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(71) Applicant: **Tai Su Energy Technology Co., Ltd.**
Taoyuan City 33852 (TW)

(72) Inventor: **LIAO, Chiu-Huei**
33852 Taoyuan City (TW)

(74) Representative: **Cabinet Chaillot**
16/20, avenue de l'Agent Sarre
B.P. 74
92703 Colombes Cedex (FR)

(54) ENERGY-SAVING DYEING MACHINE

(57) An energy-saving dyeing machine includes a body (10), a liquid dyes supply device (20), a liquid dyes heating device (30) having a direct-heating heat exchanger (31), and a cooling unit (70) connecting to the direct-heating heat exchanger (31) by a series connection. When heating up the liquid dyes (L), the liquid dyes (L) enters the direct-heating heat exchanger (31) from the liquid dyes supply device (20) via a supply tube (25), saving several heating procedures and unnecessary energy wastes. Additionally, an outer wall (15) is surrounding the body (10) to form a surrounding space (16) for the heated exhaust gas (G) from the direct-heating heat exchanger (31) to enter and reheat the liquid dyes (L) in the body (10) again, making a better use of the heat energy.

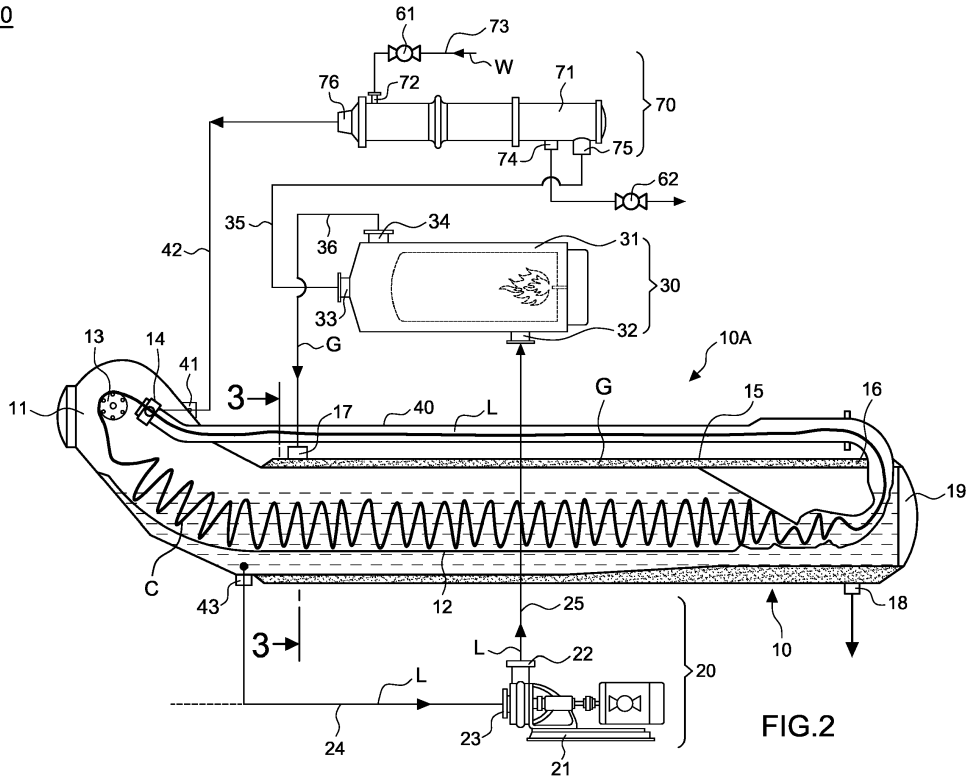

FIG.2

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention:

[0001] The present invention relates to a dyeing machine, particularly to one that has a direct-heating heat exchanger to heat up liquid dyes and further heats up the liquid dyes in a body thereof by the heated exhaust gas in order to make a better use of the heat energy and reduce unnecessary wastes.

2. Description of the Related Art

[0002] A conventional dyeing machine has structures as shown in FIG. 1, mainly including a body **110**, a liquid dye supply device **120**, and a guiding tube **140**. The bodying has a head portion **111** with a rolling reel **113** and a nozzle **114**, and a storage tank **112**. The liquid dye supply device **120** sucks in liquid dyes by a main pump **121** and a dosing pump **123** from a dosing tank **122** to flow through a heat exchanger **130** via a linking tube **124** to the nozzle **114**. The guiding tube **140** links the nozzle **114** to the rear of the body **110**, forming a routine for a piece of fabric **141** to go through a circulation dipping.

[0003] Furthermore, the heat exchanger **130** has an inlet for steams **131**, an entry for cooled water **132**, an exit for cooled water **133**, an outlet for sewage water **134**, and a manual discharging outlet **135**, so as to conduct heat exchange by steams **131** produced by a boiler with the liquid dyes. The boiler has fuels to produce heat and steams to be delivered to the heat exchanger **130** for heat exchange; in the process, the heat energy produced by the fuels have to go through several converting and delivery process before conducting heat exchanges, among which there are unnecessary wastes of heat energies; for example, the heat energies lost in conversion and steams loss in the delivery process.

