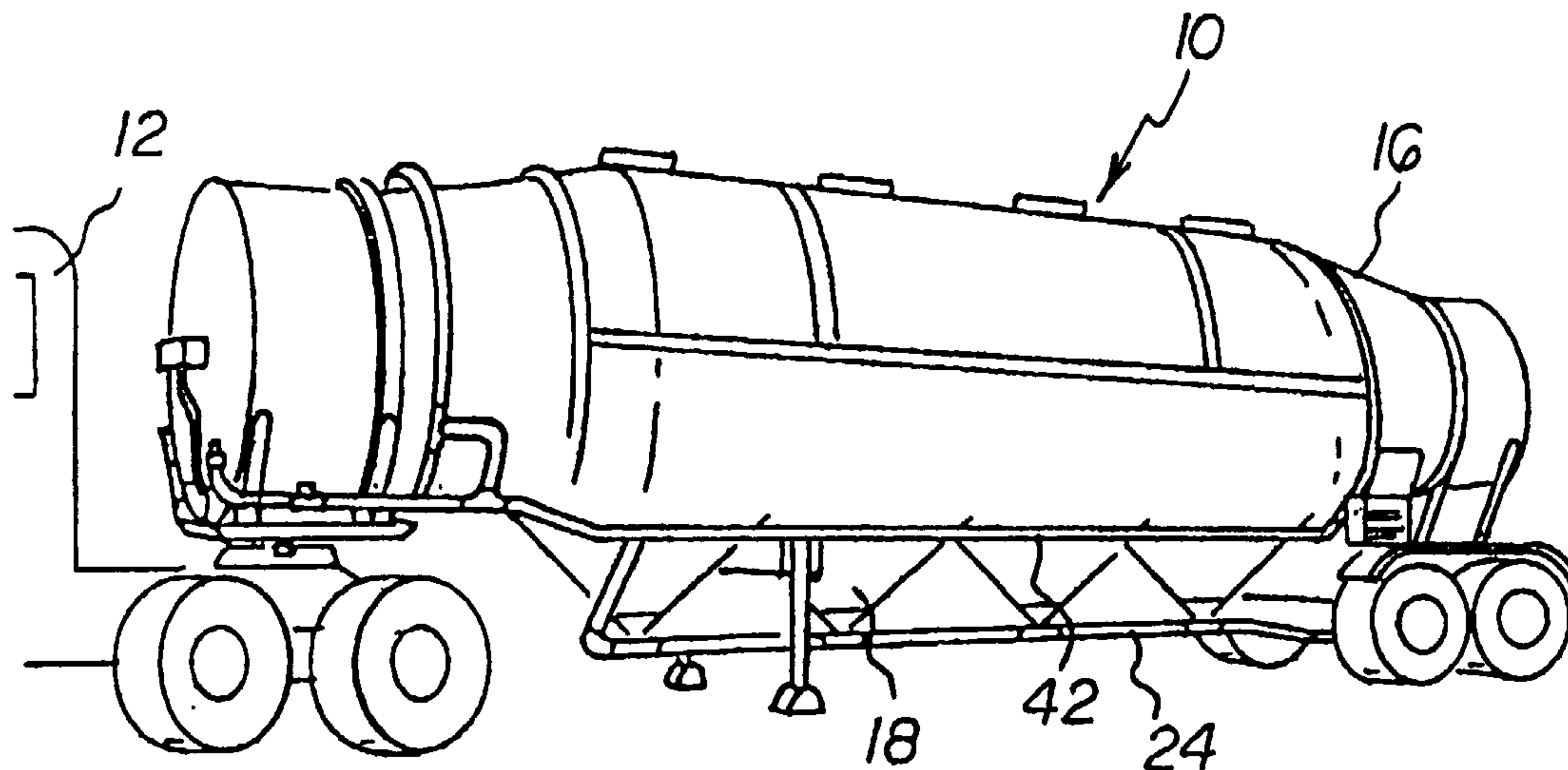




(86) Date de dépôt PCT/PCT Filing Date: 2002/08/14
(87) Date publication PCT/PCT Publication Date: 2003/11/20
(85) Entrée phase nationale/National Entry: 2004/10/15
(86) N° demande PCT/PCT Application No.: US 2002/025891
(87) N° publication PCT/PCT Publication No.: 2003/095355
(30) Priorité/Priority: 2002/04/17 (10/124,643) US

(51) Cl.Int.⁷/Int.Cl.⁷ B67D 5/08
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(54) Titre : SYSTEME AUTOMATISE DE DECHARGEMENT D'UN CAMION-CITERNE
(54) Title: AUTOMATED TANKER UNLOADING SYSTEM



(57) **Abrégé/Abstract:**

An automated tanker unloading system (10) has a plurality of electronically controlled valves (28) to control gas pressure within a tanker trailer (16) and to control the delivery of product. A plurality of electronic gas pressure transducers (40) sense internal gas pressure within individual hoppers (18) of the trailer and sense internal gas pressures within a hot hose (14) and a product hose (24) and convert the sensed gas pressure into an electronic signal. A plurality of pressure carrying pipes (42) transmit positive and negative pressures between the valves and the hoppers and the product hoses and the hot hose. A processor (44) is programmed to analyze electronically inputted data from the transducers and to then send signals to control the valve functions.



(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
20 November 2003 (20.11.2003)

PCT

(10) International Publication Number
WO 03/095355 A1

(51) International Patent Classification⁷: **B67D 5/08**

(21) International Application Number: PCT/US02/25891

(22) International Filing Date: 14 August 2002 (14.08.2002)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
10/124,643 17 April 2002 (17.04.2002) US

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(81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,

CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,
GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC,
LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,
MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SE, SG,
SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ,
VN, YU, ZA, ZM, ZW.

