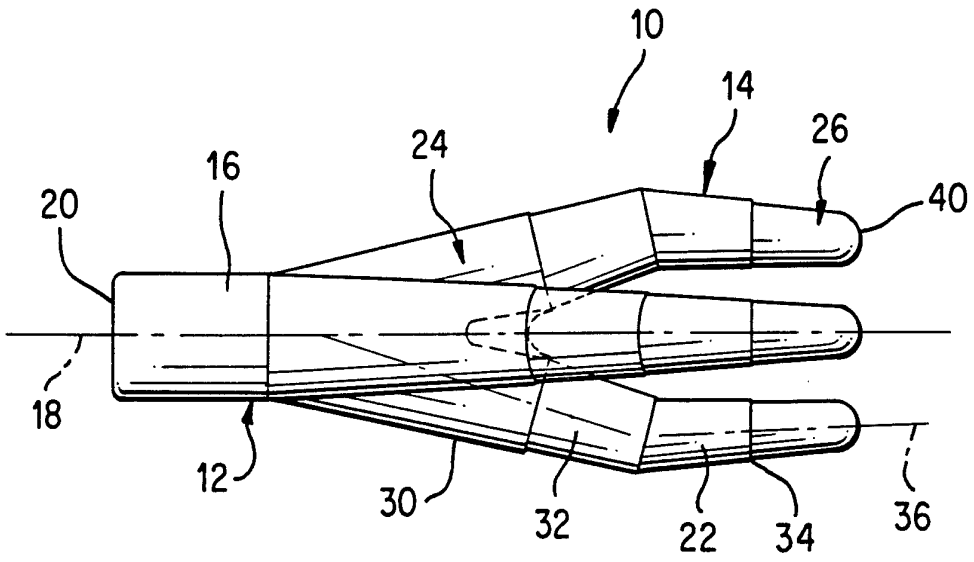
(72) Inventors: BROWN, Jennie, H. ; 10 Rhode Island Avenue, Providence, RI 02906 (US). VALERIO, Michael, A. ; 44 Ray Road, Wrentham, MA 02093 (US).

(74) Agents: HARBULAK, Stephen, J. et al.; Pennie & Edmonds, 1155 Avenue of the Americas, New York, NY 10036 (US).

(81) Designated States: AU, BB, BG, BR, BY, CA, CZ, FI, HU, JP, KR, KZ, LK, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SK, UA, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
With amended claims.

(54) Title: MEDICAL CONNECTOR



(57) Abstract

A device for connecting a plurality of drainage tubes to a single outlet tube. The device includes a main body portion (16) defining a main fluid passageway and a plurality of extended body portions (14) defining extended fluid passageways in fluid communication with the main fluid passageway. The main body portion has a central longitudinal axis. The extended body portions comprise a first section (30) having a longitudinal axis which diverges from the main longitudinal axis and a second section (34) having a longitudinal axis which is substantially parallel to the longitudinal axis. In operation, the outlet tube is inserted into an open end of the main body portion and the drainage tubes are inserted into the ends of the extended body portions. Fluid flows from the drainage tubes and the extended fluid passageways into the main fluid passageway and outlet tube attached thereto in a substantially parallel flow path.

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	**FR**	France	**MR**	Mauritania
AU	Australia	**GA**	Gabon	**MW**	Malawi
BB	Barbados	**GB**	United Kingdom	**NE**	Niger
BE	Belgium	**GN**	Guinea	**NL**	Netherlands
BF	Burkina Faso	**GR**	Greece	**NO**	Norway
BG	Bulgaria	**HU**	Hungary	**NZ**	New Zealand
BJ	Benin	**IE**	Ireland	**PL**	Poland
BR	Brazil	**IT**	Italy	**PT**	Portugal
BY	Belarus	**JP**	Japan	**RO**	Romania
CA	Canada	**KP**	Democratic People's Republic of Korea	**RU**	Russian Federation
CF	Central African Republic			**SD**	Sudan
CG	Congo	**KR**	Republic of Korea	**SE**	Sweden
CH	Switzerland	**KZ**	Kazakhstan	**SI**	Slovenia
CI	Côte d'Ivoire	**LI**	Liechtenstein	**SK**	Slovak Republic
CM	Cameroon	**LK**	Sri Lanka	**SN**	Senegal
CN	China	**LU**	Luxembourg	**TD**	Chad
CS	Czechoslovakia	**LV**	Latvia	**TG**	Togo
CZ	Czech Republic	**MC**	Monaco	**UA**	Ukraine
DE	Germany	**MG**	Madagascar	**US**	United States of America
DK	Denmark	**ML**	Mali	**UZ**	Uzbekistan
ES	Spain	**MN**	Mongolia	**VN**	Viet Nam
FI	Finland				

