PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: R. JOSEPH TROJAN
9250 WILSHIRE BLVD., STE. 325
BEVERLY HILLS, CA 90212

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Date of mailing *(day/month/year)*	
Applicant's or agent's file reference 16017768PCT	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US 16/61443	International filing date *(day/month/year)* 10 November 2016 (10.11.2016)
Applicant WOODHAM BIOTECHNOLOGY HOLDINGS, LLC	

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70

   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. ☐ **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

   ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.

   ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

   The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

   Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

   Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

   Within **19 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Lee W. Young Telephone No. PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To: R. JOSEPH TROJAN
9250 WILSHIRE BLVD., STE. 325
BEVERLY HILLS, CA 90212

PCT

NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL SEARCH REPORT AND THE WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

	Date of mailing *(day/month/year)* 02 FEB 2017
Applicant's or agent's file reference 16017768PCT	**FOR FURTHER ACTION** See paragraphs 1 and 4 below
International application No. PCT/US 16/61443	International filing date *(day/month/year)* 10 November 2016 (10.11.2016)
Applicant WOODHAM BIOTECHNOLOGY HOLDINGS, LLC	

1. [X] The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.
   Filing of amendments and statement under Article 19:
   The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):
   When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.
   How? Directly to the International Bureau of WIPO preferably through ePCT or on paper to, 34 chemin des Colombettes 1211 Geneva 20, Switzerland, Facsimile No.: +41 22 338 82 70
   For more detailed instructions, see *PCT Applicant's Guide*, International Phase, paragraphs 9.004 – 9.011.

2. [ ] The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.

3. [ ] **With regard to any protest** against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:
   [ ] the protest together with the decision thereon has been transmitted to the International Bureau together with any request to forward the texts of both the protest and the decision thereon to the designated Offices.
   [ ] no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

The applicant may **submit comments on an informal basis on the written opinion of the International Searching Authority** to the International Bureau. These comments will be made available to the public after international publication. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established.

Shortly after the expiration of **18 months from the priority date, the international application will be published** by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau before the completion of the technical preparations for international publication (Rules 90*bis*.1 and 90*bis*.3).

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase **until 30 months** from the priority date (in some Offices even later); otherwise, the applicant must, **within 20 months** from the priority date, perform the prescribed acts for **entry into the national phase** before those designated Offices. In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months. For details about the applicable time limits, Office by Office, see www.wipo.int/pct/en/texts/time_limits.html and the *PCT Applicant's Guide*, National Chapters.

Within **19 months from the priority date, the applicant may request that a supplementary international search be carried out** by a different International Searching Authority that offers this service (Rule 45*bis*.1). The procedure for requesting supplementary international search is described in the *PCT Applicant's Guide*, International Phase, paragraphs 8.006-8.032.

Name and mailing address of the ISA/ Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	Authorized officer Lee W. Young Telephone No. PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

Form PCT/ISA/220 (July 2014)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 16017768PCT	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. PCT/US 16/61443	International filing date *(day/month/year)* 10 November 2016 (10.11.2016)	(Earliest) Priority Date *(day/month/year)* 10 November 2015 (10.11.2015)
Applicant WOODHAM BIOTECHNOLOGY HOLDINGS, LLC		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☐ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of:
      ☒ the international application in the language in which it was filed.
      ☐ a translation of the international application into ________________ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (see Box No. II).
3. ☐ **Unity of invention is lacking** (see Box No. III).
4. With regard to the **title**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract**,
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the **drawings**,
   a. the figure of the **drawings** to be published with the abstract is Figure No. 3
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US 16/61443

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - C07K 1/26, G01N 27/26, G01N 27/447, G01N 33/68, H01L 33/42 (2016.01)

CPC - C07K 1/26, G01N 27/26, G01N 27/447, G01N 27/44739, G01N 33/68, H01L 33/42, H01L 51/5215

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)
IPC(8)- C07K 1/26, G01N 27/26, G01N 27/447, G01N 33/68, H01L 33/42 (2016.01);
CPC- C07K 1/26, G01N 27/26, G01N 27/447, G01N 27/44739, G01N 33/68, H01L 33/42, H01L 51/5215

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
USPC- 204/450-474, 204/546-553, 204/614, 257/59, 257/72, 257/253, 257/51.027, 436/15, 436/178, 436/517;
Patents and NPL (classification, keyword; search terms below)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Pub West (US EP JP WO), Pat Base (AU BE BR CA CH CN DE DK EP ES FI FR GB IN JP KR SE TH TW US WO), Google Patent, Google Scholar, Google Web, FPO; search terms: electrophoresis, gel, separate, transparent, semi, conductive, electrode, polymer, plate, layer, blot, membrane, permeable, semipermeable, anode, cathode, paddle, wire, lead...

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y -- A	US 2003/0032201 A1 (FLESHER) 13 February 2003 (13.02.2003), Fig. 5a; para [0029], [0034], [0038], [0041], [0043], [0045], [0046], [0048], [0049], [0050], [0051], [0066]	1, 3-6, 9-14 -------------------- 2, 7, 8, 15-18
Y -- A	US 2006/0187527 A1 (KOMATSU) 24 August 2006 (24.08.2006), Fig. 1; para [0056], [0061], [0065]-[0067], [0072], [0077], [0090], [0096], [0097], [0118], [0120]	1, 3-6, 9-14 -------------------- 2, 7, 8, 15-18
Y -- A	US 2010/0044229 A1 (MARGALIT et al.) 25 February 2010 (25.02.2010), Fig. 1; para [0012], [0014], [0017], [0027], [0035], [0107], [0112]-[0114], [0126], [0128], [0130], [0133], [0138], [0204]	1, 3-6, 9-14 -------------------- 2, 7, 8, 15-18
Y -- A	US 2012/0190591 A1 (WOHLSTADTER et al.) 26 July 2012 (26.07.2012), para [0009], [0012], [0135], [0146], [0151], [0152], [0157], [0175], [0632], [0644], [0759], [0762]	3, 4, 11 -------------------- 2, 7, 8, 15-18
A	US 2010/0247870 A1 (SUZUKI et al.) 30 September 2010 (30.09.2010), para [0091], [0106], [0116], [0117]	2, 7, 8, 15-18
A	US 2007/0284250 A1 (MAGNANT et al.) 13 December 2007 (13.12.2007), para [0012], [0014], [0099], [0116], [0122]	2, 7, 8, 15-18

☐ Further documents are listed in the continuation of Box C. ☐

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 January 2017	02 FEB 2017

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US, Commissioner for Patents
P.O. Box 1450, Alexandria, Virginia 22313-1450
Facsimile No. 571-273-8300

Authorized officer:
Lee W. Young
PCT Helpdesk: 571-272-4300
PCT OSP: 571-272-7774

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

To: R. JOSEPH TROJAN
9250 WILSHIRE BLVD., STE. 325
BEVERLY HILLS, CA 90212

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43*bis*.1)

Date of mailing *(day/month/year)* 02 FEB 2017	
Applicant's or agent's file reference 16017768PCT	**FOR FURTHER ACTION** See paragraph 2 below

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US 16/61443	10 November 2016 (10.11.2016)	10 November 2015 (10.11.2015)

International Patent Classification (IPC) or both national classification and IPC
IPC(8) - C07K 1/26, G01N 27/26, G01N 27/447, G01N 33/68, H01L 33/42 (2016.01)
CPC - C07K 1/26, G01N 27/26, G01N 27/447, G01N 27/44739, G01N 33/68, H01L 33/42, H01L 51/5215

Applicant WOODHAM BIOTECHNOLOGY HOLDINGS, LLC

1. This opinion contains indications relating to the following items:

- [X] Box No. I Basis of the opinion
- [ ] Box No. II Priority
- [ ] Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- [ ] Box No. IV Lack of unity of invention
- [X] Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- [ ] Box No. VI Certain documents cited
- [ ] Box No. VII Certain defects in the international application
- [ ] Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1 *bis*(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Fom PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/US	Date of completion of this opinion	Authorized officer:
Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450, Alexandria, Virginia 22313-1450 Facsimile No. 571-273-8300	24 January 2017	Lee W. Young PCT Helpdesk: 571-272-4300 PCT OSP: 571-272-7774

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/US 16/61443

Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:

   ☒ the international application in the language in which it was filed.

