

(12) STANDARD PATENT
(19) AUSTRALIAN PATENT OFFICE

(11) Application No. **AU 2007297397 B2**

(54) Title
Surgical console

(51) International Patent Classification(s)
A61B 19/02 (2006.01) **B65B 31/04** (2006.01)
B65B 1/30 (2006.01)

(21) Application No: **2007297397** (22) Date of Filing: **2007.09.14**

(87) WIPO No: **WO08/036555**

(30) Priority Data

(31) Number	(32) Date	(33) Country
60/845,387	2006.09.18	US

(43) Publication Date: **2008.03.27**

(44) Accepted Journal Date: **2012.08.09**

(71) Applicant(s)
Alcon, Inc.

(72) Inventor(s)
Hopkins, Mark A.;Turner, Denis P.;Huculak, John C.

(74) Agent / Attorney
Phillips Ormonde Fitzpatrick, 367 Collins Street, Melbourne, VIC, 3000

(56) Related Art
US 6073759
US 2006/0068031

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
27 March 2008 (27.03.2008)

PCT

(10) International Publication Number
WO 2008/036555 A3

(51) International Patent Classification:
B65B 1/30 (2006.01)

(21) International Application Number:
PCT/US2007/078442

(22) International Filing Date:
14 September 2007 (14.09.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
60/845,387 18 September 2006 (18.09.2006) US

(71) Applicant (for all designated States except US): **ALCON, INC.** [CH/CH]; PO Box 62, Bosch 69, CH-6331 Hunenberg (CH).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **HOPKINS, Mark A.** [US/US]; 26691 San Gonzalo, Mission Viejo, Ca 92691 (US). **HUCULAK, John C.** [US/US]; 26691 San Gonzalo, Mission Viejo, CA 92691 (US). **TURNER, Denis P.** [CL/US]; 1930 Elevado Raod, Vista, CA 92084 (US).

(74) Agents: **LEE, W. David** et al.; Alcon Research, Ltd., IP Legal, Mail Code TB4-8, 6201 South Freeway, Fort Worth, Texas 76134 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

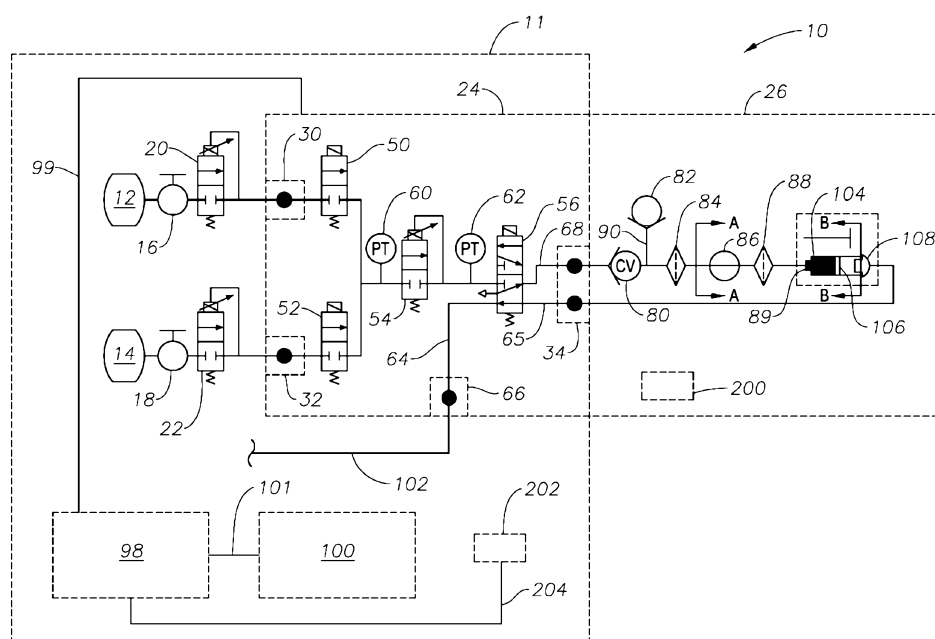
(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
10 July 2008

(54) Title: SURGICAL CONSOLE



(57) Abstract: A surgical console having bottles containing retinal tamponading gases and an automatic gas filling module disposed therein for filling an automatic gas filling consumable is disclosed. The automatic gas filling module includes a pair of gas shut-off valves and a regulator connected in series with a port for connection to the automatic gas filling consumable.

SURGICAL CONSOLE

This application claims the priority of U.S. Provisional Application Serial No. 60/845,387 filed on September 18, 2006.