[0004] In order to improve the unnecessary wastes in heat energies in the dyeing process, a direct-heating heat exchanger is developed. It has fuels to produce heated gas and directly heats up liquid dyes thereby, saving the delivery and conversion process in the conventional dyeing machine. However, after conducting the direct heating, the exhaust gas is discharged immediately, which becomes another waste in the dyeing process and therefore leaves some room for improvements in the field..

SUMMARY OF THE INVENTION

[0005] It is a primary object of the present invention to provide an energy-saving dyeing machine that has a direct-heating heat exchanger to heat up liquid dyes to reduce unnecessary energy wastes in the prior art.

[0006] Another object of the present invention is to provide an energy-saving dyeing machine that reapplies the heated exhaust gas to make a better use of the hear energy in the heating process.

[0007] In order to achieve the objects above, the present invention mainly comprises a body, a liquid dyes supply device, a liquid dyes heating device, and a cooling unit according to the annexed Claim 1.

[0008] Whereby when heating up liquid dyes, the exit valve is closed and liquid dyes enter the direct-heating heat exchanger from the liquid dyes supply device via the supply tube for heating, then flow through the series connected pipeline and the cooling unit without cooling and flow into the body via the entering tube; while cooling down liquid dyes, the exit valve is opened and liquid dyes enter the direct-heating heat exchanger from the liquid dyes supply device via the supply tube without heating, then flow through the series connected pipeline into the heat exchanger for cooling, and flow into the body via the entering tube.

[0009] With structures disclosed above, the body includes an outer wall to define a surrounding space for heating. The surrounding space has an intake port arranged aside and an exit port arranged at the other side, and the exhaust gas outlet of the direct-heating heat exchanger has an exhaust gas duct connecting the intake port of the surrounding space thereby the heated exhaust gas is able to enter the surrounding space to heat up liquid dyes in the body for a second time, making a better use of the heat energy. The body further includes a head portion with a rolling reel and a nozzle connecting to the entering port for liquid dyes, a storage tank, and a guiding tube linking the nozzle to a rear section of the body for circulation dipping.

[0010] As stated above, the present invention has the direct-heating heat exchanger to heat up liquid dyes by the heated gas, saving several heating procedures and unnecessary energy wastes in a conventional dyeing machine. In addition, the present invention further uses the heated exhaust gas reheat the liquid dyes in the body to make a better use of the heat energy.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

FIG. 1 is a schematic diagram illustrating structures of a conventional dyeing machine;
FIG. 2 is a schematic diagram illustrating structures of the present invention as a horizontal dyeing machine;
FIG. 3 is a sectional view of a body of the horizontal dyeing machine;
FIG. 4 is a schematic diagram illustrating structures of a direct-heating heat exchanger of the present invention;
FIG. 5 is a schematic diagram illustrating the horizontal dyeing machine heating up liquid dyes; and
FIG. 6 is a schematic diagram illustrating the horizontal dyeing machine cooling down liquid dyes.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0012] Referring to FIG. 2, in an applicable embodiment, a horizontal energy-saving dyeing machine **100** mainly includes a body **10**, a guiding tube **40**, a liquid dyes supply device **20**, a liquid dyes heating device **30**, and a cooling unit **70**. In this embodiment, the body **10** is horizontally arranged but it is not limited to such application. It can be vertically arranged as well.

[0013] The body **10** includes a head portion **11**, a storage tank **12**, an entering port for liquid dyes **41** arranged above, connecting to an entering tube **42**, and an exiting port for liquid dyes **43** arranged below, connecting to an exiting tube **24**. The head portion **11** further includes a rolling reel **13** and a nozzle **14** connecting to the entering port for liquid dyes **41**. The guiding tube **40** links the nozzle **14** to a rear section **19** of the body **10** for circulation dipping.

[0014] The features of the present invention are described as following. The body **10** further includes an outer wall **15** to define a surrounding space **16** for heating, and the surrounding space **16** has an intake port **17** arranged aside and an exit port **18** arranged at the other side. The liquid dyes supply device **20** is arranged outside the body **10**, including a pump **21** for pressuring liquid dyes **L**, an outlet **22** connecting to a supply tube **25**, and an inlet **23** connecting to the exiting tube **24**. The liquid dyes heating device **30** is arranged outside the body **10**, including a direct-heating heat exchanger **31** to heat up liquid dyes **L**, and an exhaust gas outlet **34** connecting to an exhaust gas duct **36** for discharging heated exhaust gas **G.** The direct-heating heat exchanger **31** includes a first entry **32** connecting to the supply tube **25** and a first exit **33** connecting to a series connected pipeline **35** for discharging heated liquid dyes **L.** The exhaust gas duct **36** further connects to the intake port **17** of the surrounding space **16**, thereby the heated exhaust gas **G** is able to enter the surrounding space **16** to heat up the liquid dyes **L** in the body **10.**

[0015] The cooling unit **70** is arranged outside the body **10** near the liquid dyes heating device **30**, including a heat exchanger **71** to cool down the liquid dyes **L**. The heat exchanger **71** has an entering port for liquid dyes **72** connecting to an entry valve **61** and a cooled water supply tube **73**, an exiting port for liquid dyes **74** connecting to an exit valve **62** for discharging cooled water **W**, a second entry **75** connecting to the series connected pipeline **35**, and a second exit **76** connecting to the entering tube **42**.