   ☐ a translation of the international application into ______________________ which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b)).

2. ☐ This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).

3. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:

   a. ☐ forming part of the international application as filed:

      ☐ in the form of an Annex C/ST.25 text file.

      ☐ on paper or in the form of an image file.

   b. ☐ furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.

   c. ☐ furnished subsequent to the international filing date for the purposes of international search only:

      ☐ in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).

      ☐ on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).

4. ☐ In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

5. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US 16/61443

Box No. V Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-18	YES
	Claims	none	NO
Inventive step (IS)	Claims	2, 7, 8, 15-18	YES
	Claims	1, 3-6, 9-14	NO
Industrial applicability (IA)	Claims	1-18	YES
	Claims	none	NO

2. Citations and explanations:

Claims 1, 5, 6, 9, 10, and 12-14 lack an inventive step under PCT Article 33(3) as being obvious over US 2003/0032201 A1 (Flesher), in view of US 2006/0187527 A1 (Komatsu) and US 2010/0044229 A1 to Margalit, et al. (hereinafter 'Margalit').

Regarding Claim 1, Flesher discloses an apparatus for electrophoretic separation and blotting (para [0029], [0038]), comprising
a first electrically semi-conductive plate (Fig. 5a; para [0050], paddle, 84, constructed of non-conductive plastic material... made capable of electric current by being immersed in a buffer solution.);
a second electrically conductive plate, the second electrically plate substantially parallel to the first electrically semi-conductive plate (Fig. 5a; para [0050], paddle, 88, constructed of stainless steel or similar material.);
an electrophoresis gel (Fig. 5a; para [0050], electrophoresis gel carrier, 30.); and,
a blotting membrane (Fig. 5a; para [0046], samples blotted, 68, down on the transfer membrane, 24.);
wherein the electrophoresis gel is between the first electrically semi-conductive plate and the blotting membrane (Fig. 5a; para [0046], [0050], paddle, 84, gel carrier, 30, and blotting membrane, 24.); and
wherein the blotting membrane is between the electrophoresis gel and the second electrically semi-conductive plate (Fig. 5a; para [0046], [0050], gel carrier, 30, blotting membrane, 24, and paddle, 88.); a transparent cover plate (para [0034]);
but does not specifically disclose said first plate is made from a transparent conductive polymer; and said second plate is made from a semi-conductive polymer. However, Komatsu discloses an apparatus for electrophoretic separation (para [0056], [0096], [0097]), comprising a transparent conductive polymer plate (para [0065]-[0067], transparent electrode, 24, poly acetylene.), a second conductive plate (Fig. 1; para [0061], [0067], picture electrode, 67.), and a gel (Fig. 1; para [0077], microcapsule gelatine, 40.). To a person of ordinary skill in the art, it would have been obvious to substitute the transparent electrode as taught by Komatsu for use in the apparatus for electrophoretic separation and blotting as in Flesher in order to view and display electrophoretic separated particles (para [0097], [0118], [0120]), because Flesher and Komatsu are directed towards electrophoretic separation comprising electrode plates, a transparent layer, and a gel. Further, regarding the second plate semi-conductive polymer, Margalit discloses an apparatus for electrophoretic separation and blotting (para [0012]), comprising a first and a second semi-conductive polymer plates (Fig. 1; para [0107], [0126], [0128], anode, 105, cathode, 107, gel matrix, 106 and 108... electrically conducting electrode comprising nonconducting polymer.). To a person of ordinary skill in the art, it would have been obvious to substitute a second plate made from a semi-conductive polymer as taught by Margalit for use in the apparatus for electrophoretic separation and blotting as in Flesher in view of Komatsu in order to accelerate the detection of proteins using electric voltage while reducing the volume of buffer (Margalit: para [0012]), because Flesher, Komatsu, and Margalit are directed towards apparatuses for electrophoretic separation having a first and second plate and electrophoretic gel and because Flesher and Margalit are directed towards apparatuses for electrophoretic separation and blotting.

Regarding Claim 5, Komatsu further discloses the apparatus of Claim 1, wherein the first electrically semi-conductive plate is made from a polymer comprising one or more types of transparent conducting polymers selected from the group consisting of polyacetylene (para [0066]), poly(pyrrole)s (PPy), polyanilines, polythiophene, poly(3,4-ethylenedioxythiophene), poly(p-phenylene) sulfide, poly(p-phenylene vinylene), and their derivatives; but does not specifically disclose that the first electrically semiconductive plate has a volume resistivity between 10^3 and 10^8 ohm-cm. However, Margalit further discloses varying the concentration of a conductive buffer (para [0112]-[0114]). To a person of ordinary skill in the art, it would have been obvious through routine experimentation to vary the concentration of a conductive buffer as taught by Margalit for use with the first electrically semi-conductive plate as in Flesher in order to optimize the conduction of desire ions for blotting of macromolecules (Margalit: para [0017]).

Regarding Claim 6, Flesher further discloses the apparatus of Claim 5, wherein the first electrically semi-conductive plate is comprised of a non-conducting polymer (para [0049]); but does not specifically disclose that said plate has a thickness of at least 1 mm and is comprised of a composite of a transparent conducting polymer and a non-conducting transparent polymer. However, Komatsu discloses an apparatus for electrophoretic separation (para [0056], [0096], [0097]), comprising a transparent conductive polymer plate (para [0065]-[0067], transparent electrode, 24, poly acetylene.). Further, Margalit discloses an electrically semi-conductive plate is comprised of a composite of a conducting polymer and a non-conducting polymer (para [0017]), adapting electrode dimensions (para [0204]), and a sheet thickness of 1 mm (para [0138]). To a person of ordinary skill in the art, it would have been obvious through routine experimentation to substitute a transparent conductive polymer and to vary the thickness of an electrode comprising a non-conducting polymer in order to optimize the visibility through the electrode and the conductivity of the electrode.

