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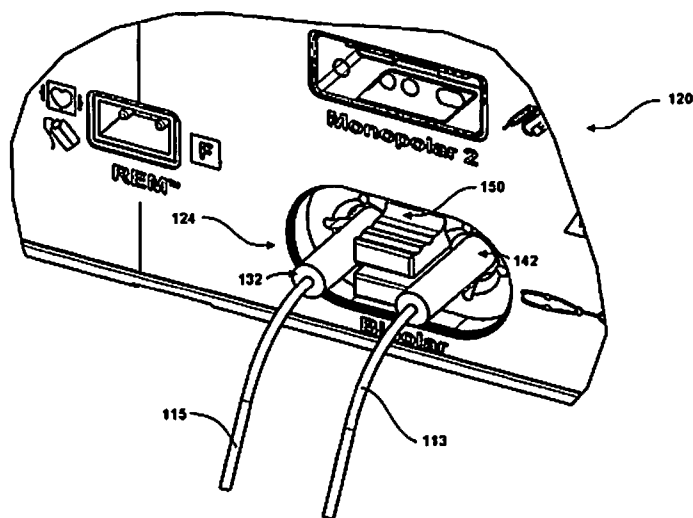


Fig. 2A

(57) Abstract: An adapter serves to secure electrical connections between an instrument and an electrosurgical generator. The adapter includes a base portion that is configured to be inserted into and retained by a receptacle formed on an electrosurgical generator. At least two openings are formed in the base portion to facilitate the passage of at least two electrical leads through the base portion. The adapter also includes a gripping portion extending away from the base portion to facilitate insertion of the adapter into the receptacle.

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ELECTRICAL CONNECTOR ADAPTER

CROSS-REFERENCE TO RELATED APPLICATION

[0001] The present application claims the benefit of and priority to U.S. Provisional Application Serial No. 60/912,295, filed April 17, 2007, the entire content of which is hereby incorporated by reference.

BACKGROUND

1. **Technical Field**

[0002] The present disclosure relates to electrical connectors, and more particularly concerns an adapter permitting the passage of flying leads commonly provided with bipolar electro-surgical instruments for connection to an electro-surgical generator.

2. **Background of Related Art**

[0003] Electro-surgery is an indispensable method of dissecting, coagulating or otherwise manipulating biological tissue in many branches of medicine. Typically, a high frequency electrical current (usually in the radiofrequency or microwave ranges) is generated in an electro-surgical unit (ESU) and passed through a cable to a tool adapted for applying the current to the tissue. Most electro-surgical activities fall into one of two categories; monopolar and bipolar. In the case of monopolar electro-surgery, a single electrode is active and used as a working tool while a second passive return electrode is usually placed on an exterior surface of the surgical subject in a location remote from the surgical site. Bipolar electro-surgery, on the

other hand, involves a pair of active electrodes used in combination as a working tool. A supply electrode usually contacts the tissue to be treated while a return electrode is placed in contact with or in close proximity to the supply electrode such that an electrical circuit is formed between the two.

[0004] A bipolar instrument typically includes a signal supply wire to deliver an electrosurgical current to the supply electrode and a current return wire to deliver the current from the return electrode back to the electrosurgical generator. It is often convenient to include both wires on a single electrosurgical cable terminating in a dual banana plug. To facilitate connection to an electrosurgical generator, a dual banana plug generally includes an insulative housing. The housing maintains a proper spacing between two male banana plugs corresponding to the spacing of the female jacks provided on the electrosurgical generator. Additionally, the housing provides structural support to the connector making accidental disconnection less likely, and may perform other functions as well.

[0005] Some bipolar instruments are provided with two individual wires each terminating with a male banana plug. Other times an electrosurgical cable will split into two "flying leads" near the end such that the two male banana plugs may be positioned independently. Neither of these configurations provides the benefit of the housing of a dual banana plug.

SUMMARY

[0006] In light of the foregoing, a need exists for an adapter capable of serving at least some of the functions of a housing for use with instruments provided with individual leads. An adapter is disclosed, which serves to secure electrical connections between an instrument and an electrosurgical generator. The adapter includes a base portion that is configured to be inserted

into and retained by a receptacle formed on an electrosurgical generator. At least two openings are formed in the base portion to facilitate the passage of at least two electrical leads through the base portion. The adapter also includes a gripping portion extending away from the base portion to facilitate insertion of the adapter into the receptacle.