[0016] FIG. 3 is a sectional view of the body **10**. The storage tank **12** is arranged at a lower position thereof for dipping a piece of fabric **C.** After being discharged from the direct-heating heat exchanger **31** via the exhaust gas duct **36**, the heated exhaust gas **G** enters the surrounding space **16** via the intake port **17** and reheats the liquid dyes **L** by another heat exchange process before being discharged from the exit port **18**.

[0017] Further referring to FIG. 4, the direct-heating heat exchanger **31** includes an inner room **53**, an intermediate room **52**, an outer room **51**, and a heating unit **54**. The inner room **53** has a heating room **57** therein and an inner entry **531** arranged aside. The intermediate room **52** is surrounding the inner room **53**, defining a heat exchanging room **56** connecting the first entry **32** and the first exit **33**. The outer room **51** is surrounding the intermediate room **52**, defining a discharging room **55** connecting to the exhaust gas outlet **34**. The discharging room further includes a plurality of connecting holes **532** connecting through the heating room **57** and an outer entry **512** arranged corresponding to the inner entry **531**. The heating unit **54** is arranged at the outer entry **512** to send fuels into the heating room **57**.

[0018] FIG. 5 illustrates the operation of the present invention heating up liquid dyes **L**. When conducting heating, the direct-heating heat exchanger **31** and the heating unit **54** are activated to send the fuels into the heating room **57** to produce heat energy, then the entry valve **61** and the exit valve **62** are closed for liquid dyes **L** to enter the direct-heating heat exchanger **31** from the liquid dye supply device **20** via the supply tube **25** for heating. After the heating, liquid dyes **L** flow to the cooling unit **70** via the series connected pipeline **35** and then into the body **10** via the entering tube for liquid dyes **42** and the nozzle **14** to arrive the storage tank **12**. The heated exhaust gas **G** after heat exchanging process with liquid dyes **L** in the direct-heating heat exchanger **31** then enters the surrounding space **16** via the exhaust gas duct **36** to reheat the liquid dyes **L** in the body **10**.

[0019] FIG. 6 illustrates the operation of the present invention cooling down liquid dyes **L.** When conducting cooling, the heat exchanger **71** of the cooling unit **70** is activated, and the entry valve **61** and exit valve **62** are opened for cooled water **W** to enter the heat exchanger **71** from the cooled water supply tube **73**. Then the liquid dyes heating device **30** is closed and liquid dyes **L** flows through the liquid dye supply device **20** via the supply tube **25** and the liquid dyes heating device **30** to enter the heat exchanger **71** via the series connected pipeline **35** for cooling. After cooling, liquid dyes **L** flow into the body **10** via the nozzle **14** to arrive the storage tank **12**.

[0020] In short, the present invention has the direct-heating heat exchanger **31** to heat up liquid dyes **L** by the heated exhaust gas **G**, saving several heating procedures and unnecessary energy wastes in a conventional dyeing machine. In addition, the present invention further has the surrounding space **16** formed between the body **10** and the outer wall **15** to reuse the heated exhaust gas **G** for heating the liquid dyes **L** in the body **10** for a second time to make a better use of the heat energy.

[0021] Although particular embodiment of the invention has been described in detail for purposes of illustration, various modifications and enhancements may be made without departing from the spirit and scope of the invention. Accordingly, the invention is not to be limited

except by the appended claims.

Claims

1. An energy-saving dyeing machine, comprising:

a body (10) having an entering port (41) for liquid dyes arranged aside, connecting to an entering tube (42), and an exiting port (43) for liquid dyes arranged at the other side, connecting to an exiting tube (24) for liquid dyes circulation;
a liquid dyes supply device (20) arranged outside said body (10), including a pump (21) for pressuring, an outlet (22) connecting to a supply tube (25), and an inlet (23) connecting to said exiting tube (24);
a liquid dyes heating device (30) arranged outside said body (10) near the liquid dyes supply device (20), including a direct-heating heat exchanger (31) to heat up liquid dyes (L), said direct-heating heat exchanger (31) including an inner room (53) having a heating room (57) therein and an inner entry (531) arranged aside, an intermediate room (52) surrounding said inner room (53), defining a heat exchanging room (56) with a first entry (32) connecting to said supply tube (25) and a first exit (33) connecting to a series connected pipeline (35) for discharging heated liquid dyes (L), an outer room (51) surrounding said intermediate room (52), defining a discharging room (55) with a exhaust gas outlet (34) and including a plurality of connecting holes (532) connecting through said heating room (57) and an outer entry (512) arranged corresponding to said inner entry (531), and a heating unit (54) arranged at said outer entry (512) to send in fuels into the heating room (57); and
a cooling unit (70) arranged outside said body (10) near said liquid dyes heating device (30), including a heat exchanger (71) to cool down liquid dyes (L), said heat exchanger (71) having an entering port (72) for cooled water connecting to an entry valve (61) and a cooled water supply tube (73), an exiting port (74) for cooled water connecting to an exit valve (62) for discharging cooled water (W), a second entry (75) connecting to said series connected pipeline (35), and a second exit (76) connecting to said entering tube (42);
whereby when heating up liquid dyes (L), the exit valve (62) is closed and liquid dyes (L) enter the direct-heating heat exchanger (31) from the liquid dyes supply device (20) via the supply tube (25) for heating, then flow through the series connected pipeline (35) and the cooling unit (70) without cooling and flow into the body (10) via the entering tube (42); while cooling down liquid dyes (L), the exit valve (62) is opened and liquid dyes (L) enter the direct-heating heat exchanger (31) from the liquid dyes supply device (20) via the supply tube (25) without heating, then flow through the series connected pipeline (35) into the heat exchanger (71) for cooling, and flow into the body (10) via the entering tube (42).