Field of the Invention

5 The present invention generally pertains to vitreoretinal surgery and more particularly to improved systems for helping to perform fluid exchanges typically used in such surgeries.

Description of the Related Art

10 In a healthy human eye, the retina is physically attached to the choroid in a generally circumferential manner behind the pars plana. The vitreous humor, a transparent jelly-like material that fills the posterior segment of the eye, helps to cause the remainder of the retina to lie against, but not physically attach, to the choroid.

Sometimes a portion of the retina becomes detached from the choroid. Other times a portion of the retina may tear, allowing vitreous humor, and sometimes 15 aqueous humor, to flow between the retina and the choroid, creating a build up of subretinal fluid. Both of these conditions result in a loss of vision.

To surgically repair these conditions, a surgeon typically inserts a vitrectomy probe into the posterior segment of the eye via a sclerotomy, an incision through the sclera at the pars plana. The surgeon typically also inserts a fiber optic light source 20 and an infusion cannula into the eye via similar incisions, and may sometimes substitute an aspiration probe for the vitrectomy probe. While viewing the posterior segment under a microscope and with the aid of the fiber optic light source, the surgeon cuts and aspirates away vitreous using the vitrectomy probe to gain access to

the retinal detachment or tear. The surgeon may also use the vitrectomy probe, scissors, a pick, and/or forceps to remove any membrane that has contributed to the retinal detachment or tear. During this portion of the surgery, a saline solution is typically infused into the eye via the infusion cannula to maintain the appropriate
5 intraocular pressure.

Next, the surgeon must manipulate the detached or torn portion of the retina to flatten against the choroid in the proper location. A soft tip cannula, forceps, or pick is typically utilized for such manipulation. Many surgeons also inject perfluorocarbon liquid as a retinal tamponading fluid into the posterior segment of the eye while
10 aspirating the saline solution in the posterior segment to help cause the detached or torn portion of the retina to flatten against the choroid in the proper location. This procedure is typically referred to as a “fluid/perfluorocarbon” exchange. Other surgeons inject air as a retinal tamponading fluid into the posterior segment of the eye while aspirating the saline solution. This procedure is typically referred to as a
15 “fluid/air” exchange. Finally, other surgeons inject a mixture of air and a gas such as SF₆, C₃F₈, or C₂F₆ as a retinal tamponading fluid into the posterior segment of the eye while aspirating the saline solution. This procedure is typically referred to as a “fluid/gas” exchange. As used herein, a “fluid” may include any liquid or gas that is suitable for use in the eye, including, but not limited to, saline solution with or
20 without additives, silicone oil, a perfluorocarbon liquid, air, or a perfluorocarbon gas. The fluid exchange process is most typically performed by using a syringe filled with gas.

The process of filling the syringe with gas is currently time consuming. The process of filling the syringe with gas is a two person activity, requiring one person to
25 be sterile, and one person not to be sterile. Often times, the coordination of activity

between the two individuals results in the loss of gas and a waste of time, and, possibly, the violation of the sterile field.

As a result, a need still exists in vitreoretinal surgery for an improved system for helping to fill syringes with gas to be used in a fluid/gas exchange. The system should
5 allow a scrub nurse to fill the gas syringe single handed, allow the nurse to maintain the integrity of the sterile field, eliminate the waste of expensive gas, provide early warning when gas bottles are depleted, and eliminate time loss as a result of mistakes.

A reference herein to a patent document or other matter which is given as prior art
10 is not to be taken as an admission that the document or matter was known or that the information it contains was part of the common general knowledge as at the priority date of any of the claims.

Where the terms “comprise”, “comprises”, “comprised” or “comprising” are used
15 in this specification (including the claims) they are to be interpreted as specifying the presence of the stated features, integers, steps or components, but not precluding the presence of one or more other features, integers, steps or components, or group thereof.

Summary of the Invention

According to a first aspect, the present invention provides an ophthalmic surgical system comprising: a surgical console, comprising: a graphical user interface configured
20 to allow a user to select a retinal tamponading gas; a microprocessor; a first bottle containing a first pressurized retinal tamponading gas removably disposed within said console; a second bottle containing a second pressurized retinal tamponading gas removably disposed within said console; the system further comprising an automatic gas filling module disposed within said console, the module comprising: a port for fluidly
25 coupling with an automatic gas filling consumable; a first shutoff valve fluidly coupled to said first bottle; a second shutoff valve fluidly coupled to said second bottle; and a pressure regulator fluidly coupled to said first shutoff valve and said second shutoff valve; and wherein the microprocessor is electrically coupled to said automatic gas filling module and to the graphical user interface and is configured such that selection, by a user,
30 of a retinal tamponading gas via the graphical user interface provides a filling of the gas filling consumable with said retinal tamponading gas from one of said first or said second bottles.