[0007] The adapter may include a base portion having a bearing surface adapted to maintain frictional contact with a corresponding surface of the receptacle. The gripping portion may include a pair of opposing tabs separated by a slot defined therebetween, the tabs being approximated to deform the adapter to facilitate insertion of the adapter into the receptacle. The at least two openings formed in the base portion may include stress relief notches.

[0008] The slot defined between the pair of opposing tabs may extend between and connect the at least two openings formed in the base portion. Alternatively, the slot may extend between one of the at least two openings and the bearing surface such that the one of the at least two openings deforms upon approximation of the opposing tabs. Also, the slot may extend between two distinct locations on the bearing surface such that the bearing surface deforms upon approximation of the opposing tabs.

[0009] The at least two openings may include a taper extending from a proximal face of the base portion to facilitate passage of the electrical leads therethrough. The at least two openings may also be adapted to permit uninhibited passage of the electrical leads through the base portion, or alternatively the at least two openings may be dimensioned to maintain frictional contact with the electrical leads.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the present disclosure and, together with the detailed description of the embodiments given below, serve to explain the principles of the disclosure.

[0011] FIG. 1A is a partial perspective view of a dual banana plug inserted into the bipolar connection receptacle of an electrosurgical generator;

[0012] FIG. 1B is a view similar to FIG. 1A depicting an unplugged dual connector plug;

[0013] FIG. 2A is a partial perspective view of an illustrative embodiment of the disclosure depicting an adapter used to facilitate the connection of a pair of banana plugs to an electrosurgical generator;

[0014] FIG. 2B is a view similar to FIG 2A depicting the components in an unplugged arrangement;

[0015] FIG. 3A is an oblique cross sectional view of the components depicted in FIG. 2A in an unplugged arrangement;

[0016] FIG. 3B is a view similar to FIG. 3A depicting the components in a plugged arrangement.

[0017] FIG. 4A is a perspective view of an alternate illustrative embodiment of an adapter for use with the present disclosure; and

[0018] FIG. 4B is a view similar to FIG. 4A depicting an additional alternate illustrative embodiment of an adapter.

DETAILED DESCRIPTION

[0019] The attached figures illustrate exemplary embodiments of the present disclosure and are referenced to describe the embodiments depicted therein. Hereinafter, the disclosure will be described in detail by explaining the figures wherein like reference numerals represent like parts throughout the several views.

[0020] Referring initially to FIG. 1A, a dual banana plug 10 is shown connected to an electrosurgical generator 20. The generator depicted is the ForceTriad™ energy platform available from Valleylab, Inc. of Boulder, Colorado and includes both a monopolar receptacle 22 and a bipolar receptacle 24 for interfacing with instruments of each type. The dual banana plug 10 terminates both signal supply wire 13 and current return wire 15 and allows for the electrical and mechanical mating of each wire with the generator 20. The dual banana plug 10 is the type commonly provided with a bipolar electrosurgical instrument (not shown).

[0021] Figure 1B depicts the components of FIG 1A in an unplugged arrangement revealing additional features. Two male banana plugs 18, 19 protrude from non-conductive housing 16 which correspond to jacks 28, 29 in the bipolar receptacle 24. The jacks 28, 29 are in electrical communication with circuitry within the generator 20 adapted for providing the necessary power for bipolar electrosurgical procedures. Micro-switches 26, 27 are each associated with one of the jacks 28, 29 and are connected to control circuitry within the generator configured to acknowledge the presence of an electrical connector at the jack. Micro-switches are pushbutton type switches normally biased to an extended position causing them to protrude from the back face 25 bipolar receptacle 24. When dual banana plug 10 is connected, the nonconductive housing 16 depresses both micro-switches 26, 27 so they are flush with back face

25 and the necessary electrical contacts are made so that the control circuitry may recognize that the micro-switches have been depressed. The control circuitry may be configured, for example, to allow the generator to provide the electrosurgical energy only when both micro-switches have been depressed.

[0022] Referring now to FIG. 2A, an embodiment of the present disclosure includes adapter 150 which facilitates the connection of standard connectors 132, 142 to the bipolar receptacle 124 of electrosurgical generator 120. Standard connectors 132, 142 are depicted as terminating flying lead style signal supply wire 113 and current return wire 115 respectively.