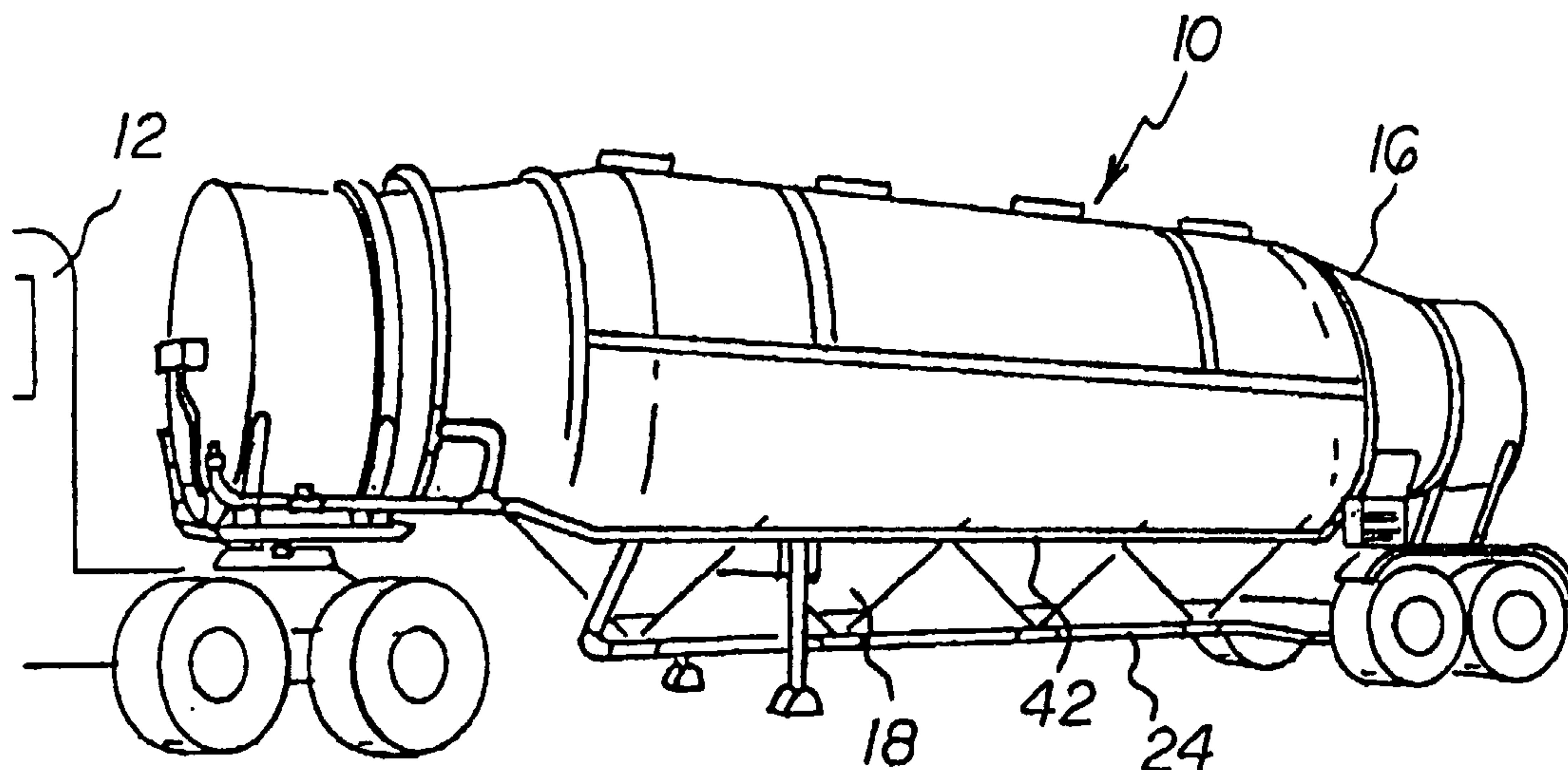
(84) Designated States (*regional*): ARIPO patent (GH, GM,
KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK,
TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

Published:

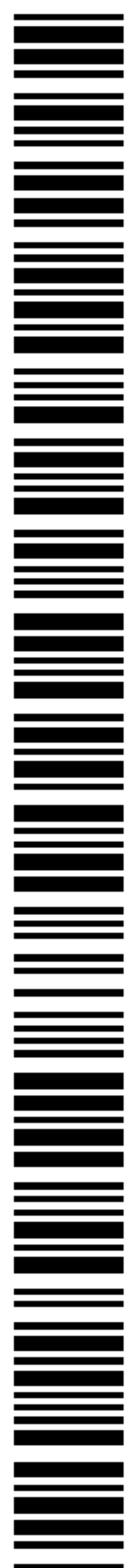
— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: AUTOMATED TANKER UNLOADING SYSTEM



(57) **Abstract:** An automated tanker unloading system (10) has a plurality of electronically controlled valves (28) to control gas pressure within a tanker trailer (16) and to control the delivery of product. A plurality of electronic gas pressure transducers (40) sense internal gas pressure within individual hoppers (18) of the trailer and sense internal gas pressures within a hot hose (14) and a product hose (24) and convert the sensed gas pressure into an electronic signal. A plurality of pressure carrying pipes (42) transmit positive and negative pressures between the valves and the hoppers and the product hoses and the hot hose. A processor (44) is programmed to analyze electronically inputted data from the transducers and to then send signals to control the valve functions.



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1 AUTOMATED TANKER UNLOADING SYSTEM

2 BACKGROUND OF THE INVENTION

3 Field of the Invention

4 The present invention relates to an automated tanker
5 unloading system and more particularly pertains to safely
6 and efficiently controlling tanker unloading.

7 Description of the Prior Art

8 The use of tanker unloading systems of known designs
9 and configurations is known in the prior art. More
10 specifically, tanker unloading systems of known designs
11 and configurations previously devised and utilized for the
12 purpose of controlling tanker unloading are known to
13 consist basically of familiar, expected, and obvious
14 structural configurations, notwithstanding the myriad of
15 designs encompassed by the crowded prior art which has
16 been developed for the fulfillment of countless objectives
17 and requirements.

18 By way of example, United States Patent Number
19 833,761 to Stevens discloses a means for causing the
20 movement of granular and like material. United States
21 Patent Number 2,931,523 to Nelligan discloses a self-
22 unloading compartment. United States Patent Number
23 3,747,811 to Lewis et al discloses an agitator for
24 facilitating flow from hopper. United States Patent
25 Number 4,244,403 to Legleiter discloses an apparatus for
26 transferring liquid between a reservoir and a mobile tank
27 truck. United States Patent Number 5,592,754 to Krieder
28 et al discloses an electronic control of compressor
29 unloader and air dryer purge. United States Patent Number
30 5,702,221 to Sridhar discloses a materials handling
31 system. United States Patent Number 5,986,597 to
32 Stemporzewski, Jr., et al discloses a fluid transfer
33 controller with digital bitstream monitor. Lastly, United
34 States Patent Number 6,244,287 to Hill et al discloses a
35 system and method for dynamically purging cargo tank wet
36 lines.

1 While these devices fulfill their respective,
2 particular objectives and requirements, the aforementioned
3 patents do not describe a automated tanker unloading
4 system that allows controlling tanker unloading safely and
5 efficiently.

6 In this respect, the automated tanker unloading
7 system according to the present invention substantially
8 departs from the conventional concepts and designs of the
9 prior art, and in doing so provides an apparatus primarily
10 developed for the purpose of controlling tanker unloading
11 safely and efficiently.

12 Therefore, it can be appreciated that there exists a
13 continuing need for a new and improved automated tanker
14 unloading system which can be used for controlling tanker
15 unloading safely and efficiently. In this regard, the
16 present invention substantially fulfills this need.

17 SUMMARY OF THE INVENTION

18 In view of the foregoing disadvantages inherent in
19 the known types of tanker unloading systems of known
20 designs and configurations now present in the prior art,
21 the present invention provides an improved automated
22 tanker unloading system. As such, the general purpose of
23 the present invention, which will be described
24 subsequently in greater detail, is to provide a new and
25 improved automated tanker unloading system and method
26 which has all the advantages of the prior art and none of
27 the disadvantages.