2. The energy-saving dyeing machine as claimed in claim 1, wherein the body (10) includes an outer wall (15) to define a surrounding space (16) for heating, said surrounding space (16) has an intake port (17) arranged aside and an exit port (18) arranged at the other side; and the exhaust gas outlet (34) of the direct-heating heat exchanger (31) has an exhaust gas duct (36) connecting the intake port (17) of the surrounding space (16) thereby the heated exhaust gas (G) is able to enter the surrounding space (16) to heat up liquid dyes (L) in the body (10) for a second time.

3. The energy-saving dyeing machine as claimed in claim 1, wherein the body (10) further includes a head portion (11) with a rolling reel (13) and a nozzle (14) connecting to the entering port (41) for liquid dyes, a storage tank (12), and a guiding tube (40) linking the nozzle (14) to a rear section (19) of the body (10) for circulation dipping.

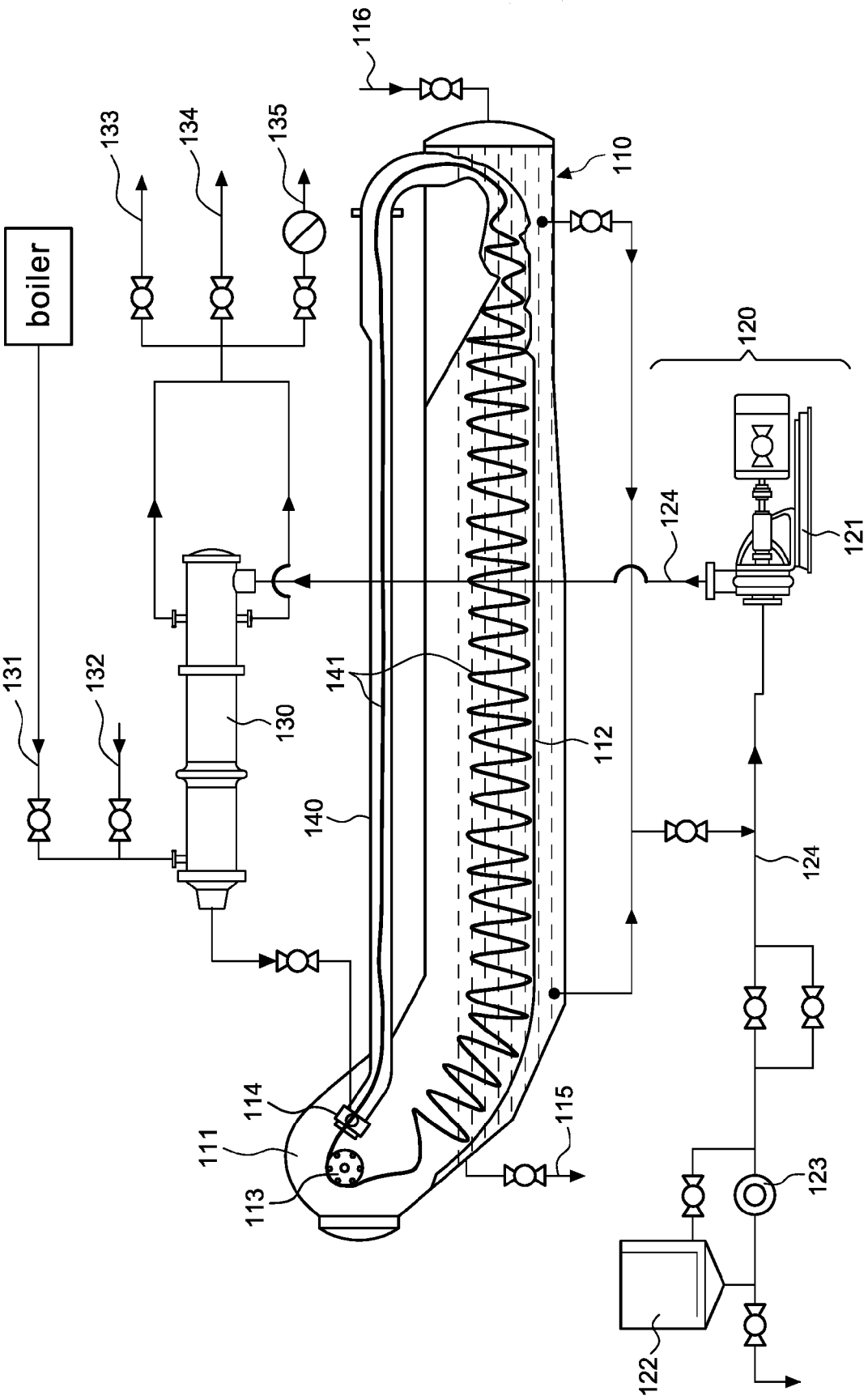

FIG.1
PRIOR ART

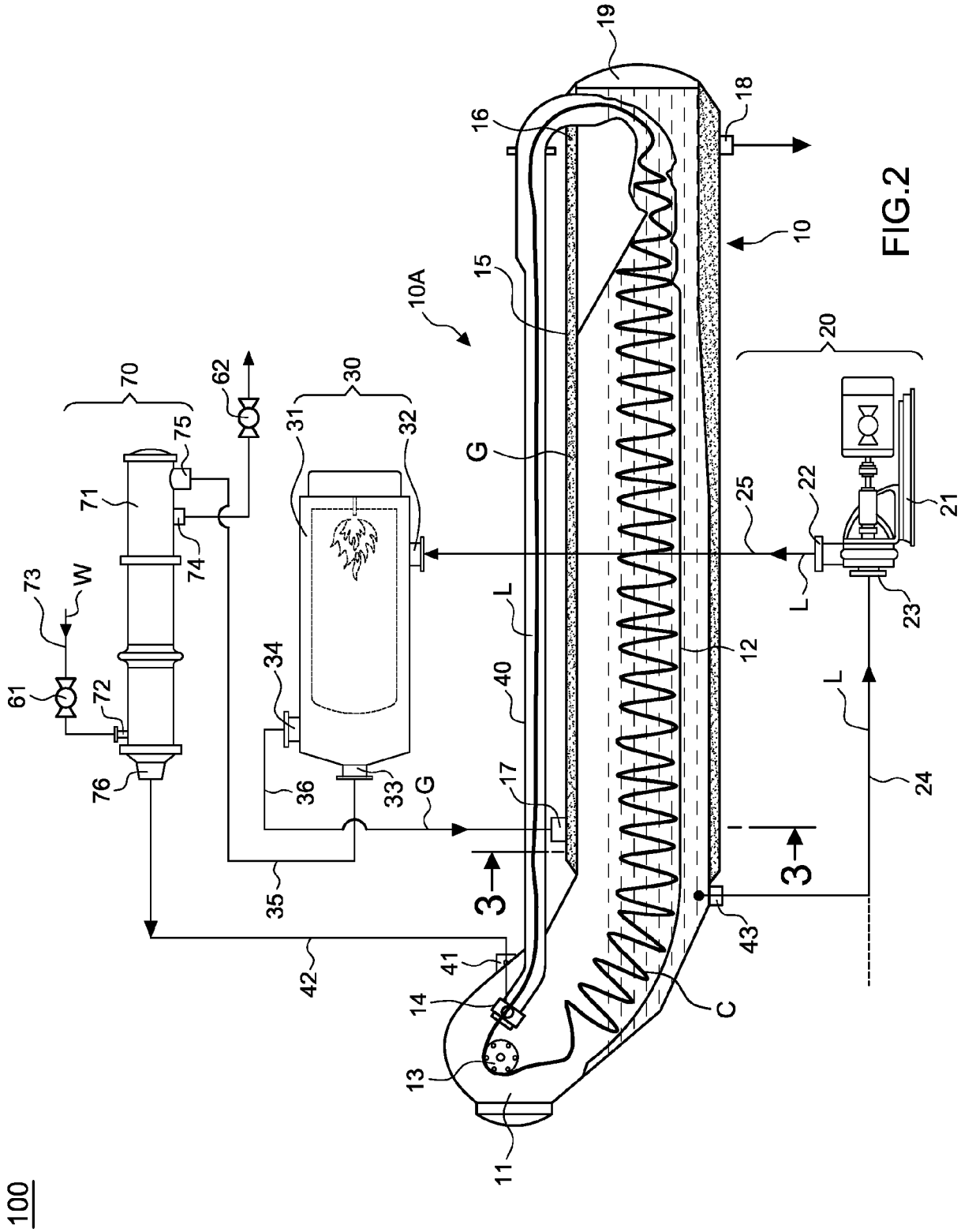
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FIG.2