-- Please See Supplemental Box --

WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY	International application No. PCT/US 16/61443

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**
Continuation of:
Box V.2., Citations and explanations,

Regarding Claim 9, Flesher discloses an apparatus for electrophoretic separation and blotting macromolecules (para [0029], [0038]), comprising:
a first plate made of a polymer (Fig. 5a; para [0050], paddle, 84, constructed of non-conductive plastic material.);
a second plate substantially parallel to the first plate (Fig. 5a; para [0050], paddle, 88, constructed of stainless steel or similar material.);
an electrophoresis gel (Fig. 5a; para [0050], electrophoresis gel carrier, 30.); and,
a blotting membrane (Fig. 5a; para [0046], samples blotted, 68, down on the transfer membrane, 24.);
wherein the electrophoresis gel is between an electrically semi-conductive transparent layer and a blotting membrane (Fig. 5a; para [0046], [0050], paddle, 84, gel carrier, 30, and blotting membrane, 24.); and,
wherein the blotting membrane is between the electrophoresis gel and the second plate (Fig. 5a; para [0046], [0050], gel carrier, 30, blotting membrane, 24, and paddle, 88.);
but does not specifically disclose the first plate made of a transparent polymer; and
an electrically semi-conductive transparent layer adjacent to the first plate.
However, Komatsu discloses an apparatus for electrophoretic separation (para [0056], [0096], [0097]), comprising an electrically semi-conductive transparent conductive polymer plate (para [0065]-[0067], transparent electrode, 24, comprising conductive poly acetylene resin and conductive metal oxide particles such indium tin oxide that is known in the art as a semi-conductive material.), a second conductive plate (Fig. 1; para [0061], [0067], picture electrode, 67.) and a gel (Fig. 1; para [0077], microcapsule gelatine, 40.).
To a person of ordinary skill in the art, it would have been obvious to substitute the transparent electrode as taught by Komatsu for use in the apparatus for electrophoretic separation and blotting as in Flesher in order to view and display electrophoretic separated particles (para [0097], [0118], [0120]), because Flesher and Komatsu are directed towards electrophoretic separation comprising electrode plates and gel.
Further, electrically semi-conductive transparent layer adjacent to the first plate, Margalit discloses an apparatus for electrophoretic separation and blotting (para [0012]), comprising a first plate having a layered conducting polymer and non-conducting polymer (para [0017]) and adapting electrode dimensions (para [0204]).
To a person of ordinary skill in the art, it would have been obvious to substitute a second layer made from a semi-conductive polymer as taught by Margalit for use in the apparatus for electrophoretic separation and blotting as in Flesher in view of Komatsu, and through routine experimentation to substitute a transparent conductive polymer and to vary the thickness of an electrode comprising a non-conducting polymer in order to optimize the visibility through the electrode and the conductivity of the electrode, in order to accelerate the detection of proteins using electric voltage while reducing the volume of buffer (Margalit: para [0012]), because Flesher, Komatsu, and Margalit are directed towards apparatuses for electrophoretic separation having a first and second plate and electrophoretic gel and because Flesher and Margalit are directed towards apparatuses for electrophoretic separation and blotting.

Regarding Claim 10, Margalit further discloses the apparatus of Claim 9, further comprising: a first electrically conductive wire array in contact with first plate and the electrically semi-conductive layer (para [0017], [0130], electrode comprising electrically conducting and non-electrically conducting materials, metal mesh... anode or cathode with surface wire mesh electrode structure.); but does not specifically disclose that said layer is transparent; and the first electrically conductive wire array distributes charge along the electrically semi-conductive layer. However, Komatsu discloses an apparatus for electrophoretic separation (para [0056], [0096], [0097]), comprising a transparent conductive polymer plate having a static-dissipative plastic (para [0065]-[0067], transparent electrode, 24, poly acetylene, which Applicant defines as a suitable plastic (instant para [0051], [0052]).). Further, Margalit discloses the first electrically conductive wire array distributes charge along the electrically semi-conductive layer (para [0017], [0130], metal wire mesh electrically conductive electrode structure, wherein the electrical conductivity of the mesh electrode structure along the plate distributes electrical charge along the electrode plate structure.). To a person of ordinary skill in the art, it would have been obvious to substitute the transparent conductive material as taught by Komatsu and the electrically conductive wire array as in Margalit for use in the conductive polymer electrode plate as in Flesher, in order to optimize the visibility through the electrode while optimizing the conductivity of the electrode.

Regarding Claim 12, Komatsu further discloses the apparatus of claim 9, wherein the first plate is made from a polymer containing one or more types of transparent conducting polymers selected from the group consisting of polyacetylene (para [0066]), poly(pyrrole)s (PPy), polyanilines, polythiophene, poly(3,4ethylenedioxythiophene), poly(p-phenylene) sulfide, poly(p-phenylene vinylene), and their derivatives.

Regarding Claim 13, Margalit further discloses the apparatus of Claim 9, adapting electrode dimensions (para [0204]), a sheet thickness of 1 mm (para [0138]), and varying the concentration of a conductive buffer (para [0112]-[0114]); but does not specifically disclose that the transparent conductive layer has a volume resistivity between 10^4 and 10^5 ohm-cm and the first plate has a volume resistivity between 10^8 and 10^10 ohm cm. To a person of ordinary skill in the art, it would have been obvious through routine experimentation to vary the concentration of a conductive buffer and to vary the thickness of an electrode as taught by Margalit for use with the first electrically semi-conductive plate comprising a transparent conductive layer as in Flesher in view of Komatsu in order to optimize the conduction of desire ions for blotting of macromolecules and the visibility through the electrode while optimizing the conductivity of the electrode.

Regarding Claim 14, Margalit further discloses the apparatus of Claim 9, further comprising a second electrically conducting wire array adjacent to the second plate (para [0017], [0130], electrode comprising electrically conducting and non-electrically conducting materials, metal mesh... anode or cathode with surface wire mesh electrode structure.), whereby the second electrically conducting wire array distributes electrical charge along the second plate (para [0017], [0130], metal wire mesh electrically conductive electrode structure, wherein the electrical conductivity of the mesh electrode structure along the plate distributes electrical charge along the electrode plate structure.).

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Box V.2., Citations and explanations,

Claims 3, 4, and 11 lack an inventive step under PCT Article 33(3) as being obvious over Flesher, in view of Komatsu, and in further view of Margalit and US 2012/0190591 A1 to Wohlstadter, et al. (hereinafter 'Wohlstadter').

Regarding Claim 3, Margalit further discloses the apparatus of Claim 1, further comprising electrically conducting wires disposed on or within the first electrically semi-conductive plate (para [0017], [0130], electrode comprising electrically conducting and non-electrically conducting materials, metal mesh... anode or cathode with surface wire mesh electrode structure.); but does not specifically disclose that the first electrically semi-conductive plate is characterized as having an outer electrically semiconductive transparent layer overlaying a static-dissipative plastic. However, Komatsu discloses an apparatus for electrophoretic separation (para [0056], [0096], [0097]), comprising a transparent conductive polymer plate having a static-dissipative plastic (para [0065]-[0067], transparent electrode, 24, comprising conductive poly acetylene resin and conductive metal particles such indium tin oxide, wherein Applicant defines as a suitable plastic (instant para [0051], [0052]), and wherein indium tin oxide is known in the art as a semi-conductive material.).
Further, Wohlstadter discloses an electrically semiconductive transparent layer and laying a plastic layer (para [0151], [0152], [0157], electrodes supported on another material, such as plastic sheets... and further comprised of semi-conducting films such as indium titanium oxide... transparent electrode... sheet or plastic applied to a support by laminating or deposition.). To a person of ordinary skill in the art, it would have been obvious to substitute an electrically semiconductive transparent layer as taught by Wohlstadter for use with the transparent conductive polymer electrode plate as in Flesher in view of Komatsu and Margalit, and through routine experimentation vary the position of a transparent layer to overlay a static-dissipative plastic, in order to optimize the visibility through the electrode while optimizing the conductivity of the electrode, because Flesher, Komatsu, and Margalit are directed towards apparatuses for electrophoretic separation having a first and second plate and electrophoretic gel, because Flesher, Margalit, and Wohlstadter are directed towards apparatuses for electrophoretic separation and blotting, and because Komatsu and Wohlstadter are directed towards transparent eelctrodes for use in luminescent/visual electrochemical separations (Wohlstadter: para [0009], [0012], [0135], [0644]).