28 To attain this, the present invention essentially
29 comprises a tractor. The tractor is equipped to provide
30 airflow and pressure through a pressure feed pipe known as
31 a hot hose. A tanker trailer is next provided. The
32 trailer has a plurality of hoppers. The trailer is suited
33 to haul dried granular material known as product. The
34 trailer is equipped with a gas pressurization system for
35 each of the plurality of hoppers contained within the
36 tanker. The tanker also has a discharge piping system,

1 known as a product hose, for carrying the product from the
2 hopper to a storage area. Next provided is a plurality of
3 electronically controlled valves. The valves control gas
4 pressure within a tanker trailer and control the delivery
5 of the product. Each of the valves performs one function
6 from a group of functions. The valves and their functions
7 include a blow down valve, an aeration valve, an air
8 product flow valve, and one of a plurality of hopper
9 discharge valves. A plurality of electronic gas pressure
10 transducers are next provided. The transducers sense
11 internal gas pressure within the individual hoppers of the
12 trailer and sense internal gas pressures within the hot
13 hose and the product hose and convert the sensed gas
14 pressure into an electronic signal. Next provided are a
15 plurality of pressure carrying pipes. The pipes transmit
16 positive and negative pressures between the valves and the
17 hoppers and the product hoses and the hot hose. A
18 processor is next provided. The process is programmed to
19 analyze electronically inputted data from the transducers
20 and to then send signals to control the valve functions.
21 An electronic coupling means is next provided. The
22 transducers and the processor are coupled allowing
23 electronic signals from the transducers to be transmitted
24 to the processor. The coupling means also couples the
25 processor and the valves thereby allowing the processor to
26 control the function of the valves according to the
27 installed program in the processor. Finally, a control
28 box is provided. The control box is fabricated of rigid
29 material. The control box has five closed sides. The
30 control box also has a pivotally mounted sixth side for
31 allowing the opening and closing of the control box. The
32 box houses a plurality of components of the system.

33 There has thus been outlined, rather broadly, the
34 more important features of the invention in order that the
35 detailed description thereof that follows may be better
36 understood and in order that the present contribution to

1 the art may be better appreciated. There are, of course,
2 additional features of the invention that will be
3 described hereinafter and which will form the subject
4 matter of the claims attached.

5 In this respect, before explaining at least one
6 embodiment of the invention in detail, it is to be
7 understood that the invention is not limited in its
8 application to the details of construction and to the
9 arrangements of the components set forth in the following
10 description or illustrated in the drawings. The invention
11 is capable of other embodiments and of being practiced and
12 carried out in various ways. Also, it is to be understood
13 that the phraseology and terminology employed herein are
14 for the purpose of descriptions and should not be regarded
15 as limiting.

16 As such, those skilled in the art will appreciate
17 that the conception, upon which this disclosure is based,
18 may readily be utilized as a basis for the designing of
19 other structures, methods and systems for carrying out the
20 several purposes of the present invention. It is
21 important, therefore, that the claims be regarded as
22 including such equivalent constructions insofar as they do
23 not depart from the spirit and scope of the present
24 invention.

25 It is therefore an object of the present invention to
26 provide a new and improved automated tanker unloading
27 system which has all of the advantages of the prior art
28 tanker unloading systems of known designs and
29 configurations and none of the disadvantages.

30 It is another object of the present invention to
31 provide a new and improved automated tanker unloading
32 system which may be easily and efficiently manufactured
33 and marketed.

34 It is further an object of the present invention to
35 provide a new and improved automated tanker unloading
36 system which is of durable and reliable constructions.

1 An even further object of the present invention is to
2 provide a new and improved automated tanker unloading
3 system which is susceptible of a low cost of manufacture
4 with regard to both materials and labor, and which
5 accordingly is then susceptible of low prices of sale to
6 the consuming public, thereby making such automated tanker
7 unloading system economically available to the buying
8 public.

9 Even still another object of the present invention is
10 to provide a automated tanker unloading system for
11 controlling tanker unloading safely and efficiently.

12 Lastly, it is an object of the present invention to
13 provide a new and improved automated tanker unloading
14 system having a plurality of electronically controlled
15 valves to control gas pressure within a tanker trailer and
16 to control the delivery of the product, a plurality of
17 electronic gas pressure transducers to sense internal gas
18 pressure within individual hoppers of the trailer and
19 sense the internal gas pressures within a hot hose and
20 product hoses and convert the sensed gas pressure into an
21 electronic signal, a plurality of pressure carrying pipes
22 to transmit positive and negative pressures between the
23 valves and the hoppers and the product hoses and the hot
24 hose, a processor programmed to analyze electronically
25 inputted data from the transducers and to then send
26 signals to control the valve functions.

27 These together with other objects of the invention,
28 along with the various features of novelty which
29 characterize the invention, are pointed out with
30 particularity in the claims annexed to and forming a part
31 of this disclosure. For a better understanding of the
32 invention, its operating advantages and the specific
33 objects attained by its uses, reference should be had to
34 the accompanying drawings and descriptive matter in which
35 there is illustrated preferred embodiments of the
36 invention.

1 BRIEF DESCRIPTION OF THE DRAWINGS

2 The invention will be better understood and objects
3 other than those set forth above will become apparent when
4 consideration is given to the following detailed
5 description thereof. Such description makes reference to
6 the annexed drawings wherein:

7 Figure 1 is a perspective illustration of the tanker
8 trailer of the automated tanker unloading system
9 constructed in accordance with the principles of the
10 present invention.

11 Figure 2 is a plan view of the control box of the
12 present invention.

13 Figure 3 is a enlarged view of circle 3 of Figure 2
14 showing the indicia for valves.

15 Figure 4 is a plan view of the processor of the
16 present invention shown in a protective housing.

17 Figure 5 is an electrical schematic for the present
18 invention.

19 Figure 6 is an air system schematic for the present
20 invention.

21 With the exception of the schematics of Figures 5
22 and 6, the same reference numerals refer to the same parts
23 throughout the various Figures.

24 DESCRIPTION OF THE PREFERRED EMBODIMENT

25 With reference now to the drawings, and in particular
26 to Figure 1 thereof, the preferred embodiment of the new
27 and improved automated tanker unloading system embodying
28 the principles and concepts of the present invention and
29 generally designated by the reference numeral 10 will be
30 described.

31 The present invention, the automated tanker unloading
32 system 10 is comprised of a plurality of components. Such
33 components in their broadest context include a plurality
34 of electronically controlled valves, a plurality of
35 electronic gas pressure transducers, a plurality of
36 pressure carrying pipes and a processor. Such components

1 are individually configured and correlated with respect to
2 each other so as to attain the desired objective.

3 First provided is a tractor 12. The tractor is
4 equipped to provide airflow and pressure through a
5 pressure feed pipe known as a hot hose 14.

6 A tanker trailer 16 is next provided. The trailer
7 has a plurality of hoppers 18. The trailer is suited to
8 haul dried granular material known as product. The
9 trailer is equipped with a gas pressurization system for
10 each of the plurality of hoppers 18 contained within the
11 tanker. The tanker also has a discharge piping system,
12 known as a product hose 24, for carrying the product from
13 the hopper to a storage area.

14 First provided is a plurality of electronically
15 controlled valves 28. The valves control gas pressure
16 within a tanker trailer and control the delivery of the
17 product. Each of the valves performs one function from a
18 group of functions. The valves and their functions
19 include a blow down valve 28, an aeration valve 30, an air
20 product flow valve 32, and one of a plurality of hopper
21 discharge valves 34, 36, 38.

22 A plurality of electronic gas pressure transducers 40
23 are next provided. The transducers sense internal gas
24 pressure within the individual hoppers of the trailer and
25 sense internal gas pressures within the hot hose and the
26 product hose and convert the sensed gas pressure into an
27 electronic signal.

28 Next provided are a plurality of pressure carrying
29 pipes 42. The pipes transmit positive and negative
30 pressures between the valves and the hoppers and the
31 product hoses and the hot hose.