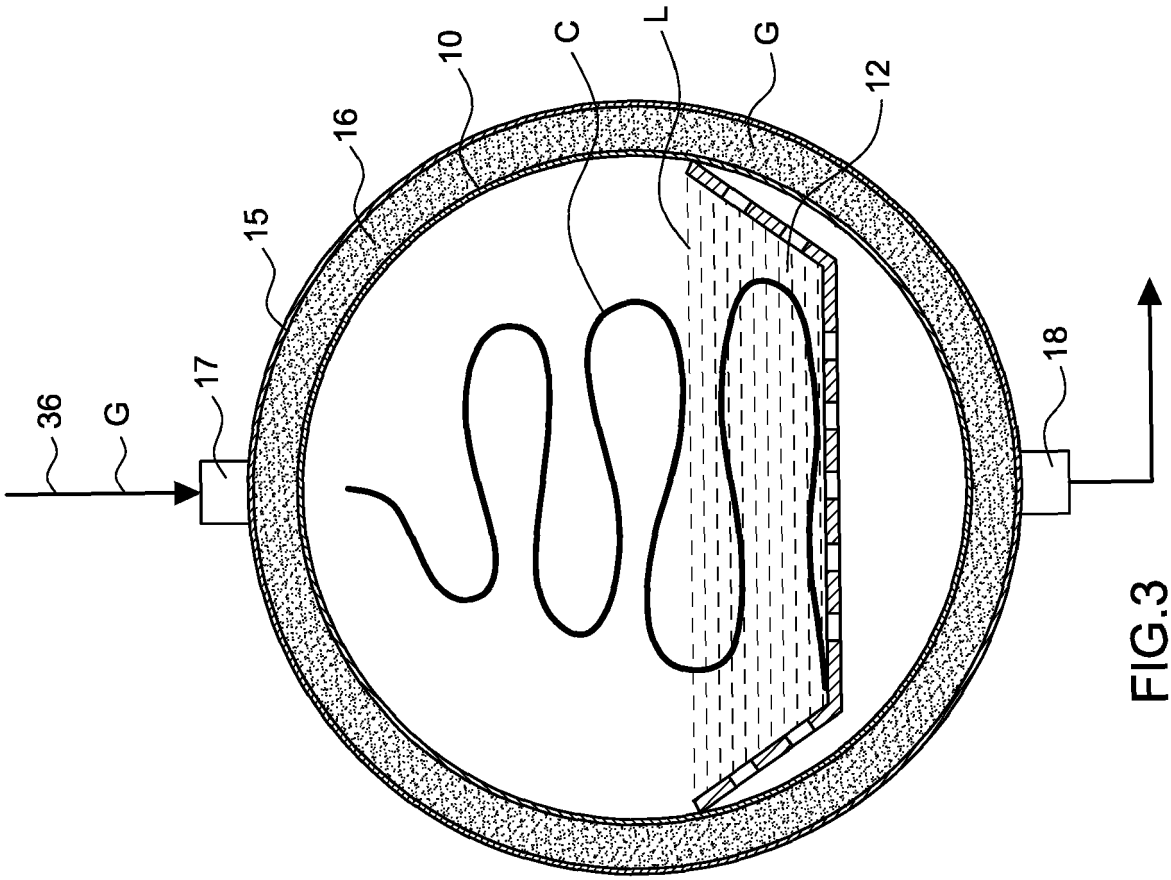

FIG.3

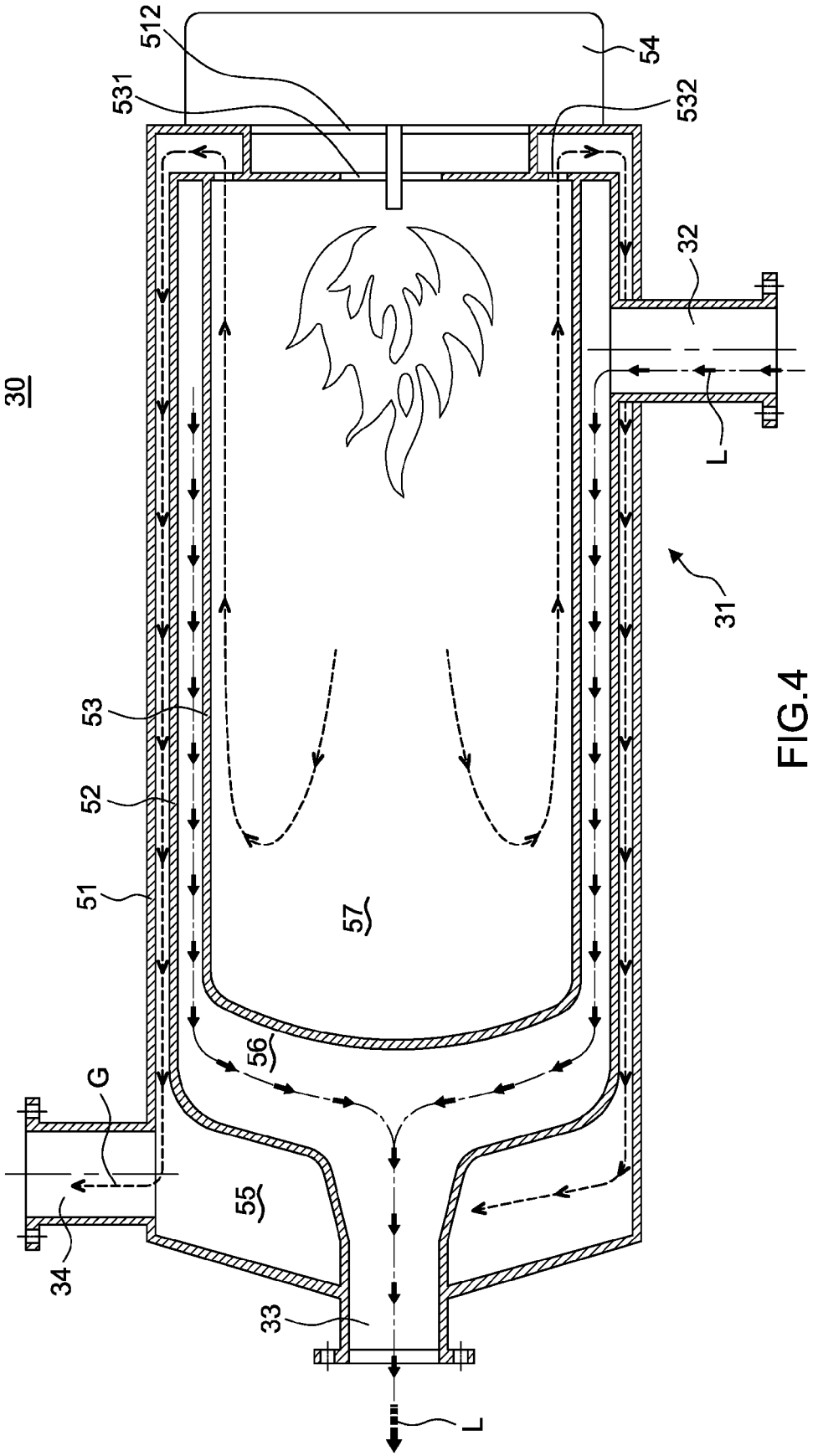

FIG.4