Regarding Claim 4, Wohlstadter further discloses the apparatus of Claim 3, wherein an electrically semi-conductive transparent layer (para [0151], [0152], [0157], electrodes supported on another material, such as plastic sheets... and further comprised of semi-conducting films such as indium titanium oxide... transparent electrode... sheet or plastic applied to a support by laminating or deposition.) and an electrode thickness of less than 1 mm (para [0161]), wherein the outer electrically semi-conductive transparent layer comprises at least one of indium tin oxide (para [0151], [0152], [0157], electrodes supported on another material, such as plastic sheets... and further comprised of semi-conducting films such as indium titanium oxide that is known in the art as a semi-conductive material.), fluorine doped tin, doped zinc oxide, and aluminum-doped zinc-oxide; but does not specifically disclose an outer electrically semi-conductive transparent layer and is disposed on an inner surface of the first electrically semi-conductive plate. However, Flesher discloses an apparatus for electrophoretic separation and blotting (para [0029], [0038]), comprising a first electrically semi-conductive plate (Fig. 5a; para [0050], paddle, 84, constructed of non-conductive plastic material... made capable of electric current by being immersed in a buffer solution.).
To a person of ordinary skill in the art, it would have been obvious to substitute an electrically semiconductive transparent layer as taught by Wohlstadter for use with the transparent conductive polymer electrode plate apparatus as in Flesher in view of Komatsu and Margalit, and through routine experimentation vary the position of a transparent layer to an inner surface of the first electrically semi-conductive plate and the thickness of the electrode, in order to optimize the transparency and conductivity of the electrode.

Regarding Claim 11, Komatsu further discloses the apparatus of claim 10, wherein the electrically semi-conductive transparent layer, as discussed above, is an electrically conductive film, wherein the electrically semi-conductive film is made of a film containing one or more types of conductive transparent metals selected from the group consisting of indium tin oxide, fluorine doped tin, doped zinc oxide, aluminum-doped zinc-oxide, and their derivatives (para [0065]-[0067], transparent electrode, 24, comprising conductive poly acetylene resin and conductive metal oxide particles such indium tin oxide that is known in the art as a semi-conductive material.); but does not specifically disclose that said electrically conductive film disposed on an inner surface of the first plate. However, Wohlstadter discloses an electrically semiconductive transparent layer and laying a plastic layer (para [0151], [0152], [0157], electrodes supported on another material, such as plastic sheets... and further comprised of semi-conducting films such as indium titanium oxide... transparent electrode... sheet or plastic applied to a support by laminating or deposition.). To a person of ordinary skill in the art, it would have been obvious to substitute an electrically semiconductive transparent layer as taught by Wohlstadter for use with the transparent conductive polymer electrode plate as in Flesher in view of Komatsu and Margalit, and through routine experimentation vary the position of a transparent layer to overlay a static-dissipative plastic, in order to optimize the visibility through the electrode while optimizing the conductivity of the electrode, because Flesher, Komatsu, and Margalit are directed towards apparatuses for electrophoretic separation having a first and second plate and electrophoretic gel, because Flesher, Margalit, and Wohlstadter are directed towards apparatuses for electrophoretic separation and blotting, and because Komatsu and Wohlstadter are directed towards transparent eelctrodes for use in luminescent/visual electrochemical separations (Wohlstadter: para [0009], [0012], [0135], [0644]).

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Box V.2., Citations and explanations,

Claims 2, 7, 8, and 15-18 meet the criteria set forth in PCT Article 33(2) and PCT Article 33(3) because the prior art fails to teach or fairly suggest:

Regarding Claim 2. The apparatus of Claim 1, further comprising: a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase;
a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane;
wherein the blotting membrane is at least one of a nitrocellulose membrane, polyvinylidene difluoride (PVDF) membrane, or nylon membrane.

Regarding Claim 7. The apparatus of Claim 6, wherein the composite is between 1% and 10% PPy composite, thereby providing the first electrically semi-conductive plate to have sufficient volume resistivity to act as an insulating plate during a protein separation phase and sufficient conductivity to allow proteins to migrate to the blotting membrane during a protein transfer phase, and sufficient rigidity to support the electrophoresis gel, and sufficient transparency to allow a user to visualize a dye front through the first electrically semi-conductive plate.

Regarding Claim 15. A system for both electrophoretic separation and blotting macromolecules, comprising:
a liquid receptacle tank having an upper buffer chamber and a lower buffer chamber, a front panel, rear panel, and bottom;
a first separation phase electrode in the upper buffer chamber;
a second separation phase electrode in the lower buffer chamber;
a first blotting phase electrode;
a second blotting phase electrode;
a precast gel and membrane combination unit having (i) a first electrically semi-conductive plate made from a transparent conductive polymer, (ii) a second electrically semi-conductive plate made from a conductive polymer, the second electrically semiconductive plate substantially parallel to the first electrically conductive plate, (iii) an electrophoresis gel, and (iv) a blotting membrane; and,
a power supply, wherein the power supply is configured to apply a voltage to the first separation phase electrode and second separation phase electrode to perform electrophoretic separation of macromolecules along the electrophoresis gel, and wherein the power supply is configured to automatically switch a voltage from the first and second separation phase electrodes to the first and second blotting phase electrodes, whereby switching the voltage allows a user to perform electrophoretic separation of proteins and transfer of proteins onto the blotting membrane.

Regarding Claim 17. A method for separation and post-separation transfer of macromolecules to a blotting membrane, the method comprising the steps of:
providing an apparatus in a first orientation within a liquid receptacle tank, wherein the apparatus has a first electrically semi-conductive plate made of (i) a transparent semi-conductive polymer, (ii) second electrically semi-conductive plate made of a conductive polymer, the second electrically conductive plate substantially parallel to the first electrically conductive plate, (iii) an electrophoresis gel, and (iv) a blotting membrane, wherein the electrophoresis gel is between the first semi-conductive plate and the blotting membrane, and wherein the blotting membrane is between the electrophoresis gel and the second electrically semi-conductive plate;
separating macromolecules along the gel of the apparatus by applying a first electrical driving force to a pair of separation electrodes, wherein separating macromolecules along the gel occurs in the first orientation of the apparatus;
discontinuing the first electrical driving force to the pair of separation electrodes;
transferring macromolecules through the gel to the blotting membrane by applying a second electrical driving force substantially perpendicular to the first electrical driving force while maintaining the first orientation of the apparatus, thereby combining the steps of macromolecule separation and transfer to a blotting membrane in a single liquid receptacle tank without having to reorient the apparatus between the separating step and transferring step.