32 A processor 44 is next provided. The process is
33 programmed to analyze electronically inputted data from
34 the transducers and to then send signals to control the
35 valve functions. The processor is shown in a protective
36 housing.

1 An electronically coupling means 48 is next provided.
2 The transducers and the processor are coupled allowing
3 electronic signals from the transducers to be transmitted
4 to the processor. The coupling means also couples the
5 processor and the valves thereby allowing the processor to
6 control the function of the valves according to the
7 installed program in the processor.

8 Finally, a control box 50 is provided. The control
9 box is fabricated of rigid material. The control box has
10 five closed sides. The control box also has a pivotally
11 mounted sixth side 52 for allowing the opening and closing
12 of the control box. The box houses a plurality of
13 components of the invention.

14 An optional display screen, not shown, may be
15 incorporated in the invention. The display screen would
16 be used to monitor the functions of the system.

17 Figure 5 shows the electrical system schematic for
18 the present invention in which:

- 19 1. Blow down valve position switch. Connects to
20 junction box 9 with 6-wire harness.
- 21 2. Aeration valve position switch. Connects to
22 junction box 9 with 6 wire harness.
- 23 3. Air product flow valve position switch.
24 Connects to junction box 9 with 6-wire harness.
- 25 4. Pod one discharge valve position switch.
26 Connects to junction box 9 with 6-wire harness.
- 27 5. Pod two discharge valve position switch.
28 Connects to junction box 9 with 6-wire harness.
- 29 6. Pod three discharge valve positions witch.
30 Connects to junction box 9 with 6-wire harness.
- 31 7. Pod pressure transducer connects to junction box
32 9 with 3-wire harness.
- 33 8. Discharge pressure transducer connects to
34 junction box 9 with 3-wire harness.

- 1 9. Junction box for wires connecting from position
2 switches and pressure transducers to wires from
3 PLC control box and the air solenoids.
- 4 10. Connector at rear of truck for 39 -wire harness
5 going from the junction box 9 to the PLC control
6 box 12.
- 7 11. Connector at rear of truck for 2-wire power
8 supply harness going between the junction box 9
9 and the PLC control box 12.
- 10 12. PLC control box which houses the 12 volt power
11 supply to operate the trailer solenoid valves
12 and the PLC control computer.
- 13 13. Discharge hose connect switch connected to the
14 junction box 9 by a 2-wire harness.
- 15 14. Silo level switch that connects to the PLC
16 control box 12 with a 2-wire harness.

17 Figure 6 is an air system schematic for the present
18 invention in which:

- 19 1. Blow down valve connects to control valve bank 8
20 with two plastic air lines.
- 21 2. Aeration valve connects to control valve bank 8
22 with two plastic air lines.
- 23 3. Air product flow valve connects to control valve
24 bank 8 with two plastic air lines.
- 25 4. Pod one discharge valve connects to control
26 valve bank 8 with two plastic air lines.
- 27 5. Pod two discharge valve connects to control
28 valve bank 8 with two plastic air lines.
- 29 6. Pod three discharge valve connects to control
30 valve bank 8 with two plastic air lines.
- 31 7. Air supply tank connects to control valve bank 8
32 with one plastic air line.
- 33 8. Air supply tank connects to external air supply
34 with single plastic air line at connector 9.

35 A large variety of dry particulate materials are
36 transported by truck today in what are called dry bulk

1 pneumatic tankers. The unloading of these tankers
2 requires human monitoring to make a number of logical
3 decisions with consequential physical adjustment. These
4 are to initiate the unloading, maintain efficient
5 unloading pace, decide when individual unloading
6 compartments are empty and switch compartments
7 accordingly, resolve instances of plugging-up, too much
8 material collecting somewhere in the discharge line that
9 prevents unloading, and end the unloading procedure. Some
10 of these logical decisions and physical adjustments can be
11 performed by the present invention.

12 The present invention is a logic circuit with a
13 computer programmed routine that controls air driven
14 valves in response to pressure reading feedback from the
15 tanker it is unloading. Parts of a pneumatic tanker
16 include a blower, a mechanical device attached to the
17 truck's transmission that creates an airflow. A hot hose
18 is the hose that connects between the blower and tank's
19 aeration system providing airflow and pressure to the
20 tanker. A silo, not illustrated, is a storage device for
21 materials that must stay dry. A product hose is the hose
22 that connects the tanker's discharge piping to the silo so
23 the particulate material may be conveyed between the two.
24 Product valves are the valves that separate the material
25 compartments and the discharge piping. The secondary
26 purpose of this valve is to, when necessary, remove
27 material from the discharge pipes. The air valve to the
28 tanker's primary purpose is to control the amount of air
29 that is introduced to the material compartments. It also
30 has a secondary purpose that when necessary it will allow
31 pressure to escape from the material compartments. The
32 air valve to discharge piping controls the amount of air
33 introduced to the discharge piping. Manipulation of this
34 valve determines how much air is used to push material
35 through the discharge. The air valve to pressure relief
36 controls the amount of air that is permitted to escape

1 from the aeration system. It's primary use is to remove
2 all pressure from the tank when the unloading is finished.
3 A secondary use is to, when necessary, produce a vacuum to
4 remove material from the discharge pipes. The hatch is
5 the opening on top of a tanker that allows it to be loaded
6 quickly at loading facilities. A tank gauge tells the air
7 pressure within the material compartments. It is
8 typically near the middle or rear end of a tanker on the
9 side with the valves. The line gauge tells the air
10 pressure within the discharge pipes.

11 Without the use of the present invention, the
12 procedure for unloading a tanker is as follows:

13 1. Connect:

- 14 a. Hook up hot hose to tanker.
- 15 b. Hook up product hose to silo.
- 16 c. Product valves are closed.
- 17 d. Air valve to tanker is 100 percent open.
- 18 e. Air valve to discharge piping is closed.
- 19 f. Air valve to pressure relief is closed.
- 20 g. Hatch on top is closed.
- 21 h. Gauges are at "0".

22 2. Unloading:

- 23 a. Start blower.
- 24 b. When tank gauge indicated 9 lbs, then:
- 25 c. Open product air valve to 50%.
- 26 d. If the line gauge indicates more than
- 27 2 lbs., then:
- 28 e. Open product air valve to 100% until the
- 29 line gauge indicated 2 lbs. or less for 5
- 30 seconds, then:
- 31 f. Open product air valve to 50 percent.
- 32 g. If line gauge indicates 2 lbs. or less for
- 33 5 seconds, then:
- 34 h. Open the product valve on the front pod
- 35 100 percent.

- 1 i. The line gauge should indicate within 1 lb.
2 of the tank gauge.
- 3 j. At this point the product will start to
4 flow.
- 5 k. Monitor the line gauge to stay at 10 lbs.
- 6 l. If the line gauge goes to 12 lbs, then:
- 7 m. Open product air valve to 100 percent for
8 10 seconds or if the line gauge starts to
9 decrease to 10 lbs., then:
- 10 n. If the line gauge does not decrease, then
11 close all three product valves and keep the
12 product air valve open 100 percent.
- 13 o. If the line gauge still does not decrease,
14 then close the air valve to the tank.
- 15 p. If the line gauge still does not decrease,
16 then open the blow down valve slowly until
17 tank gauge indicated 5 lbs. or less. Once
18 at 5 lbs. or less, then:
- 19 q. Open the front product valve until the line
20 gauge indicates 2 lbs. or less or for 10
21 seconds, then close for 10 seconds. If the
22 line gauge starts to decrease go to step
23 "r" below. If the line gauge does not
24 start to decrease, open the center product
25 valve until the tank gauge indicated 2 lbs.
26 or less for 15 seconds, then close for 1
27 seconds. If the line gauge indicates to
28 decrease, go to step "r". If not, repeat
29 the center pod. Then, if not clear go to
30 the rear pod open until tank line gauge
31 indicates 2 lbs. or less or 20 seconds,
32 then close the rear pod valve for 20
33 seconds or until the line gauge indicates 2
34 lbs. or less. If not, repeat the rear pod
35 sequence.