[0023] As can be seen in FIG. 2B, each standard connector 132, 142 includes an electrically conductive male banana plug 133, 143 protruding from an insulated shaft 131, 141. The male plugs 133, 143 are in electrical communication with electrodes on a bipolar electrosurgical instrument (not shown). Inserting the male plugs into the jacks 128, 129 brings these electrodes into electrical communication with the electrosurgical generator 120 since jacks 128, 129 each include a conductive sleeve in communication with the circuitry of the generator 120. Barrel springs 135, 145 may be provided on the plugs 133, 143 to help maintain contact with the conductive sleeves of jacks 128, 129. However, bipolar instruments may be provided having no such spring on the connectors, and often these springs alone provide an insufficient force allowing the connectors to be accidentally unplugged. Micro-switches 126, 127 aggravate the problem because of their bias to protrude from back face 125.

[0024] Accordingly, adapter 150 may be provided to counteract the force the micro-switches impart on the connectors 132, 142. Adapter 150 includes a base portion having a bearing surface 154 which provides a light-press fit with corresponding surface 121 on the

bipolar receptacle 124. As used herein, the term light-press fit means a slight frictional contact between two parts such that neither part has a tendency to move relative to the other unless acted upon by a force such as a force of a magnitude that might be applied by two fingers of an operator. The adapter 150 may be inserted into the bipolar receptacle until a distal face opposite proximal face 153 contacts the back face of the bipolar receptacle 124. This arrangement allows for the frictional force associated with the bearing surface 154 to hold the adapter 150 in place against the urging of micro-switches 126, 127.

[0025] A pair of opposed finger tabs 151 are provided for handling the adapter 150 between two fingers. Slot 157 is provided between the finger tabs 151 allowing the adapter 150 to be elastically deformed to facilitate insertion into the bipolar receptacle 124. Finger grips 152 prevent slipping as the finger tabs 151 are squeezed to pivot together. Stress relief notches 156 are also provided around connector receiving through bores 155 to allow for flexibility of the adapter 150.

[0026] A pair of openings such as through bores 155 are formed through the base portion of adapter 150 to allow connectors 132, 142 to access jacks 128, 129 and include a taper extending from proximal face 153 to facilitate the passage of connectors 132, 142 therethrough. Through bores 155 are sized to allow an uninhibited passage of male plugs 133, 143. Although not necessarily preferred, through bores 155 may also be sized to create a light-press fit with the insulated shafts 131, 141. Because the adapter 150 preferably is able to accommodate standard connectors of slightly differing sizes, slightly oversized through bores are preferred.

[0027] Referring now to FIG. 3A, the use of adapter 150 will be further described. First the adapter 150 is inserted into bipolar receptacle 124 until the distal face 159 contacts both

micro-switches 126, 127. Further insertion of adapter 150 depresses the micro-switches at least until the control circuitry within the generator 120 is able to acknowledge the presence of the adapter 150. Adapter may be inserted fully such that the distal face 159 is flush with back face 125 and the light-press fit arrangement keeps micro-switches 126, 127 depressed as seen in FIG. 3B. Connectors 132, 142 may then be inserted in the usual fashion such that the male plugs 133, 143 come into electrical contact with the sleeves of jacks 128, 129. Because the adapter 150 alone provides enough force to depress the micro-switches 126, 127, any bipolar instrument may be used with generator 120 even if the instrument is provided with flying leads terminating in male plugs which would otherwise be unable to adequately engage the micro-switches.

[0028] Finally, referring to FIG. 4A and FIG. 4B, alternate embodiments of an adapter for use with the present disclosure are discussed. Adapter 250 includes base portion 258, gripping portion 251 and opening 255. Adapter 350 includes base portion 358, gripping portion 351 and opening 355. The base portion 258, 358 of each may be compressed by the gripping portion 251, 351 to facilitate insertion into a receptacle and formation of a friction fit therewith. Openings 255, 355 then permit passage of an electrical lead.

[0029] Although the foregoing disclosure has been described in some detail by way of illustration and example, for purposes of clarity or understanding, it will be obvious that certain changes and modifications may be practiced within the scope of the appended claims.