Accordingly, regarding Claims 2, 7, 15, and 17, considering Flesher, Flesher further discloses a nylon blotting membrane (para [0046]), protein transfer onto blotting paper (para [0041], [0043]), filter paper (para [0041]), buffer tank (para [0048], buffer chambers.), separation phase (para [0045], [0046]), and pre-cast materials (para [0051]); but does not specifically disclose
a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase; a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane (as in Claim 2);
a composite is between 1% and 10% PPy composite, thereby providing the first electrically semi-conductive plate to have sufficient volume resistivity to act as an insulating plate during a protein separation phase and sufficient conductivity to allow proteins to migrate to the blotting membrane during a protein transfer phase, and sufficient rigidity to support the electrophoresis gel, and sufficient transparency to allow a user to visualize a dye front through the first electrically semi-conductive plate (as in Claim 7);

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a power supply, wherein the power supply is configured to apply a voltage to the first separation phase electrode and second separation phase electrode to perform electrophoretic separation of macromolecules along the electrophoresis gel, and wherein the power supply is configured to automatically switch a voltage from the first and second separation phase electrodes to the first and second blotting phase electrodes, whereby switching the voltage allows a user to perform electrophoretic separation of proteins and transfer of proteins onto the blotting membrane (as in Claim 15); and
separating macromolecules along the gel of the apparatus by applying a first electrical driving force to a pair of separation electrodes, wherein separating macromolecules along the gel occurs in the first orientation of the apparatus; providing an apparatus in a first orientation within a liquid receptacle tank discontinuing the first electrical driving force to the pair of separation electrodes; transferring macromolecules through the gel to the blotting membrane by applying a second electrical driving force substantially perpendicular to the first electrical driving force while maintaining the first orientation of the apparatus, thereby combining the steps of macromolecule separation and transfer to a blotting membrane in a single liquid receptacle tank without having to reorient the apparatus between the separating step and transferring step (as in Claim 17).

Accordingly, regarding Claims 2, 7, 15, and 17, considering Komatsu, Komatsu further discloses a dye (para [0072]) and polypyrrole (para [0090]); but does not specifically disclose
a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase; a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane (as in Claim 2);
a composite is between 1% and 10% PPy composite, thereby providing the first electrically semi-conductive plate to have sufficient volume resistivity to act as an insulating plate during a protein separation phase and sufficient conductivity to allow proteins to migrate to the blotting membrane during a protein transfer phase, and sufficient rigidity to support the electrophoresis gel, and sufficient transparency to allow a user to visualize a dye front through the first electrically semi-conductive plate (as in Claim 7);
a power supply, wherein the power supply is configured to apply a voltage to the first separation phase electrode and second separation phase electrode to perform electrophoretic separation of macromolecules along the electrophoresis gel, and wherein the power supply is configured to automatically switch a voltage from the first and second separation phase electrodes to the first and second blotting phase electrodes, whereby switching the voltage allows a user to perform electrophoretic separation of proteins and transfer of proteins onto the blotting membrane (as in Claim 15); and
separating macromolecules along the gel of the apparatus by applying a first electrical driving force to a pair of separation electrodes, wherein separating macromolecules along the gel occurs in the first orientation of the apparatus; providing an apparatus in a first orientation within a liquid receptacle tank discontinuing the first electrical driving force to the pair of separation electrodes; transferring macromolecules through the gel to the blotting membrane by applying a second electrical driving force substantially perpendicular to the first electrical driving force while maintaining the first orientation of the apparatus, thereby combining the steps of macromolecule separation and transfer to a blotting membrane in a single liquid receptacle tank without having to reorient the apparatus between the separating step and transferring step (as in Claim 17).

Accordingly, regarding Claims 2, 7, 15, and 17, considering Margalit, Margalit further discloses an ion reservoir (para [0014]), filter paper (para [0027]), dye (para [0035]), and power supply (para [0133]); but does not specifically disclose
a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase; a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane (as in Claim 2);
a composite is between 1% and 10% PPy composite, thereby providing the first electrically semi-conductive plate to have sufficient volume resistivity to act as an insulating plate during a protein separation phase and sufficient conductivity to allow proteins to migrate to the blotting membrane during a protein transfer phase, and sufficient rigidity to support the electrophoresis gel, and sufficient transparency to allow a user to visualize a dye front through the first electrically semi-conductive plate (as in Claim 7);
a power supply, wherein the power supply is configured to apply a voltage to the first separation phase electrode and second separation phase electrode to perform electrophoretic separation of macromolecules along the electrophoresis gel, and wherein the power supply is configured to automatically switch a voltage from the first and second separation phase electrodes to the first and second blotting phase electrodes, whereby switching the voltage allows a user to perform electrophoretic separation of proteins and transfer of proteins onto the blotting membrane (as in Claim 15); and
separating macromolecules along the gel of the apparatus by applying a first electrical driving force to a pair of separation electrodes, wherein separating macromolecules along the gel occurs in the first orientation of the apparatus; providing an apparatus in a first orientation within a liquid receptacle tank discontinuing the first electrical driving force to the pair of separation electrodes; transferring macromolecules through the gel to the blotting membrane by applying a second electrical driving force substantially perpendicular to the first electrical driving force while maintaining the first orientation of the apparatus, thereby combining the steps of macromolecule separation and transfer to a blotting membrane in a single liquid receptacle tank without having to reorient the apparatus between the separating step and transferring step (as in Claim 17).

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Accordingly, regarding Claims 2, 7, 15, and 17, considering Wohlstadter, Wohlstadter further discloses electrode boundaries comprising low conductivity (para [0146]), nickel electrodes (para [0151], [0175]), a voltage switch (para [0632]), and receptacles (para [0759], [0762]); but does not specifically disclose an analogous field of art for use in electrophoresis; and furthermore does not specifically disclose
a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase; a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane (as in Claim 2);
a composite is between 1% and 10% PPy composite, thereby providing the first electrically semi-conductive plate to have sufficient volume resistivity to act as an insulating plate during a protein separation phase and sufficient conductivity to allow proteins to migrate to the blotting membrane during a protein transfer phase, and sufficient rigidity to support the electrophoresis gel, and sufficient transparency to allow a user to visualize a dye front through the first electrically semi-conductive plate (as in Claim 7);
a power supply, wherein the power supply is configured to apply a voltage to the first separation phase electrode and second separation phase electrode to perform electrophoretic separation of macromolecules along the electrophoresis gel, and wherein the power supply is configured to automatically switch a voltage from the first and second separation phase electrodes to the first and second blotting phase electrodes, whereby switching the voltage allows a user to perform electrophoretic separation of proteins and transfer of proteins onto the blotting membrane (as in Claim 15); and
separating macromolecules along the gel of the apparatus by applying a first electrical driving force to a pair of separation electrodes, wherein separating macromolecules along the gel occurs in the first orientation of the apparatus; providing an apparatus in a first orientation within a liquid receptacle tank discontinuing the first electrical driving force to the pair of separation electrodes; transferring macromolecules through the gel to the blotting membrane by applying a second electrical driving force substantially perpendicular to the first electrical driving force while maintaining the first orientation of the apparatus, thereby combining the steps of macromolecule separation and transfer to a blotting membrane in a single liquid receptacle tank without having to reorient the apparatus between the separating step and transferring step (as in Claim 17).