- 1 r. Keep air product valve open and tank air
2 valve closed and close the blow down valve
3 when the line gauge indicates 10 lbs. Then
4 open the air valve to the tank 100 percent
5 open the air valve to the product line to
6 50 percent and open the front product valve
7 10 percent and continue to unload if the
8 line gauge indicates 6 lbs., then:
9 s. Close the air product valve to 10 percent,
10 leave the front product valve open 100
11 percent, and open the center product valve
12 to 75 percent and monitor the gauges for
13 line pressure to maintain 10 lbs. until
14 the line gauge indicates 6 lbs., then:
15 t. Close the air product valve to 10 percent,
16 close the front product valve to 10
17 percent, center product valve at 50
18 percent, and open the rear product valve
19 100 percent, and monitor the gauges to
20 maintain 10 lbs. line pressure until line
21 gauge indicates 6 lbs. or less, then:
22 u. Open all product valves and air product
23 valve for 5 seconds. Then close with
24 product valves open for 60 seconds. If
25 pressure indicates 2 lbs. or less then
26 empty. Continue for 2 minutes, then open
27 blow down valve for 1 minutes. Then, stop
28 blower.
- 29 3. Disconnect:
30 a. Unhook product discharge line.
31 b. Unhook hot hose.
32 c. Close front, center and rear product
33 valves.
34 d. Close air product valve.

35 The procedure, though logical, requires training to take
36 in the cues from the gauges and respond properly. In an

1 ideal situation with a well skilled person at the controls
2 the "unplugging procedure" represented by steps "Unloading
3 o through 4" can be completely avoided. Improper response
4 to increasing pressure represented in "Unloading 1 through
5 n" increases the likelihood of a plug-up. Failure to
6 maintain a pressure close to 10 lbs. results in longer
7 than necessary unload time. In addition to avoiding these
8 logical errors, use of the automated tanker unloading
9 system of the present invention frees up the operator to
10 perform other tasks, thus increasing overall efficiency.

11 As to the manner of usage and operation of the
12 present invention, the same should be apparent from the
13 above description. Accordingly, no further discussion
14 relating to the manner of usage and operation will be
15 provided.

16 With respect to the above description then, it is to
17 be realized that the optimum dimensional relationships for
18 the parts of the invention, to include variations in size,
19 materials, shape, form, function and manner of operation,
20 assembly and use, are deemed readily apparent and obvious
21 to one skilled in the art, and all equivalent
22 relationships to those illustrated in the drawings and
23 described in the specification are intended to be
24 encompassed by the present invention.

25 Therefore, the foregoing is considered as
26 illustrative only of the principles of the invention.
27 Further, since numerous modifications and changes will
28 readily occur to those skilled in the art, it is not
29 desired to limit the invention to the exact construction
30 and operation shown and described, and accordingly, all
31 suitable modifications and equivalents may be resorted to,
32 falling within the scope of the invention.

CLAIMS

What is claimed is:

- 1 1. An automated tanker unloading system to allow a
2 user to safely and efficiently control tanker unloading
3 comprising, in combination:
 - 4 a tractor equipped to provide airflow and pressure
5 through a pressure feed pipe known as a hot hose;
 - 6 a tanker trailer having a plurality of hoppers, with
7 the trailer being suited to haul dried granular material
8 known as product with the trailer equipped with a gas
9 pressurization system for each of the plurality of hoppers
10 contained within the tanker, with the tanker also having a
11 discharge piping system known as a product hose for
12 carrying the product from the hopper to a storage area;
 - 13 a plurality of electronically controlled valves to
14 control gas pressure within a tanker trailer and to
15 control the delivery of the product, with each of the
16 valves performing one of the functions from the group of
17 functions including a blow down valve and an aeration
18 valve and an air product flow valve and one of a plurality
19 of hopper discharge valves;
 - 20 a plurality of electronic gas pressure transducers to
21 sense internal gas pressure within the individual hoppers
22 of the trailer and to sense the internal gas pressures
23 within the hot hose and the product hose and convert the
24 sensed gas pressure into an electronic signal;
 - 25 a plurality of pressure carrying pipes for
26 transmitting positive and negative pressures between the
27 valves and the hoppers and the product hoses and the hot
28 hose;
 - 29 a processor being programmed to analyze
30 electronically inputted data from the transducers and to
31 then send signals to control the valve functions;
 - 32 an electronically coupling means by which the
33 transducers and the processor are coupled allowing
34 electronic signals from the transducers to be transmitted

35 to the processor and said coupling means also coupling the
36 processor and the valves thereby allowing the processor to
37 control the function of the valves according to the
38 installed program in the processor by said coupling
39 electronic means; and,

40 a control box fabricated of rigid material having
41 five closed sides and a pivotally mounted sixth side for
42 allowing the opening and closing of the control box, with
43 the box housing a plurality of components.