MEDICAL CONNECTOR

Field of the Invention

The invention generally relates to connectors and, in particular, to a medical connector for connecting a plurality of drainage tubes to a single outlet tube.

Background of the Invention

Medical connectors are used in a variety of applications to join a plurality of tubes to a single tube. These types of connectors are frequently utilized in intravenous (IV) systems, infusion systems, transfusion systems, drainage systems, and other environments where it is desirable to join tubes in this manner.

One particular application in which it is desirable to connect several tubes to a single tube is in orthopaedics. In drainage of orthopaedic wound sites, a plurality of tubes are commonly used to collect blood and other fluids from various locations around a wound site following orthopaedic surgery. The tubes are typically connected by a series of connectors to a single tube which drains into a collection device.

Y-shaped connectors are commonly used to connect two drainage tubes to a single outlet tube. When more than two drainage tubes are required at the wound site, a number of Y-shaped connectors are often used in combination to connect the various drainage tubes to the outlet tube. In these multiple tube configurations, the number of connections necessary to couple the drainage tube to the outlet tube increases the time needed by attending medical personnel to set up the device. Further, the number of Y-connections required makes the device set-up cumbersome. The multiplicity of connections also increases the risk of disconnection of tubes which could result in a medical

emergency. The invention is an improved medical connector which overcomes at least the limitations noted above.

Summary of the Invention

The present invention is directed to a device comprising a main body portion integrally connected with at least three branch portions. The main body portion defines a main fluid passageway therethrough, while the branch portions each define branch fluid passageways in fluid communication with the main fluid passageway.

The main body portion has a central longitudinal axis therethrough. Each branch portion comprises a first section having a longitudinal axis which diverges from the central axis of the main passageway and a second section having a longitudinal axis which is substantially parallel to the main axis. The second sections of the branch portions are symmetrically oriented about the main fluid passageway. Further, the second section of each branch passageway is coplanar with the main fluid passageway. The diameter of the branch passageways continuously decreases along the length thereof to facilitate connection with drainage tubes of varying diameter.

A device in accordance with the invention comprises a body portion defining a main passageway having a longitudinal axis to allow for passage of fluid therethrough. The device includes at least three extended body portions, wherein each extended body portion defines an extended passageway to allow for the passage of fluid through each of the extended body portions. Each extended body portion comprises a first section having a longitudinal axis which diverges from the longitudinal axis of the main passageway and a second section having a longitudinal axis which is parallel to the central longitudinal

axis of the main passageway. The extended passageways have a proximal end connected to the main fluid passageway and distal end opposite the proximal end. The passageways may have a first diameter at the proximal end and may decrease to a second diameter at the distal end. The distal ends of the passageways may include a removable seal.

Brief Description of the Drawings

The present invention is described in detail below with reference to the drawings wherein:

Figure 1 is a side view illustrating a connector in accordance with the present invention;

Figure 2 is an end view of the connector illustrated in Figure 1.

Detailed Description of the Invention

In the description which follows, any reference to either direction or orientation is intended primarily and solely for purposes of illustration and is not intended in any way as a limitation of the scope of the present invention. Also, the particular embodiments described herein, although being preferred, are not to be considered as limiting of the present invention. Furthermore, like parts or elements in the various drawings hereto are identified by like numerals for ease of reference.

The following is a connector 10 in accordance with the present invention, as illustrated in Figure 1. The connector 10 is preferably formed of a flexible plastic material and comprises a main body portion 12 and a plurality of extended body portions, generally designated 14. The main body portion 12 of the connector 10 defines a main fluid passageway 16 therethrough having a central longitudinal axis 18. The connector 10 includes an open end 20 adjacent the main body portion 12 into which a single outlet tube (not shown) is inserted, such that the outlet tube is

in fluid communication with the main fluid passageway 16.