WHAT IS CLAIMED IS:

1. An adapter for securing electrical connections between an instrument and an electrosurgical generator, which comprises:
 - a base portion configured to be inserted into and retained by a receptacle formed on an electrosurgical generator, wherein the base portion includes at least two openings formed therein to facilitate the passage therethrough of at least two electrical leads; and
 - a gripping portion extending away from the base portion to facilitate insertion of the adapter into a receptacle.
2. The adapter according to claim 1, wherein the base portion includes a bearing surface adapted to maintain frictional contact with a corresponding surface of the receptacle.
3. The adapter according to claim 2, wherein the gripping portion includes a pair of opposing tabs separated by a slot defined therebetween, the tabs being approximatable to deform the adapter to facilitate insertion of the adapter into the receptacle.
4. The adapter according to claim 3, wherein the at least two openings formed in the base portion include stress relief notches.
5. The adapter according to claim 2, wherein the slot extends between and connects the at least two openings.
6. The adapter according to claim 3, wherein the slot extends between one of the at least two openings and the bearing surface such that the one of the at least two openings deforms upon approximation of the opposing tabs.

7. The adapter according to claim 3, wherein the slot extends between two distinct locations on the bearing surface such that the bearing surface deforms upon approximation of the opposing tabs.
8. The adapter according to claim 1, wherein the at least two openings include a taper extending from a proximal face of the base portion to facilitate passage of the electrical leads therethrough.
9. The adapter according to claim 1, wherein the at least two openings are adapted to permit uninhibited passage of the electrical leads through the base portion.
10. The adapter according to claim 1, wherein the at least two openings are dimensioned to maintain frictional contact with the electrical leads.