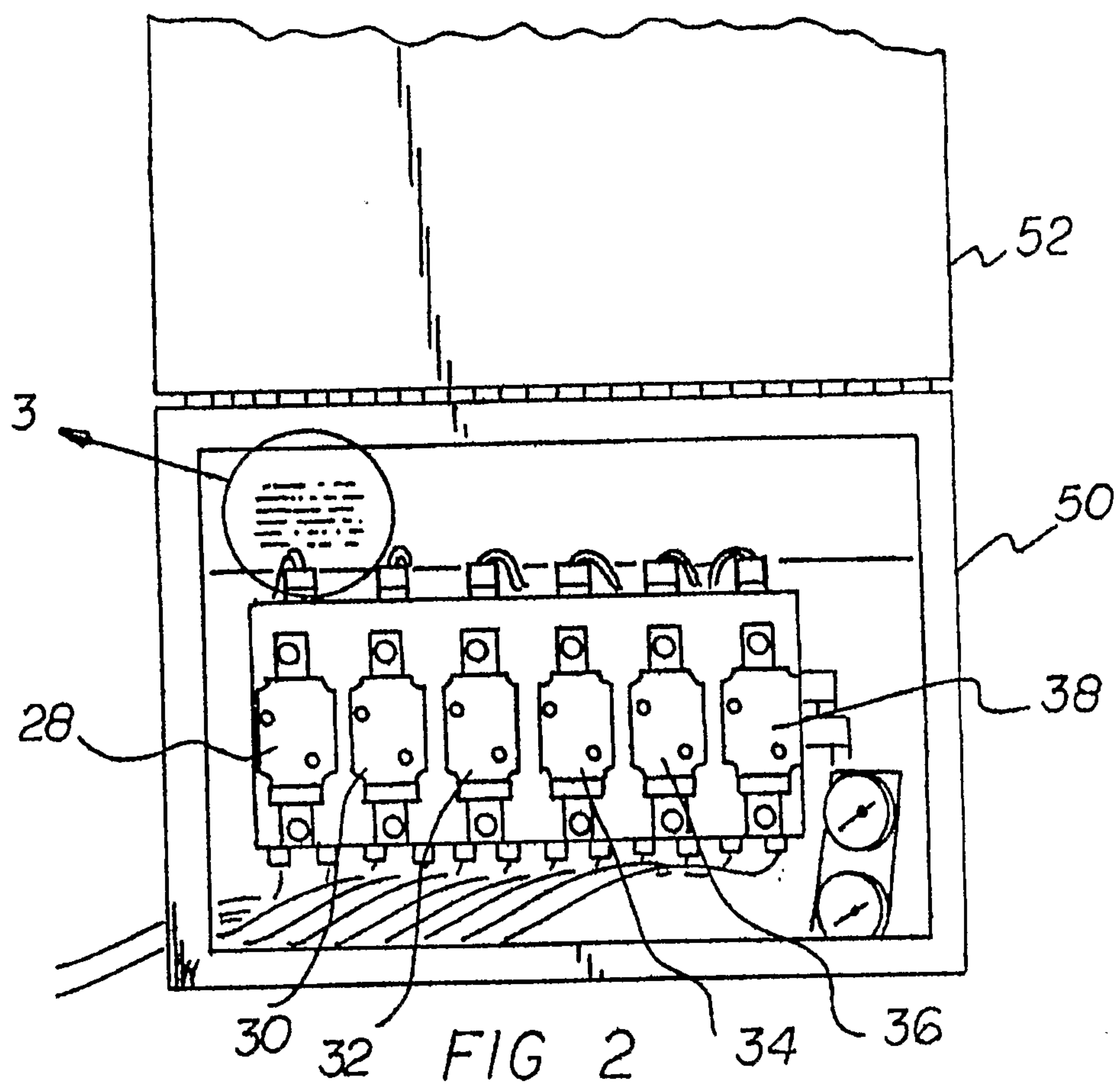
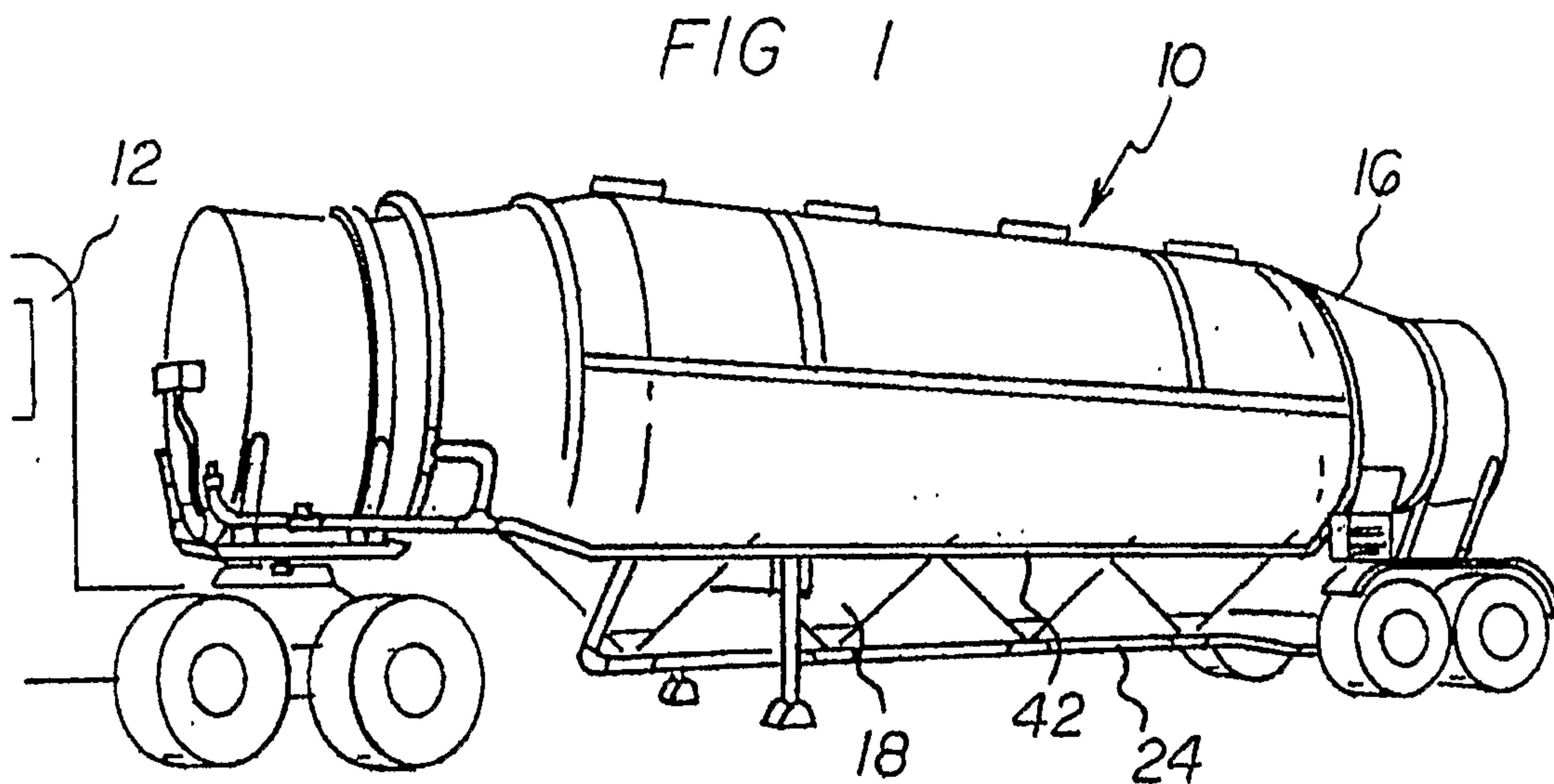
1 2. An automated tanker unloading system comprising,
2 in combination:

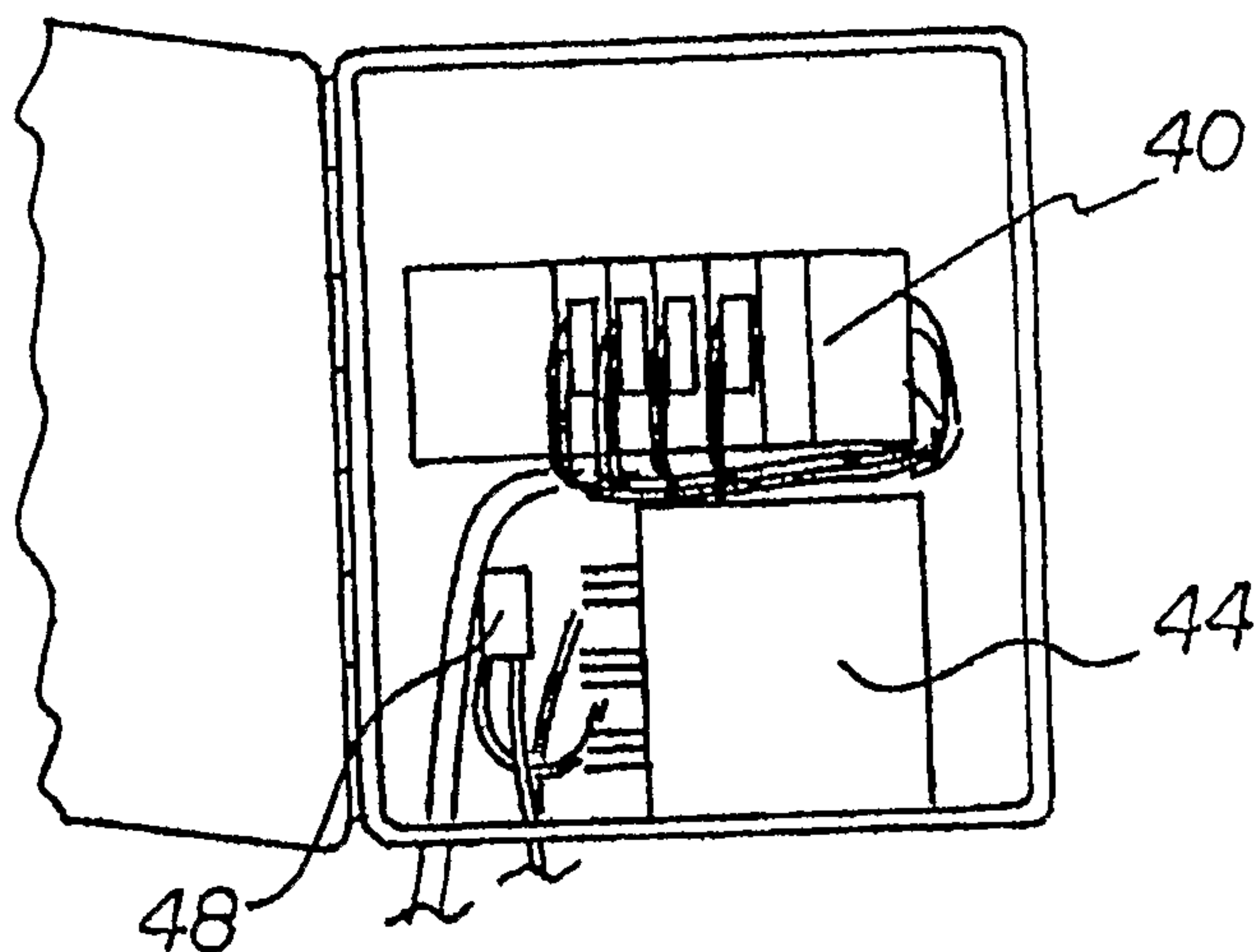
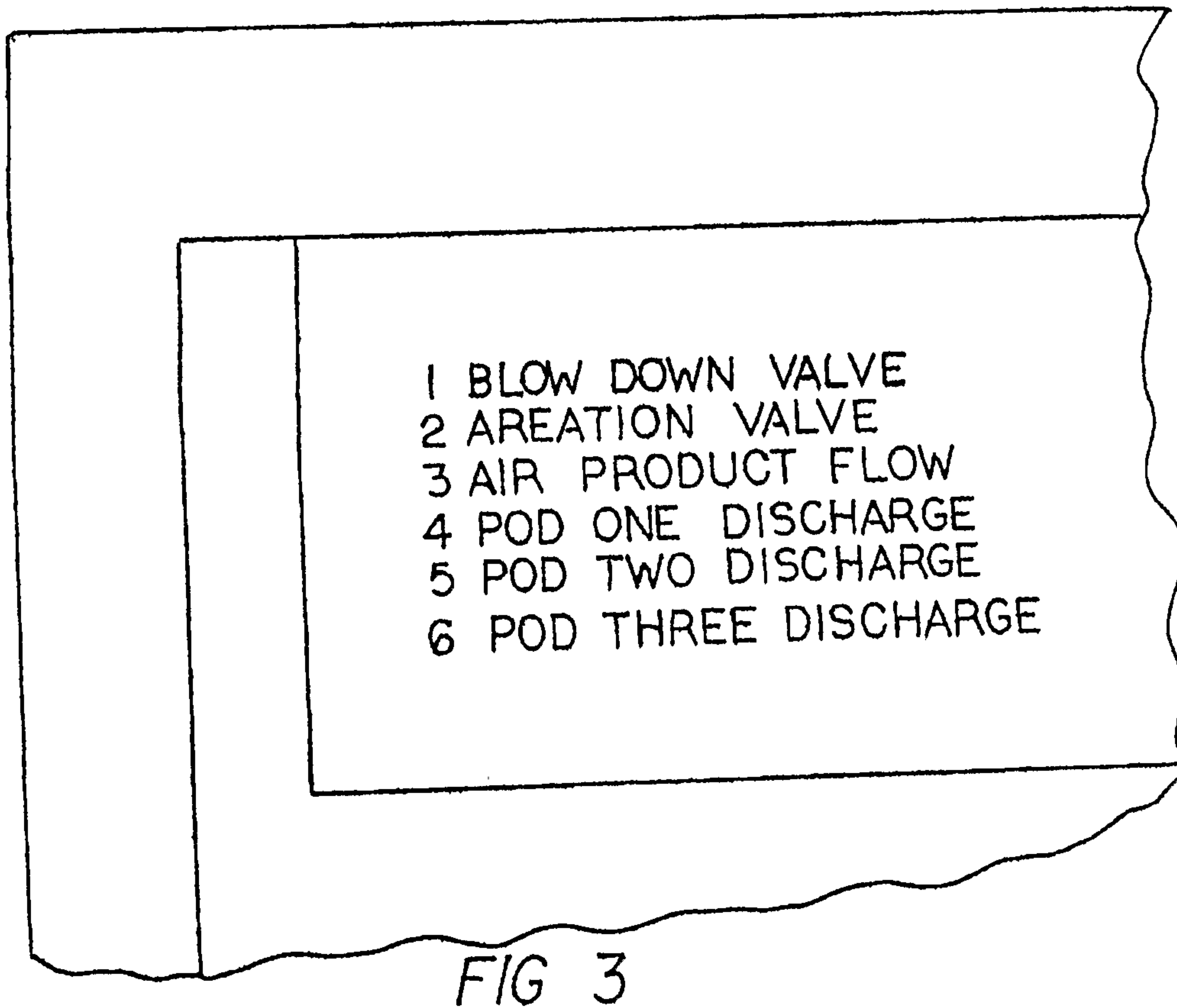
3 a plurality of electronically controlled valves to
4 control gas pressure within a tanker trailer and to
5 control the delivery of a product, with each of the valves
6 performing one of the functions from a group of valve
7 functions;

8 a plurality of electronic gas pressure transducers to
9 sense internal gas pressure within individual hoppers of
10 the trailer and to sense internal gas pressures within a
11 hot hose and a product hose and convert the sensed gas
12 pressure into an electronic signal;

13 a plurality of pressure carrying pipes for
14 transmitting positive and negative pressures between the
15 valves and the hoppers and the product hoses and the hot
16 hose; and

17 a processor being programmed to analyze
18 electronically inputted data from the transducers and to
19 then send signals to control the valve functions.