Accordingly, regarding Claims 2, 7, 15, and 17, considering US 2010/0247870 A1 to Suzuki, et al. (hereinafter 'Suzuki'), Suzuki discloses a transparent electrode comprising a layer of metal oxide and a conductive polymer (para [0106], [0116], [0117]) comprising nickel and polypyrrole (para [0091], [0117]); but does not specifically disclose an analogous field of art for use in electrophoresis; and furthermore does not specifically disclose
a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase; a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane (as in Claim 2);
a composite is between 1% and 10% PPy composite, thereby providing the first electrically semi-conductive plate to have sufficient volume resistivity to act as an insulating plate during a protein separation phase and sufficient conductivity to allow proteins to migrate to the blotting membrane during a protein transfer phase, and sufficient rigidity to support the electrophoresis gel, and sufficient transparency to allow a user to visualize a dye front through the first electrically semi-conductive plate (as in Claim 7);
a power supply, wherein the power supply is configured to apply a voltage to the first separation phase electrode and second separation phase electrode to perform electrophoretic separation of macromolecules along the electrophoresis gel, and wherein the power supply is configured to automatically switch a voltage from the first and second separation phase electrodes to the first and second blotting phase electrodes, whereby switching the voltage allows a user to perform electrophoretic separation of proteins and transfer of proteins onto the blotting membrane (as in Claim 15); and
separating macromolecules along the gel of the apparatus by applying a first electrical driving force to a pair of separation electrodes, wherein separating macromolecules along the gel occurs in the first orientation of the apparatus; providing an apparatus in a first orientation within a liquid receptacle tank discontinuing the first electrical driving force to the pair of separation electrodes; transferring macromolecules through the gel to the blotting membrane by applying a second electrical driving force substantially perpendicular to the first electrical driving force while maintaining the first orientation of the apparatus, thereby combining the steps of macromolecule separation and transfer to a blotting membrane in a single liquid receptacle tank without having to reorient the apparatus between the separating step and transferring step (as in Claim 17).

Accordingly, regarding Claims 2, 7, 15, and 17, considering US 2007/0284250 A1 to Magnant, et al. (hereinafter 'Magnant'), Magnant further discloses an apparatus for electrophoretic separation and blotting (para [0012]), comprising switching voltage to drive macromolecules (para [0116], [0122]), a conductive liquid (para [0014]), prevents migration of macromolecules from diffusing (para [0099]); but does not specifically disclose an analogous field of art for use in electrophoresis; and furthermore does not specifically disclose
a low conductivity gel having a lower conductivity than the electrophoresis gel, wherein the low conductivity gel is between the electrophoresis gel and the blotting membrane, whereby the low conductivity gel prevents migration of macromolecules from diffusing away from the electrophoresis gel and adhering to the blotting membrane during a macromolecule separation phase; a filter paper between the second semi-conductive plate and the blotting membrane, whereby the filter paper, when wet, acts as an ion reservoir and provides substantial electrical contact between the blotting membrane the second conductive plate to aid in transferring macromolecules from the electrophoresis gel through the low conductivity gel to the blotting membrane (as in Claim 2);

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SEARCH HISTORY

Application Number	PCT/US 16/61443
Search Conducted By	SRH
Search Approved By	SRH

IPC, CPC, USPC Classifications Searched	IPC(8)- C07K 1/26, G01N 27/26, G01N 27/447, G01N 33/68, H01L 33/42 (2016.01) CPC- C07K 1/26, G01N 27/26, G01N 27/447, G01N 27/44739, G01N 33/68, H01L 33/42, H01L 51/5215 USPC- 204/450-474, 204/546-553, 204/614, 257/59, 257/72, 257/253, 257/51.027, 436/15, 436/178, 436/517
Date Conducted	24 January 2017

Documentation Searched	Patent Literature and Non-Patent Literature
Search Terms Used	electrophoresis, gel, separate, transparent, semi, conductive, electrode, polymer, plate, layer, blot, membrane, permeable, semipermeable, anode, cathode, paddle, wire, lead, polypyrrole, PPy, polyacetylene, polyaniline, polythiophene, polyethylene dioxythiophene, polyphenylene, polyphenylenevinylene, filter, paper, conductivity, nickel, Ni, oxide, Zn, zinc, In, indium, Sn, tin, Al, aluminum, aluminium, oxide, alumina, Al2O3, zirconia, ZrO2
Date Conducted	24 January 2017

Electronic Database Searched	Pub West
Files Searched	(US Pat, PgPub, EPO, JPO: class, keyword)
Date Conducted	24 January 2017

Search Logic:

DATE: Friday, January 13, 2017 Purge Queries Printable Copy Create Case

Order By	Set Name Side by	Query	Hit Count	Set Name Result	Set Name Grid	Set Name Classification

	Side			Set		
		DB=PGPB,USPT,USOC,EPAB,JPAB; PLUR=NO; OP=ADJ				
Date	L50	L42 and L41 and L6	0	L50	L50	L50
Date	L49	L39 not (L40 or L37 or L28 or L24 or L22)	4	L49	L49	L49
Date	L48	L44 not (L37 or L28 or L24 or L22)	23	L48	L48	L48
Date	L47	L42 and L41 and L30 and L14 and L10	0	L47	L47	L47
Date	L46	L42 and L41 and L30 and L10 and L3	2	L46	L46	L46
Date	L45	L42 and L41 and L30 and L10 and L6	0	L45	L45	L45
Date	L44	L42 and L41 and L30 and L10	23	L44	L44	L44
Date	L43	L42 and L41	157	L43	L43	L43
Datc	L42	ent$ with (conduct$ or electrod$ or polymer$ or plate$ or layer$))	27339	L42	L42	L42
Date	L41	L7 and (transparent$ with (semiconductiv$ or (semi near conductiv$)))	157	L41	L41	L41
Date	L40	L33 and L10 and L8 and L3	6	L40	L40	L40
Date	L39	L33 and L10 and L8	15	L39	L39	L39
Date	L38	L37 not (L28 or L24 or L22)	3	L38	L38	L38
Date	L37	L33 and L14 and L10 and L8	9	L37	L37	L37
Date	L36	L33 and L14 and L10 and L9	253	L36	L36	L36
Date	L35	L33 and L15 and L14	0	L35	L35	L35
Date	L34	L33 and L17 and L15 and L14	0	L34	L34	L34
Date	L33	L7 and ($blot$ or blot$).ab,clm,ti.	4845	L33	L33	L33
Date	L32	L30 and L15 and L14 and L10 and L8	4	L32	L32	L32
Date	L31	L30 and L14 and L10 and L8	37	L31	L31	L31
Date	L30	L7 and ($blot$ or blot$)	154051	L30	L30	L30
Date	L29	L28 not (L24 or L22)	15	L29	L29	L29
Date	L28	L25 and L14 and L10 and L8 and L3	19	L28	L28	L28
Date	L27	L25 and L14 and L10 and L8 and L6	0	L27	L27	L27
Date	L26	L25 and L14 and L10 and L8	37	L26	L26	L26
Date	L25	L7 and blot$	148973	L25	L25	L25
Date	L24	L14 and L10 and L9 and L8 and L3	4	L24	L24	L24
Date	L23	L14 and L10 and L9 and L8 and L6	0	L23	L23	L23
Date	L22	L14 and L10 and L9 and L8	7	L22	L22	L22
Date	L21	L15 and L14 and L10 and L9	0	L21	L21	L21
Date	L20	L17 and L15 and L14 and L9	0	L20	L20	L20
Date	L19	L17 and L15 and L14	69	L19	L19	L19