The extended body or branch portions 14 of the connector 10 define extended or branch fluid passageways 22 through the connector 10 which are in fluid communication with the main passageway 16. The extended body portions 14 include an open proximal end 24 which is connected to the main fluid passageway 16 and a distal end 26, opposite the proximal end 24, into which a plurality of drainage tubes (not shown) may be inserted so as to be in fluid communication with the extended fluid passageways 22 therethrough.

Each extended fluid passageway 22 comprises a first section 30 having a longitudinal axis 32 which diverges from the central longitudinal axis 18 of the main fluid passageway 16 and a second sections 34 having a longitudinal axis 36 which is substantially parallel to the central longitudinal axis 18 of the main passageway 16. Preferably, the longitudinal axes 32 of the first sections 30 of the extended passageways 22 diverge from the longitudinal axis 18 of the main passageway 16 at an angle of approximately 10°.

The second sections 34 of the extended portions 14 of the connector 10 are oriented symmetrically about the central axis 18 of the main passageway 16. Further, the second sections 34 of each extended portion 14 is coplanar with the main body portion 12. Preferably, the connector 10 includes four extended portions 14 having second sections 34 which are oriented symmetrically in a rhomboidal configuration about the central axis 18 of the main passageway 16.

As shown in Figure 1 and Figure 2, the diameter of the extended fluid passageways 22 continuously varies along the length of the passageways from the proximal end 24 to the distal end 26. Preferably, the diameter of the extended fluid passageways 22

gradually decreases from a first diameter of approximately .25 inches at the proximal end 24 to a second diameter of approximately .09375 inches at the distal end 26. In this manner, the extended fluid passageways 22 are able to accommodate the insertion of drainage tubes of various diameters along the length thereof. Additionally, markings are provided at predetermined intervals on the exterior surface along the length of the extended fluid passageways 22 to indicate the connection points for standard size tubes. Preferably the markings are provided at three locations on the extended fluid passageways 22 to indicate connection points for 1/8", 3/16", and 1/4" tubing, however, those skilled in the art will recognize that markings could be provided at other locations on the passageways as desired. The distal ends 26 of the extended fluid passageways 22 are formed with rounded tips 40 which are removed on an as needed basis when tubes are connected thereto.

Referring again to Figure 1, in use in an orthopaedic wound drainage system, the outlet tube is first connected to the main body portion 12 by inserting the outlet tube into the open end 20 of the connector 10. Next, for each drainage tube provided at a wound site, an extended body portion 14 is selected and cut to the appropriate size diameter as indicated by the markings on the external surface thereof. The drainage tube(s) is then inserted into the opening in the distal ends 26 of the extended portions 14 of the connector 10. The distal ends 26 of the unused extended body portions 14 of the connector 10 remain covered by the sealed tips 40 to prevent dust, dirt, or other contaminants from entering the connector and becoming mixed with the fluid carried therein.

Blood and fluid may be drained from the wound site using well-known suction or gravity drainage

techniques. Blood and fluid draining from the wound site through the drainage tubes enters the second sections 34 of the extended fluid passageways 22. The fluid from the drainage tubes then flows into the first sections 30 of the extended passageways 22, emptying into the main passageway 16. From the main passageway 16, the fluid flows into the outlet tube attached thereto for removal into an associated collection device. The substantially parallel orientation of the extended fluid passageways 22 relative to the main passageway 16 provides a substantially parallel flow path from the drainage tubes through the connector 10 into the outlet tube. In this manner, undesirable partial pressures which can result from sharp angles in the flow path are minimized. Further, the symmetric orientation of the extended body portions 14 relative to the main body portion 12 localizes the connections and minimizes the space requirements of the connector system.

Variations of the above-described connector 10 which involve minor changes are clearly contemplated to be within the scope of the present invention. In addition, minor variations in the design, angles or materials of the various components of the connector 10 are also contemplated to be within the scope of the present invention. These modifications and variations may be made without departing from the spirit and scope of the present invention, as will become apparent to those skilled in the art. The specific embodiments described herein are offered by way of example only, and the invention is limited only by the terms of the appended claims.