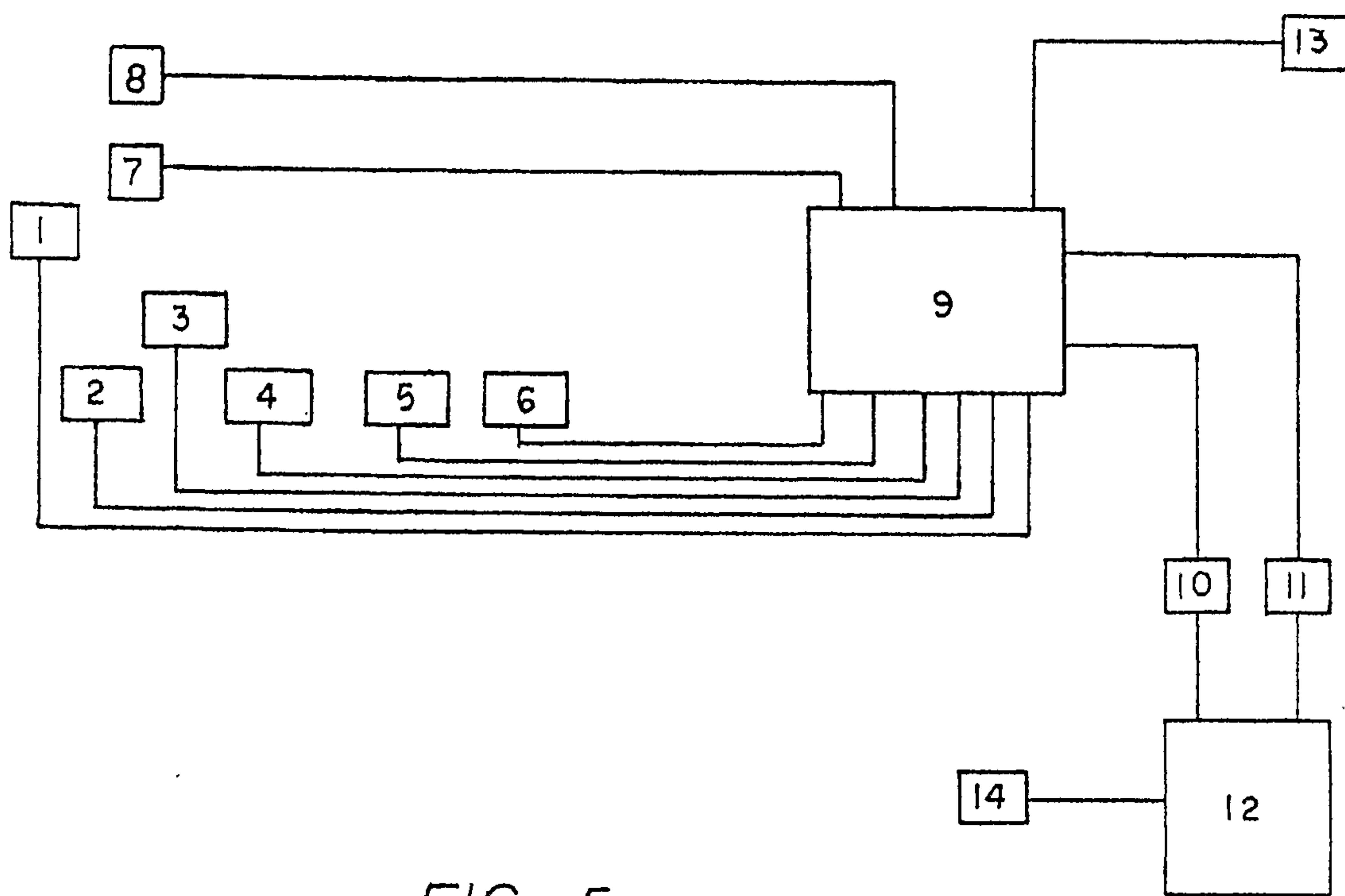
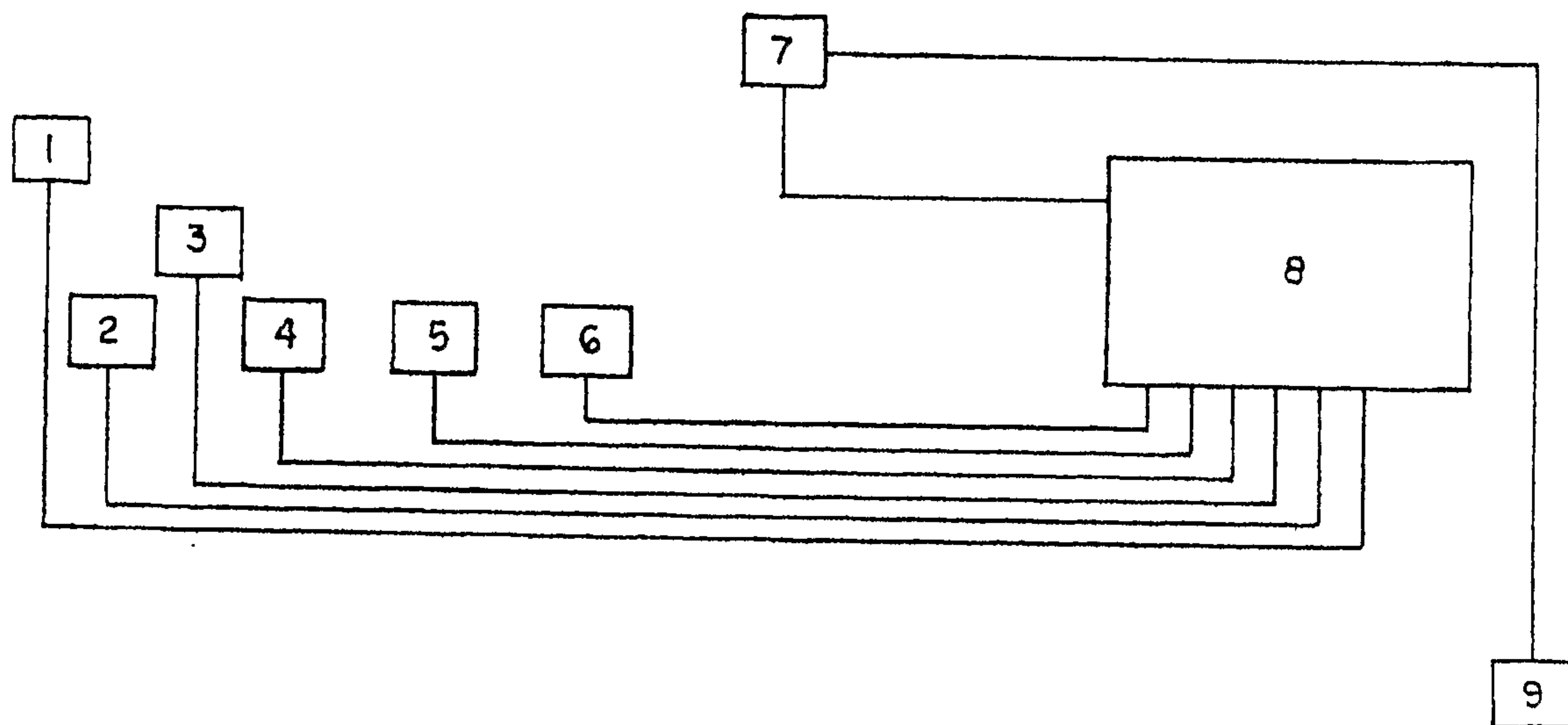


FIG 5

*FIG 6*