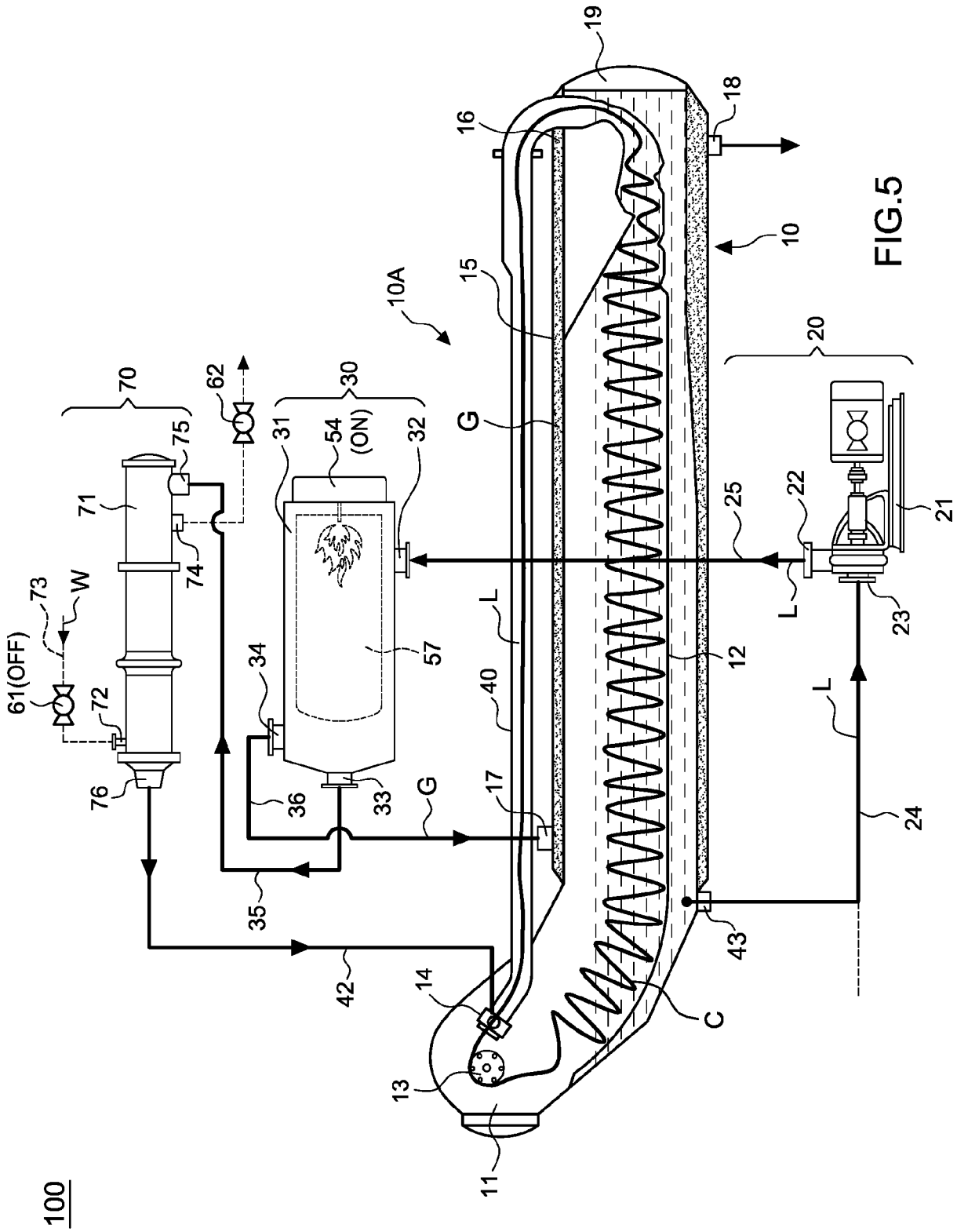
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FIG.5