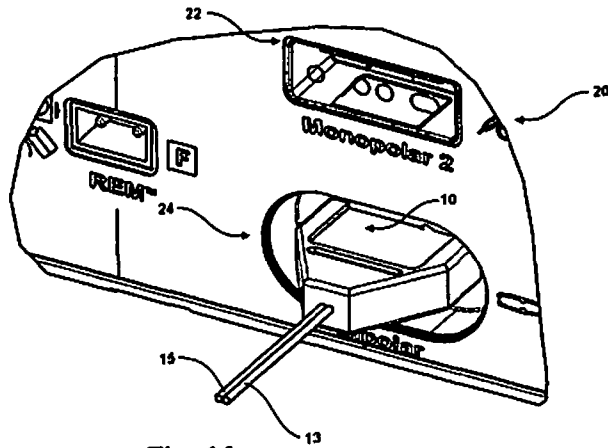


Fig. 1A

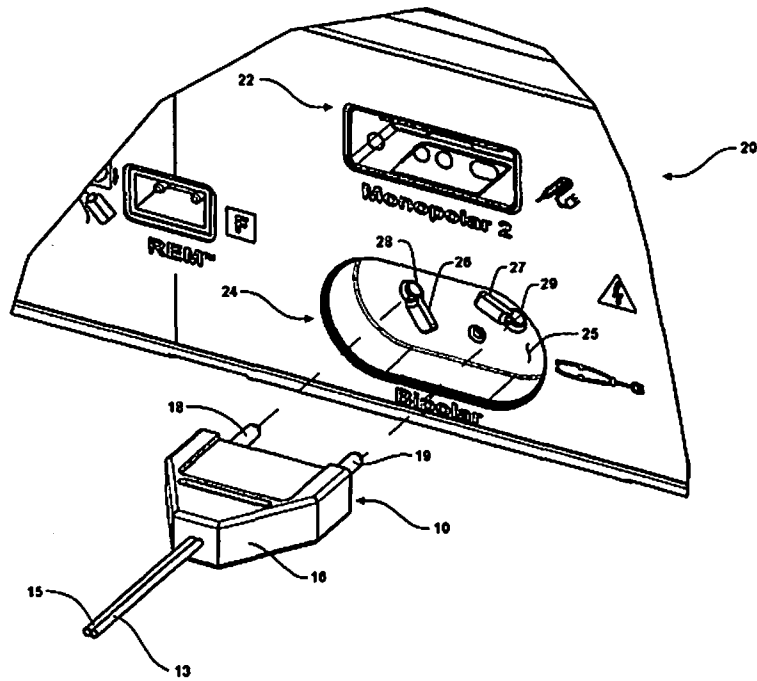


Fig. 1B

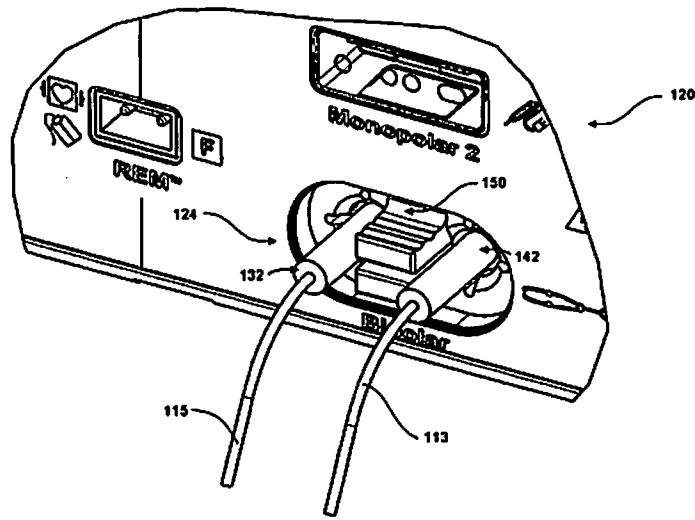


Fig. 2A

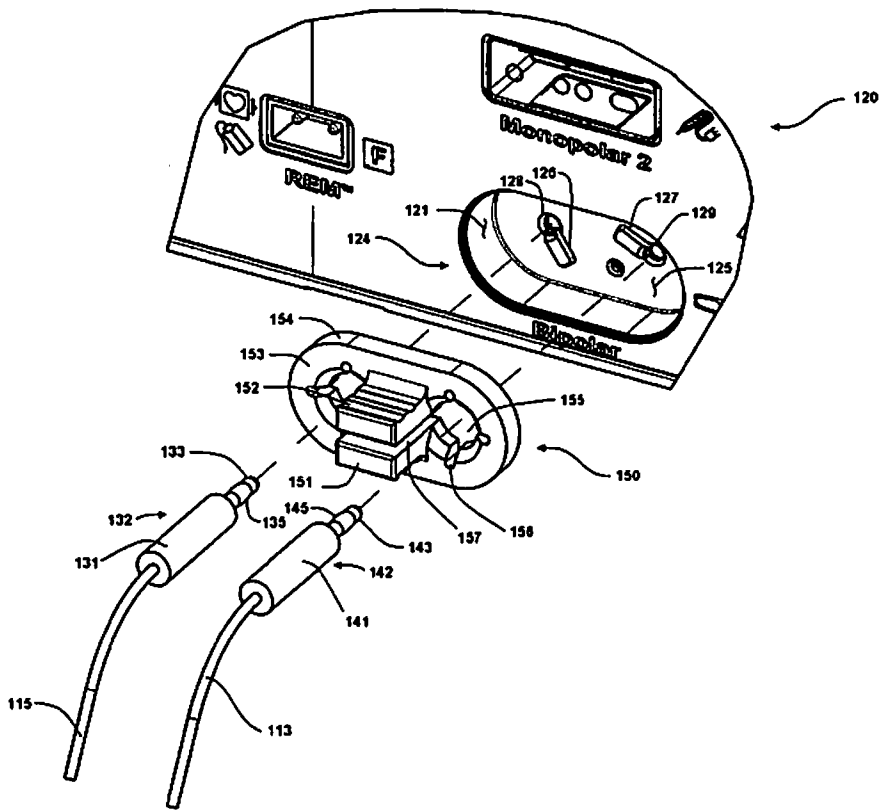


Fig. 2B

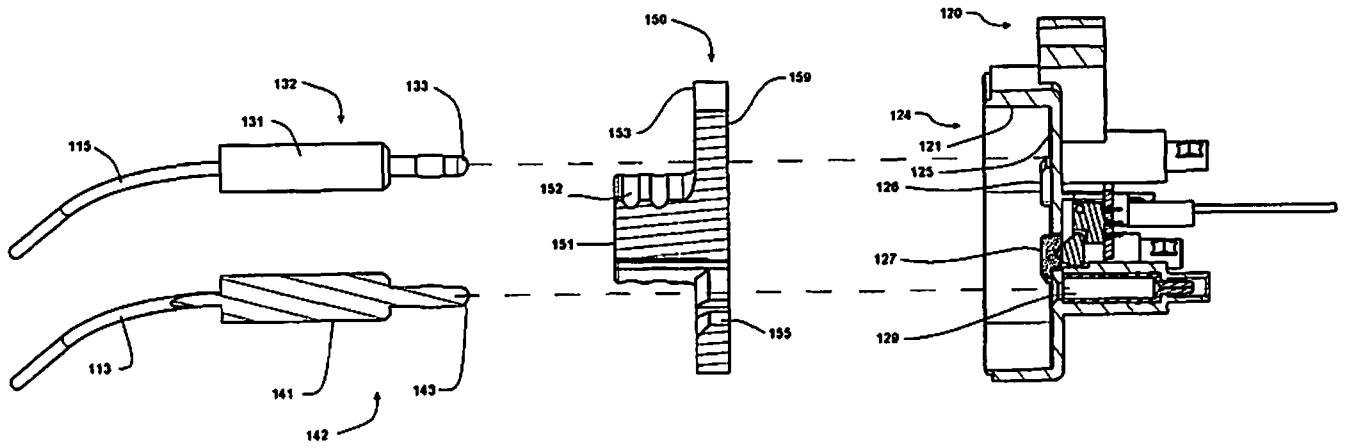


Fig. 3A

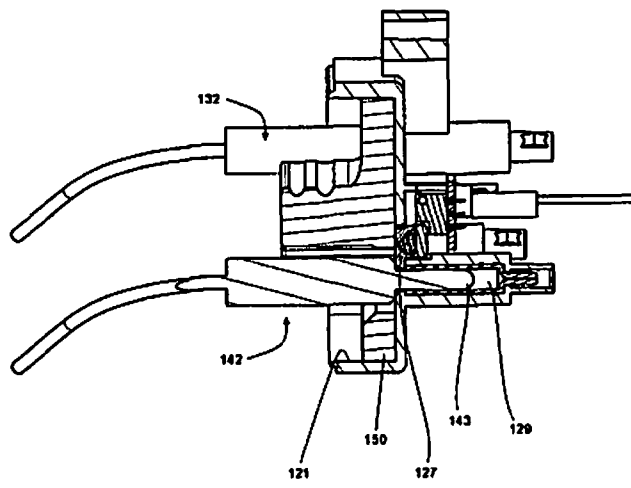


Fig. 3B

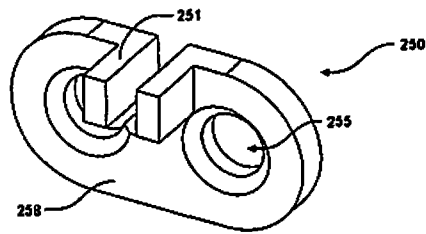


Fig. 4A

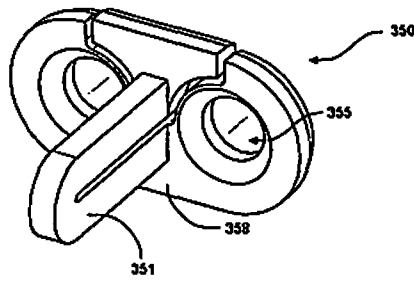


Fig. 4B

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/058929

<p>A. CLASSIFICATION OF SUBJECT MATTER INV. A61B18/14 H01R13/00</p>		
<p>According to International Patent Classification (IPC) or to both national classification and IPC</p>		
<p>B. FIELDS SEARCHED</p>		
<p>Minimum documentation searched (classification system followed by classification symbols) A61B H01R</p>		
<p>Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched</p>		
<p>Electronic data base consulted during the international search (name of data base and, where practical, search terms used) EPO-Internal</p>		
<p>C. DOCUMENTS CONSIDERED TO BE RELEVANT</p>		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/013350 A1 (D ADDARIO JAMES [US]) 16 January 2003 (2003-01-16) figures 1,2	1,2,8-10
X	US 2004/182972 A1 (BAKOS GREGORY J [US] ET AL) 23 September 2004 (2004-09-23) figures 1-6	1,2,9,10
X	US 2004/236323 A1 (SCHOENMAN ARTHUR [US] ET AL) 25 November 2004 (2004-11-25) figures 1,7-13	1,2,9
X	US 6 338 657 B1 (HARPER RICHARD M [US] ET AL) 15 January 2002 (2002-01-15) figures 1-6	1,2,10
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<p><input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.</p>		
<p>* Special categories of cited documents :</p>		
<p>*A* document defining the general state of the art which is not considered to be of particular relevance</p>		<p>*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p>
<p>*E* earlier document but published on or after the international filing date</p>		<p>*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</p>
<p>*L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p>		<p>*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p>
<p>*O* document referring to an oral disclosure, use, exhibition or other means</p>		<p>* & * document member of the same patent family</p>
<p>*P* document published prior to the international filing date but later than the priority date claimed</p>		
<p>Date of the actual completion of the international search 1 August 2008</p>		<p>Date of mailing of the international search report 07/08/2008</p>
<p>Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016</p>		<p>Authorized officer Cornelissen, P</p>

INTERNATIONAL SEARCH REPORT

International application No
PCT/US2008/058929

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

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