According to a second aspect, the present invention provides a method of filling a syringe with a retinal tamponading gas using the ophthalmic surgical system of the first aspect comprising the step of: fluidly coupling an automatic gas filling consumable
5 containing a syringe to a port of an ophthalmic surgical console; using a graphical user interface of said console to allow a user to select a retinal tamponading gas; in response to said selection, effecting a filling of said syringe with said retinal tamponading gas from said console via microprocessor control; and removing said syringe from said automatic gas filling consumable.

Brief Description of Drawings

For a more complete understanding of the present invention, and for further objects and advantages thereof, reference is made to the following description taken in conjunction with the accompanying drawing in which Figure 1 is a schematic view of a
15 surgical system including an automatic gas filling module and an automatic gas filling consumable.

Detailed Description of the Preferred Embodiments

The preferred embodiments of the present invention and their advantages are best understood by referring to Figure 1 of the drawings. Surgical system 10 generally includes a surgical console 11 and an automatic gas filling consumable 26. Surgical
5 system 10 is preferably an ophthalmic surgical system.

Surgical console 11 preferably includes a pressurized gas bottle 12 having an integral valve 16 and regulator 20, a pressurized gas bottle 14 having an integral valve 18 and regulator 22, an automatic gas filling module 24 having an automatic gas filling port 34, a microprocessor 98 electrically coupled to automatic gas filling
10 module 24 via an interface 99, a graphical user interface 100 electrically coupled to microprocessor 98 via interface 101, and a pressurized air line 102 capable of providing pressurized air in a proportional manner. Pressurized gas bottle 12 preferably holds a first retinal tamponading gas such as, by way of example, C_3F_8 . Pressurized gas bottle 14 preferably holds a second retinal tamponading gas such as,
15 by way of example, SF_6 . Gas bottles 12 and 14, valves 16 and 18, and regulators 20 and 22 are fluidly coupled with automatic gas filling module 24 via connection points 30 and 32. Likewise, automatic gas filling module 24 is fluidly coupled with automatic gas filling consumable 26 via automatic gas filling port 34.

Automatic gas filling module 24 preferably includes shutoff valves 50 and 52,
20 each of which is fluidly coupled with a regulator 54. Regulator 54 is fluidly coupled to timing valve 56. A pair of pressure transducers 60 and 62 are positioned on either side of regulator 54 to monitor gas pressure and flow. Alternatively, pressure transducer 60 may be positioned between regulator 54 and transducer 62. Pressurized air line 102 is fluidly coupled to automatic gas filling module 24 via connection point
25 66, and is also fluidly coupled with timing valve 56 via a gas line 64. A gas line 68

fluidly couples timing valve 56 and automatic gas filling port 34. A gas line 65 fluidly couples gas line 64 and automatic gas filling port 34 via timing valve 56. Alternatively, timing valve 56 may be eliminated, and a shutoff valve (not shown) may be included on pressurized air line 102 instead.

5 Automatic gas filling consumable 26 preferably includes a check valve 80 fluidly coupled to automatic gas filling port 34 via gas line 68. A relief valve 82 is fluidly coupled with gas line 68 via a gas line 90. Gas line 68 also fluidly couples filter 84, stop cock 86, filter 88, and a distal end 89 of a syringe 104. Pressurized air line 102 is fluidly coupled to an end cap 108 of syringe 104 via gas lines 64 and 65.

10 Gas bottles 12 and 14 are installed in console 11 with valves 16 and 18 open, and with regulators 20 and 22 pre-set. During operation, a scrub nurse will insert a sterile automatic gas filling consumable 26 into automatic gas filling port 34 on automatic gas filling module 24. Preferably, an RFID tag 200 on consumable 26 will be read by an RFID receiver 202 within surgical console 11. RFID receiver 202 is
15 electrically coupled to microprocessor 98 via an interface 204. Surgical console 11 will thus detect that consumable 26 is an automatic gas filling consumable, and will populate the graphical user interface 100 appropriately. Alternatively, population of graphical user interface 100 may be performed manually in the event that RFID is not available.