WHAT IS CLAIMED IS:

1. Device for connecting a plurality of drainage tubes to a single outlet tube comprising:

A. body portion defining a main passageway having a longitudinal axis to allow for passage of fluid therethrough; and

B. at least three extended body portions, wherein each extended body portion defines an extended passageway in fluid communication with said main passageway to allow for passage of fluid through each of said extended body portions.

2. Device defined in Claim 1, wherein each of said extended body portions comprises a first section having a first longitudinal axis which diverges from said longitudinal axis of said main fluid passageway and a second section having a second longitudinal axis which is parallel to said central longitudinal axis of said main fluid passageway.

3. Device defined in Claim 2, wherein said extended passageways have a proximal end connected to said main fluid passageway and a distal end opposite said proximal end, said extended passageways having a first diameter at said proximal end and decreasing in diameter to a second diameter at said distal end.

4. Device defined in Claim 3, wherein said distal ends of said extended passageways include a removable seal.

5. A coupling device for coupling four drainage tubes to a single outlet tube comprising:

a main passageway for connection with said outlet tube, said main passageway oriented about a central longitudinal axis; and

four branch passageways, each of said branch passageways having a first section for connection with a respective one of said four drainage tubes, wherein each of said first sections is

oriented about a central longitudinal axis, each of said branch passageways further including a second section in fluid communication with said main passageway, wherein said central longitudinal axes of said first sections of said four passageways are parallel to and symmetrical about said central axis of said main passageway.

6. The coupling device defined in Claim 5, wherein each of said branch passageways has a proximal end in communication with said main passageway and a distal end opposite said proximal end, each of said branch passageways having a first diameter at said proximal end and a second diameter and said distal end, wherein said second diameter is less than said first diameter, and wherein the diameter of each of said branch passageways decreases gradually from said first diameter to said second diameter.

7. The coupling device defined in Claim 5, wherein each distal end includes a seal which is removed prior to the attachment of one of said drainage tubes thereto.

8. The coupling device defined in Claim 6, wherein said branch passageways are marked at predetermined locations to indicate connection points for standard tubing sizes.

AMENDED CLAIMS

[received by the International Bureau on 31 January 1994 (31.01.94); original claims 1-8 replaced by amended claims 1-8 (2 pages)]

1. Device for connecting a plurality of drainage tubes to a single outlet tube comprising:

A. body portion defining a main passageway having a central longitudinal axis to allow for passage of fluid therethrough; and

B. at least three extended body portions extending from said main passageway and being disposed generally symmetrically about the central axis, each of said extended body portions comprising an extended passageway in fluid communication with said main passageway to allow for passage of fluid through each of said extended body portions, and wherein the ends of said extended body portions are sealingly closed.

2. Device defined in claim 1, wherein each of said extended body portions comprises a first section having a first longitudinal axis which diverges from said longitudinal axis of said main fluid passageway and a second section having a second longitudinal axis which is parallel to said central longitudinal axis of said main fluid passageway.

3. Device defined in claim 2, wherein said extended passageways have a proximal end connected to said main fluid passageway and a distal end opposite said proximal end, said extended passageways having a first diameter at said proximal end and decreasing in diameter to a second diameter at said distal end.

4. Device defined in claim 3, wherein each of said distal ends of said extended passageways are sealing closed which is removed prior to the attachment of one of said drainage tubes thereto.

5. Coupling device for coupling four drainage tubes to a single outlet tube comprising:

a main passageway for connection with said outlet tube, said main passageway defining a central longitudinal axis; and

four branch passageways extending from said main passageway and being disposed generally symmetrically about the central axis, each of said branch passageways having a first section for connection with a respective one of said four drainage tubes, wherein each of said first sections is oriented about a branchway central longitudinal axis, each of said branch passageways further including a second section in fluid communication with said main passageway, wherein said branchway central longitudinal axes of said first sections of said four passageways are generally parallel to and symmetrical about said central axis of said main passageway, and wherein the ends of said first sections are sealingly closed.

6. Coupling device defined in claim 5, wherein each of said branch passageways has a proximal end in communication with said main passageway and a distal end opposite said proximal end, each of said branch passageways having a first diameter at said proximal end and a second diameter and said distal end, wherein said second diameter is less than said first diameter, and wherein the diameter of each of said branch passageways decreases gradually from said first diameter to said second diameter.