Date	L18	L17 and L16 and L15 and L14	0	L18	L18	L18
Date	L17	L7 and (gel$).ab,clm,ti.	24410	L17	L17	L17
Date	L16	L7 and (blot$ near (membran$ or semipermeab$ or permeab$)).ab,clm,ti.	138	L16	L16	L16
Date	L15	L7 and (transparent$ near (conduct$ or electrod$ or polymer$ or plate$ or layer$)).ab,clm,ti.	3481	L15	L15	L15
Date	L14	L7 and (electrophore$ or $electrophor$ or (gel$ near separat$)).ab,clm,ti.	34636	L14	L14	L14
Date	L13	L10 and L9 and L8 and L3	5	L13	L13	L13
Date	L12	L10 and L9 and L8 and L6	0	L12	L12	L12
Date	L11	L10 and L9 and L8	29	L11	L11	L11
Date	L10	L7 and gel$	265172	L10	L10	L10
Date	L9	L7 and (blot$ near (membran$ or semipermeab$ or permeab$))	8426	L9	L9	L9
Date	L8	L7 and (transparent$ near (conduct$ or electrod$ or polymer$ or plate$ or layer$))	17899	L8	L8	L8
Date	L7	(electrophore$ or $electrophor$ or (gel$ near separat$))	333744	L7	L7	L7
Date	L6	L5 or L4	114	L6	L6	L6
Date	L5	(WOODHAM).in.	114	L5	L5	L5
Date	L4	(WOODHAM).as.	4	L4	L4	L4
Date	L3	L2 or L1	41505	L3	L3	L3
Date	L2	(204/450-474 or 204/546-553 or 204/614 or 257/59 or 257/72 or 257/253 or 257/51.027 or 436/15 or 436/178 or 436/517).ccls.	21154	L2	L2	L2
Date	L1	(C07K1/26 or G01N27/26 or G01N27/447 or G01N33/68 or H01L33/42).ipc. or (C07K1/26 or G01N27/26 or G01N27/447 or G01N27/44739 or G01N33/68 or H01L33/42 or H01L51/5215).cpc.	22642	L1	L1	L1

DATE: Friday, January 13, 2017 Purge Queries Printable Copy Create Case

Order By	Set Name Side by Side	Query	Hit Count	Set Name Result Set	Set Name Grid	Set Name Classification
		DB=PGPB,USPT,USOC,EPAB,JPAB; PLUR=NO; OP=ADJ				
Date	L50	L48 and L33 and L32 and L31 and L3	0	L50	L50	L50
Date	L49	L48 and L33 and L32 and L31	6	L49	L49	L49

Date	L48	L7 and (gel$ near conduct$)	1313	L48	L48	L48
Date	L47	(L33 or L32) and L31 and L27 and L9 and L8 and L3	12	L47	L47	L47
Date	L46	(L33 or L32) and L31 and L27 and L9 and L8 and L6	0	L46	L46	L46
Date	L45	(L33 or L32) and L31 and L27 and L9 and L8	14	L45	L45	L45
Date	L44	(L33 or L32) and L31 and L9 and L8	41	L44	L44	L44
Date	L43	L33 and (L32 or L31) and L27 and L9 and L8 and L6	0	L43	L43	L43
Date	L42	L33 and (L32 or L31) and L27 and L9 and L8 and L3	12	L42	L42	L42
Date	L41	L33 and (L32 or L31) and L9 and L8 and L3	26	L41	L41	L41
Date	L40	L33 and (L32 or L31) and L9 and L8 and L6	0	L40	L40	L40
Date	L39	L33 and (L32 or L31) and L9 and L8	57	L39	L39	L39
Date	L38	L33 and L32 and L31 and L9 and L8	2	L38	L38	L38
Date	L37	L33 and L32 and L31 and L3	2	L37	L37	L37
Date	L36	L33 and L32 and L31 and L6	0	L36	L36	L36
Date	L35	L33 and L32 and L31 and L22	0	L35	L35	L35
Date	L34	L33 and L32 and L31	55	L34	L34	L34
Date	L33	L7 and ((electrod$ or cathod$ or anod$ or plate$ or paddl$) near (wire$ or lead$))	5608	L33	L33	L33
Date	L32	L7 and ((electrod$ or cathod$ or anod$ or plate$ or paddl$) near resist$)	3563	L32	L32	L32
Date	L31	L7 and (PPy or polypyrrol$ or (poly$ near pyrrol$))	5340	L31	L31	L31
Date	L30	L22 and L8 and L3	0	L30	L30	L30
Date	L29	L22 and L8 and L6	0	L29	L29	L29
Date	L28	L27 and L22 and L9	12	L28	L28	L28
Date	L27	L7 and (electrophore$ or $electrophor$ or (gel$ near separat$)).ab,clm,ti.	34636	L27	L27	L27
Date	L26	L22 and L9 and L3	6	L26	L26	L26
Date	L25	L22 and L9 and L6	0	L25	L25	L25
Date	L24	L22 and L9	38	L24	L24	L24
Date	L23	L22 and L9 and L8	0	L23	L23	L23
Date	L22	L21 or L21	83	L22	L22	L22
Date	L21	L7 and (transparent$ with (electrod$ and (poly$ near (acetylene$ or pyrrole$ or aniline$ or thiophene$ or	83	L21	L21	L21

		ethylenedioxythiophene$ or phenylen$ or vinylene$))))				
Date	L20	L7 and (transparent$ with (electrod$ and (polyacetylene$ OR polypyrrole$ OR PPy OR polyaniline$ OR polythiophene$ OR (poly near ethylenedioxythiophene$) OR polyphenylene$ OR (poly near phenylene$) OR (poly near vinylene$))))	487	L20	L20	L20
Date	L19	L16 and L9 and L8 and L3	10	L19	L19	L19
Date	L18	L16 and L9 and L8 and L6	0	L18	L18	L18
Date	L17	L16 and L9 and L8	84	L17	L17	L17
Date	L16	L15 or L14	3495	L16	L16	L16
Date	L15	L7 and (transparent$ with ((electrod$ or plate$) and (poly near (acetylene$ or pyrrole$ or aniline$ or thiophene$ or ethylenedioxythiophene$ or phenylen$ or vinylene$))))	78	L15	L15	L15
Date	L14	L7 and (transparent$ with ((electrod$ or plate$) and (polymer$ or polyacetylene$ OR polypyrrole$ OR PPy OR polyaniline$ OR polythiophene$ OR (poly near ethylenedioxythiophene$) OR polyphenylene$ OR (poly near phenylene$) OR (poly near vinylene$))))	3493	L14	L14	L14
Date	L13	L10 and L9 and L8 and L3	3	L13	L13	L13
Date	L12	L10 and L9 and L8 and L6	0	L12	L12	L12
Date	L11	L10 and L9 and L8	39	L11	L11	L11
Date	L10	L7 and (transparent$ near electrod$)	7725	L10	L10	L10
Date	L9	L7 and gel$	265172	L9	L9	L9
Date	L8	L7 and blot$	148973	L8	L8	L8
Date	L7	(electrophore$ or $electrophor$ or (gel$ near separat$))	333744	L7	L7	L7
Date	L6	L5 or L4	114	L6	L6	L6
Date	L5	(WOODHAM).in.	114	L5	L5	L5
Date	L4	(WOODHAM).as.	4	L4	L4	L4
Date	L3	L2 or L1	41505	L3	L3	L3
Date	L2	(204/450-474 or 204/546-553 or 204/614 or 257/59 or 257/72 or 257/253 or 257/51.027 or 436/15 or 436/178 or 436/517).ccls.	21154	L2	L2	L2
Date	L1	(C07K1/26 or G01N27/26 or	22642	L1	L1	L1

G01N27/447 or G01N33/68 or
H01L33/42).ipc. or (C07K1/26 or
G01N27/26 or G01N27/447 or
G01N27/44739 or G01N33/68 or
H01L33/42 or H01L51/5215).cpc.