20 Using graphical user interface 100, the scrub nurse will then select the retinal tamponading gas to be used and initiate the automatic gas filling process. At this point, depending on the retinal tamponading gas selected, microprocessor 98 opens one of gas shutoff valves 50 or 52. Regulator 54 will regulate the gas to a preset pressure that will flow to timing valve 56. Pressure transducers 60 and 62 will be
25 monitored to verify that sufficient gas pressure and flow are available (i.e. that the

readings in pressure transducers 60 and/or 62 are at or near the set point of regulator 54). In the event that sufficient gas pressure and flow are not available, microprocessor 98 will signal the scrub nurse via graphical user interface 100 that the active gas bottle 12 or 14 needs to be replaced.

5 Next, timing valve 56 will be energized, and retinal tamponading gas will flow through automatic gas filling port 34 into automatic gas filling consumable 26, and into distal end 89 of syringe 104. Gas pressure will overcome the friction of a stopper 106 within syringe 104, and stopper 106 will travel toward end cap 108, filling syringe 104 with retinal tamponading gas. Pressurized air within pressurized air line 102 will
10 be vented to atmosphere during this process.

 Timing valve 56 will then be closed and pressurized air from pressurized air line 102 will be supplied to end cap 108 of syringe 104, overcoming the friction of stopper 106 and allowing retinal tamponading gas to flow through syringe 104, filter 88, stop cock 86, and filter 84. Relief valve 82 is overcome so that retinal
15 tamponading gas is vented to atmosphere. Microprocessor 98 repeats this cycle of introducing gas to syringe 104, and purging gas from syringe 104, a sufficient number of times until the concentration of retinal tamponading gas within syringe 104 is at or near 100%. In the embodiment where timing valve 56 is not utilized, microprocessor 98 controls the opening, closing, and cycling of (a) either shutoff valve 50 or 52 and
20 (b) the shutoff valve on pressurized air line 102 in a manner similar to that described above.

 The scrub nurse will then remove end cap 108 from syringe 104 and will install a plunger (not shown) into syringe 104. The scrub nurse then closes stop cock 86 and disconnects consumable 26 from surgical console 11 at section A. Gas filled
25 syringe 104 is then presented to the surgeon for final mixing and administration. The

portion of automatic gas filling consumable 26 that remains on console 11 will be removed and discarded when the case is complete.

From the above, it may be appreciated that the present invention provides improved apparatus and methods for helping to fill a syringe with gas and helping to perform fluid/gas exchanges in vitreoretinal surgery. The system allows a scrub nurse to fill a gas syringe single handed, allows the nurse to maintain the integrity of the sterile field, eliminates the waste of expensive gas, provides an early warning when gas bottles are near depleted, and saves time lost due to mistakes.

It is believed that the operation and construction of the present invention will be apparent from the foregoing description. While the apparatus and methods shown or described above have been characterized as being preferred, various changes and modifications may be made therein without departing from the spirit and scope of the invention as defined in the following claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. An ophthalmic surgical system comprising:
a surgical console, comprising:
5 a graphical user interface configured to allow a user to select a retinal tamponading gas;
a microprocessor;
a first bottle containing a first pressurized retinal tamponading gas removably disposed within said console;
10 a second bottle containing a second pressurized retinal tamponading gas removably disposed within said console;
the system further comprising an automatic gas filling module disposed within said console, the module comprising:
15 a port for fluidly coupling with an automatic gas filling consumable;
a first shutoff valve fluidly coupled to said first bottle;
a second shutoff valve fluidly coupled to said second bottle; and
a pressure regulator fluidly coupled to said first shutoff valve and said second shutoff valve; and
wherein the microprocessor is electrically coupled to said automatic gas filling module
20 and to the graphical user interface and is configured such that selection, by a user, of a retinal tamponading gas via the graphical user interface provides a filling of the gas filling consumable with said retinal tamponading gas from one of said first or said second bottles.
- 25 2. The surgical console of claim 1 wherein said first gas bottle contains C_3F_8 .
3. The surgical console of claim 2 wherein said second gas bottle contains SF_6 .
4. The surgical console of any one of the preceding claims wherein said automatic
30 gas filling module further comprises a timing valve fluidly coupled to said port, and wherein said pressure regulator is fluidly coupled to said timing valve.
5. The surgical console of claim 4 further comprising a pressurized air line disposed within said console and fluidly coupled to said timing valve and said port.

6. The surgical console of any one of the preceding claims further comprising a pressurized air line disposed within said console and fluidly coupled to said port and a third shutoff valve disposed on said pressurized air line, and wherein said microprocessor
5 is electrically coupled to said third shutoff valve.

7. The surgical console of any one of the preceding claims wherein said automatic gas filling consumable comprises a syringe.