7. Coupling device defined in claim 5, wherein each distal end are sealing closed which is removed prior to the attachment of one of said drainage tubes thereto.

8. Coupling device defined in claim 6, wherein said branch passageways are marked at predetermined locations to indicate connection points for standard tubing sizes.

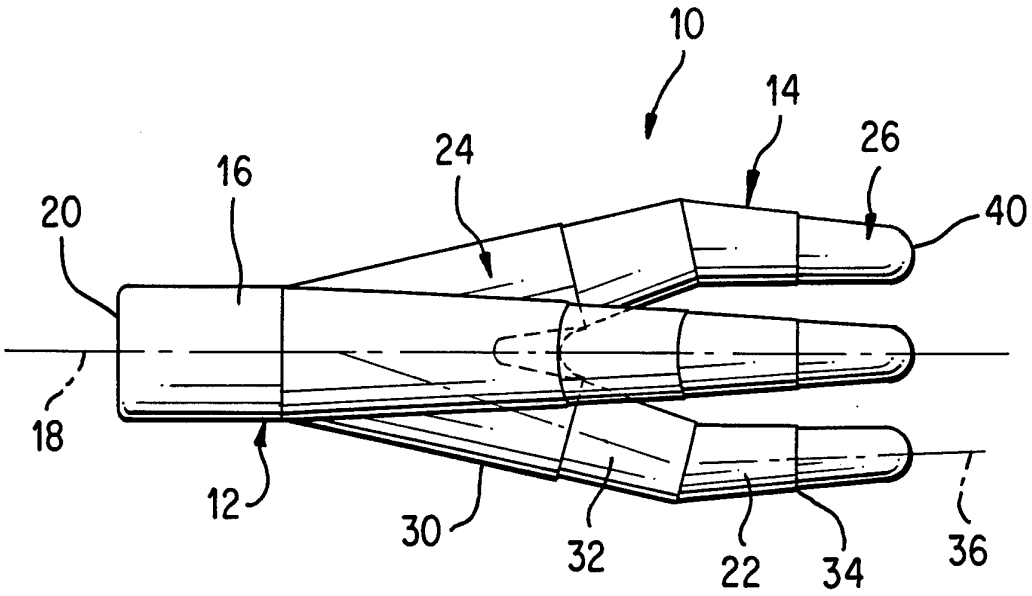


FIG. 1

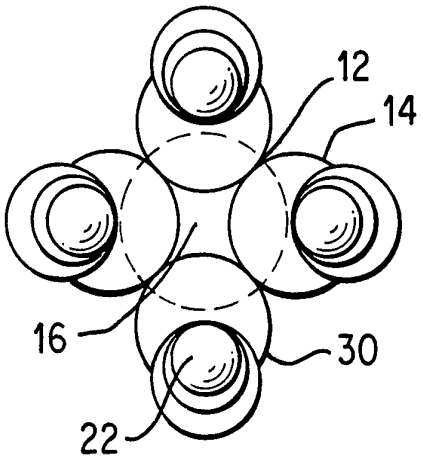


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US93/08339

A. CLASSIFICATION OF SUBJECT MATTER

IPC(5) :A61M 5/00
US CL :604/8

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. : 604/8,43, 280, 283, 284 D24/129

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)

none

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X,P --- Y	US, A, 5,163,902 (Lynn et al.) 17 November 1992 See entire referrence	1-8
A	US, A, 3,902,492 (Greenhalgh) 2 September 1975 See entire reference	1-8
A	US, A, 4,950,255 (Brown et al.) 21 August 1990 See entire reference	1-8
A	US, A, 3,981,299 (Murray) 21 September 1976 See entire reference	1-8

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

*	Special categories of cited documents:	"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
"A"	document defining the general state of the art which is not considered to be part of particular relevance	"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
"E"	earlier document published on or after the international filing date	"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
"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)	"&"	document member of the same patent family
"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		

Date of the actual completion of the international search 15 OCTOBER 1993	Date of mailing of the international search report 03 DEC 1993
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. NOT APPLICABLE	Authorized officer SAM RIMELL Telephone No. (703) 308-2677

Form PCT/ISA/210 (second sheet)(July 1992)*