Electronic Database Searched	Google
Files Searched	Google Patent
Date Conducted	24 January 2017

Search Logic:

(electrophoretic separation blotting) (electric (semi conductive) plate) (transparent conductive polymer)
About 2,810 results (0.54 seconds)
(electrophoretic gel separation blotting) (electric (conductive OR semiconductive) (plate OR electrode)) (transparent conductive polymer)
About 6,540 results (0.60 seconds)
(electrophoretic gel separation) (blotting (membrane OR permeable OR semipermeable)) (electric (plate electrode)) (transparent conductive polymer)
About 1,980 results (0.64 seconds)
((electrophoresis OR electrophoretic) gel separation) (blot (membrane OR permeable OR semipermeable)) (electric (plate OR electrode)) (transparent conductive polymer) (electrode (semiconductive OR (semi conductive)))
About 1,750 results (0.34 seconds)
((electrophoresis OR electrophoretic) gel separation) (blot (membrane OR permeable OR semipermeable)) "transparent electrode"
About 26 results (0.78 seconds)
((electrophoresis OR electrophoretic) gel separation) (transparent polymer electrode) (polyacetylene OR polypyrrole OR PPy OR polyaniline OR polythiophene OR (poly ethylenedioxythiophene) OR polyphenylene OR (poly phenylene sulfide) OR poly(phenylene vinylene))
About 535 results (0.64 seconds)
(ppy OR polypyrrole OR (poly pyrrole)) (nickel OR Ni) (electrophoresis gel) (transparent electrode)
About 736 results (0.52 seconds)
(electrophoresis gel) (electrode plate) (low conductivity gel) (filter paper) (blotting membrane)
About 1,450 results (0.59 seconds)
(electrophoresis gel (blot OR electroblot)) (electrode transparent) (((Zn OR zinc OR indium OR In OR tin OR Sn OR aluminum OR aluminium OR Al) oxide) OR alumina OR Al2O3 OR zirconia OR ZrO2)
About 3,960 results (0.80 seconds)

Electronic Database Searched	Google
Files Searched	Google Scholar
Date Conducted	24 January 2017

Search Logic:

(electrophoretic separation blotting) (electric (semi conductive) plate) (transparent conductive polymer)
About 2,790 results (0.08 sec)
(electrophoretic gel separation blotting) (electric (conductive OR semiconductive) (plate OR electrode)) (transparent conductive polymer)
About 6,140 results (0.12 sec)
(electrophoretic gel separation) (blotting (membrane OR permeable OR semipermeable)) (electric (plate electrode)) (transparent conductive polymer)
About 2,060 results (0.07 sec)
((electrophoresis OR electrophoretic) gel separation) (blot (membrane OR permeable OR semipermeable)) (electric (plate OR electrode)) (transparent conductive polymer) (electrode (semiconductive OR (semi conductive)))
About 2,230 results (0.10 sec)
((electrophoresis OR electrophoretic) gel separation) (blot (membrane OR permeable OR semipermeable)) "transparent electrode"
About 58 results (0.07 sec)
((electrophoresis OR electrophoretic) gel separation) (transparent polymer electrode) (polyacetylene OR polypyrrole OR PPy OR polyaniline OR polythiophene OR (poly ethylenedioxythiophene) OR polyphenylene OR (poly phenylene sulfide) OR poly(phenylene vinylene))
About 1,470 results (0.08 sec)
(ppy OR polypyrrole OR (poly pyrrole)) (nickel OR Ni) (electrophoresis gel) (transparent electrode)
About 1,040 results (0.06 sec)
(electrophoresis gel) (electrode plate) (low conductivity gel) (filter paper) (blotting membrane)
About 3,350 results (0.20 sec)
(electrophoresis gel (blot OR electroblot)) (electrode transparent) (((Zn OR zinc OR indium OR In OR tin OR Sn OR aluminum OR aluminium OR Al) oxide) OR alumina OR Al2O3 OR zirconia OR ZrO2)
About 9,080 results (0.13 sec)

Electronic Database Searched	Free Patents Online
Files Searched	(US Pat, PgPub, EPO, JPO, WIPO, NPL: class, keyword)
Date Conducted	24 January 2017

Search Logic:

(electrophoretic separation blotting) (electric (semi conductive) plate) (transparent conductive polymer)
Matches 1 - 50 out of 1236
(electrophoretic gel separation blotting) (electric (conductive OR semiconductive) (plate OR electrode)) (transparent conductive polymer)
Matches 1 - 50 out of 2151
(electrophoretic gel separation) (blotting (membrane OR permeable OR semipermeable)) (electric (plate electrode)) (transparent conductive polymer)
Matches 1 - 50 out of 939
((electrophoresis OR electrophoretic) gel separation) (blot (membrane OR permeable OR semipermeable)) (electric (plate OR electrode)) (transparent conductive polymer) (electrode (semiconductive OR (semi conductive)))
Matches 1 - 50 out of 1353

((electrophoresis OR electrophoretic) gel separation) (blot (membrane OR permeable OR semipermeable)) "transparent electrode"~2
Matches 1 - 50 out of 127
((electrophoresis OR electrophoretic) gel separation) (transparent polymer electrode) (polyacetylene OR polypyrrole OR PPy OR polyaniline OR polythiophene OR (poly ethylenedioxythiophene) OR polyphenylene OR (poly phenylene sulfide) OR poly(phenylene vinylene))
Matches 1 - 50 out of 4722
(ppy OR polypyrrole OR (poly pyrrole)) (nickel OR Ni) (electrophoresis gel) (transparent electrode)
Matches 1 - 50 out of 2442
(electrophoresis gel) (electrode plate) (low conductivity gel) (filter paper) (blotting membrane)
Matches 1 - 50 out of 5866
(electrophoresis gel (blot OR electroblot)) (electrode transparent) (((Zn OR zinc OR indium OR In OR tin OR Sn OR aluminum OR aluminium OR Al) oxide) OR alumina OR Al2O3 OR zirconia OR ZrO2)
Matches 1 - 50 out of 2659

Electronic Database Searched	Pat Base
Files Searched	Full-text: AU BE BR CA CH CN DE DK EP ES FI FR GB IN JP KR SE TH TW US WO Bibliographic: (Europe) AT BA BE BG CH CS CY CZ DD DK EE ES FI GE GR HR HU IE IS IT LT LU LV MC MD MT NL NO PL PT RO RS SE SI SK SM TR UA YU (Asia) EA GC HK ID IL IN KZ MN MY PH RU SG SU TH TJ TW UZ VN (North America) CA CR CU DO GT HN MX NI PA SV TT (South America) AR BR CL CO EC PE UY (Australasia) AU NZ (Africa) AP DZ EG KE MA MW OA ZA ZM ZW
Date Conducted	24 January 2017

Search Logic:

Search 1: (electrophore* or *electrophor* or (gel* near separat*)) (Results 47102)
Search 2: 1 and SP=(transparent* and (conduct* or electrod* or polymer* or plate* or layer*)) (Results 5570)
Search 3: 2 and (blot* or *blot*) (Results 86)
Search 4: 3 and gel* (Results 67)
Search 5: 4 and (transparent* near electrod*) (Results 1)
Search 6: 4 and SP=(transparent* and electrod*) (Results 15)
Search 7: 6 and (polyacetylene* OR polypyrrole* OR PPy OR polyaniline* OR polythiophene* OR (poly near ethylenedioxythiophene*) OR polyphenylene* OR (poly near phenylene*) OR (poly near vinylene*) or (poly* near (acetylene* or pyrrole* or aniline* or thiophene* or ethylenedioxythiophene* or phenylen* or vinylene*))) (Results 3)