10 8. A method of filling a syringe with a retinal tamponading gas using the ophthalmic surgical system of claim 1 comprising the step of:

fluidly coupling an automatic gas filling consumable containing a syringe to a port of an ophthalmic surgical console;

15 using a graphical user interface of said console to allow a user to select a retinal tamponading gas;

in response to said selection, effecting a filling of said syringe with said retinal tamponading gas from said console via microprocessor control; and

removing said syringe from said automatic gas filling consumable.

20 9. The method of claim 8 further comprising the step of purging said gas and air disposed within said syringe to atmosphere using a pressurized air line fluidly coupled to an end cap of said syringe.

10. The method of claim 9 further comprising the step of:

25 repeating said filling step and said purging step until said syringe contains substantially one said retinal tamponading gas and none of said air.

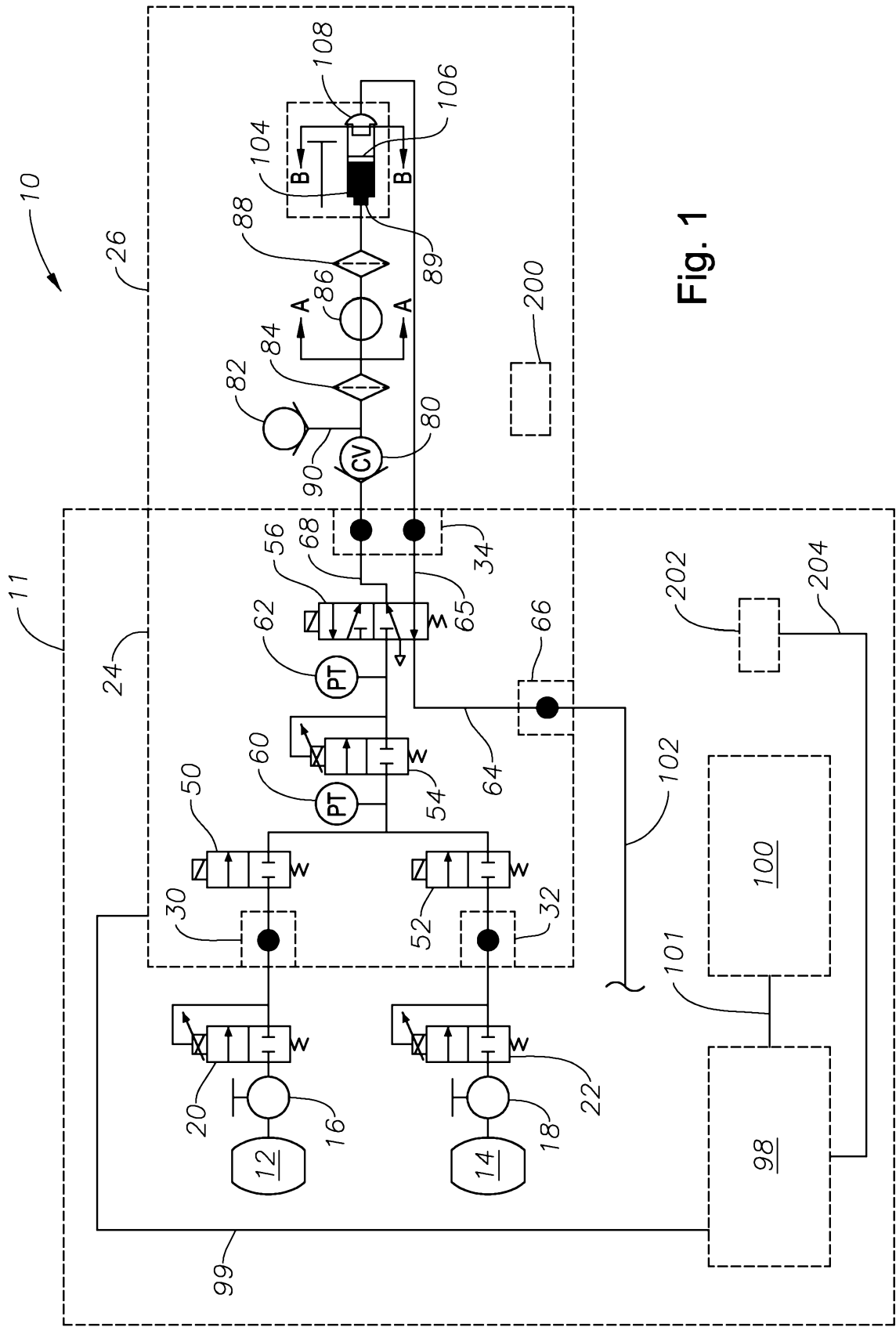


Fig. 1