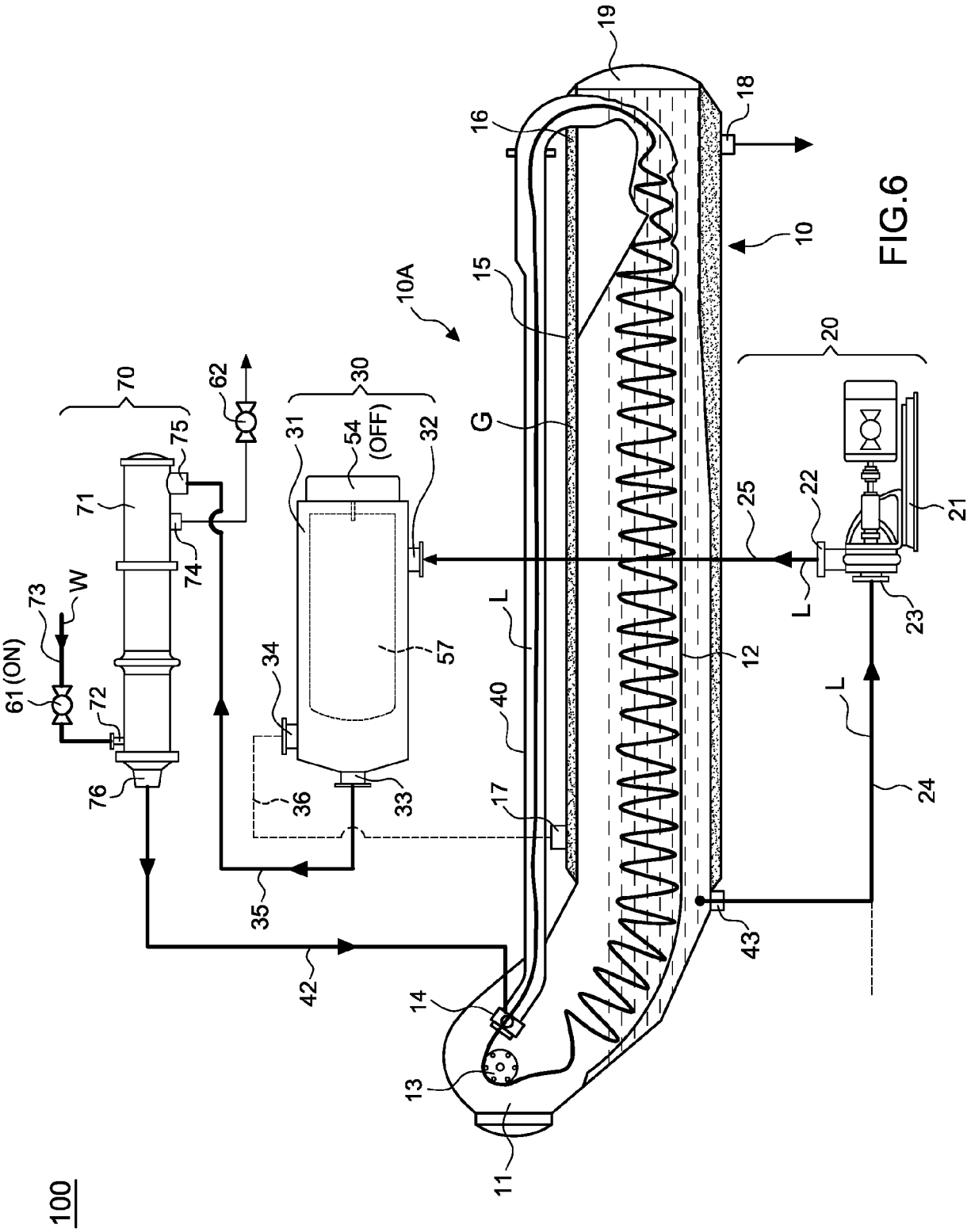
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FIG.6

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EUROPEAN SEARCH REPORT

Application Number
EP 16 15 9750

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X A	JP 2000 192365 A (KEN MANSEN) 11 July 2000 (2000-07-11) * paragraphs [0011] - [0015;0022]; figures 2,3 *	1,3 2	INV. D06B3/28 D06B23/14 D06B23/22
A	EP 0 436 874 A1 (CERIT SPA [IT]) 17 July 1991 (1991-07-17) * column 2, lines 17-41 * * column 3, line 19 - column 4, line 18; figure 2 *	1-3	
A	CN 104 711 804 A (SHENG ZHUN ENTPR CO LTD) 17 June 2015 (2015-06-17) * the whole document *	1-3	
A	EP 1 418 265 A2 (TENG CHIN LIN [TW]) 12 May 2004 (2004-05-12) * claims 1-5 *	1-3	
A	CN 2 642 807 Y (CHEN QINGXIANG [CN]) 22 September 2004 (2004-09-22) * the whole document *	1-3	TECHNICAL FIELDS SEARCHED (IPC) D06B
A	CH 593 470 A5 (SCHULTHESS AD MASCHINENFABRIK) 30 November 1977 (1977-11-30)	1-3	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	14 September 2016	Bichi, Marco

CATEGORY OF CITED DOCUMENTS

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14-09-2016

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 2000192365 A	11-07-2000	NONE	
EP 0436874 A1	17-07-1991	EP 0436874 A1	17-07-1991
		IT 1238971 B	17-09-1993
CN 104711804 A	17-06-2015	NONE	
EP 1418265 A2	12-05-2004	NONE	
CN 2642807 Y	22-09-2004	NONE	
CH 593470 A5	30-11-1977	NONE	

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