(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 324 932**
A1

(12) EUROPEAN PATENT APPLICATION

(21) Application number: **88120038.0**

(22) Date of filing: **01.12.88**

(51) Int. Cl.4: **B01F 15/04 , B01F 3/08 , B01F 5/06 , B01F 5/10 , B65B 31/00**

(30) Priority: **10.12.87 US 131224**

(43) Date of publication of application:
26.07.89 Bulletin 89/30

(84) Designated Contracting States:
AT BE CH DE ES FR GB GR IT LI LU NL SE

(71) Applicant: **Colgate-Palmolive Company**
300 Park Avenue
New York, N.Y. 10022(US)

(72) Inventor: **Wigglesworth, Paul**
41 Henderson Street
Levenshulme Manchester(GB)
Inventor: **Ellis, Roger David**
1 Cliff Mount
Ramsbottom Lancashire(GB)

(74) Representative: **UEXKÜLL & STOLBERG**
Patentanwälte
Beselerstrasse 4
D-2000 Hamburg 52(DE)

(54) Apparatus for making a post-foaming gel.

(57) An apparatus for making a post-foaming gel comprising, a device for pumping a gel base, a device (34) for measuring the flow rate of the pumped gel base, a device (51) responsive to the measuring device (34) for pumping a foaming agent at a flow rate in a predetermined ratio to the flow rate of the gel base, a device (38) for introducing the foaming agent to the gel base, and a device (84) for forming the gel or emulsion from the introducing device (38).

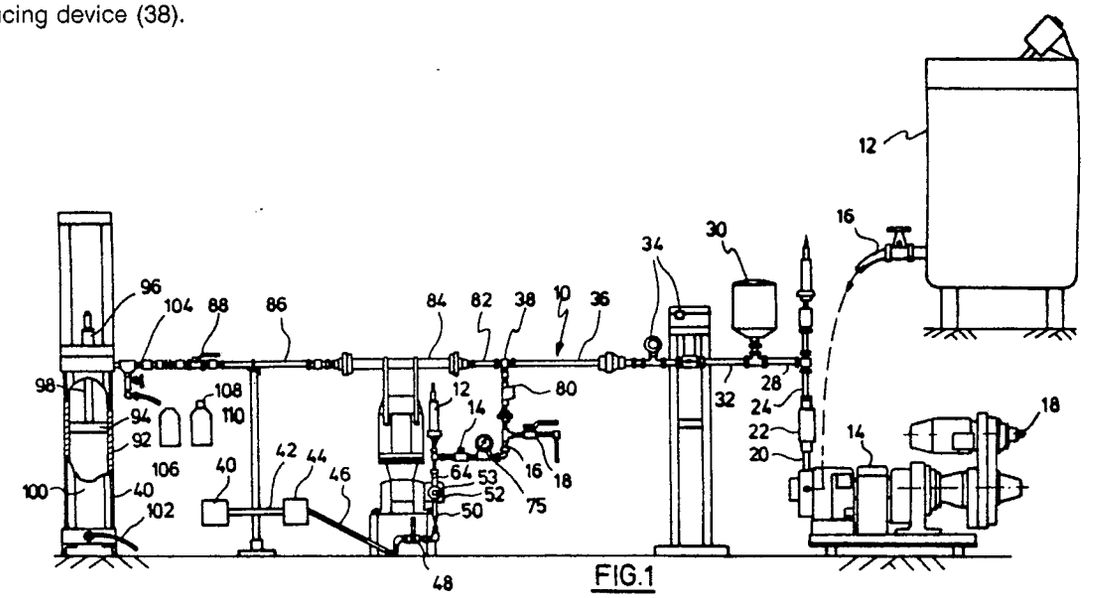


FIG.1

EP 0 324 932 A1

APPARATUS FOR MAKING A POST-FOAMING GEL

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus and method for making a post-foaming gel.

Before the present invention, attempts have been made to add foaming agents, such as pentane/butane mixtures to gel bases in conventional partly filled pressure vessels to make a post-foaming gel. However, any post foaming gel of cosmetically acceptable stiffness will tend to foam spontaneously when exposed to atmospheric pressure if it contains bubbles of air or hydrocarbon. These act as nuclei for foaming, by expanding and shearing the gel in their immediate vicinity. This means that pentane/butane mixtures cannot be incorporated into gel base in a conventional, partly-filled pressure vessel, even when the headspace is pressurized with air or nitrogen. Inevitably some of the water-soluble gas will be entrained in the gel. The resulting spontaneous foaming makes filling into cans very difficult and messy. Even then the product will not settle down on storage to give a satisfactory result.

Taking a potentially 'easy' situation, such as adding only isopentane(B.Pt. 29 °C) or n-pentane (B.Pt. 37 °C), there are still problems. Assuming a good gel is produced by cold mixing, you will find that at temperatures around 20 °C the mixing does vaporise significant amounts of foaming agent and the resulting gel is foamy.

These bubbly gels are not suitable for packing into cans because the external propellant used with the cans gives insufficient pressure to collapse the bubbles on storage. This is largely due to the fact that these gels have a yield value such that they resist the applied pressure (or fail to transmit the full effect to the bubbles).

A post-foaming gel is disclosed in U.S. patent 3,541,581. A continuous method and apparatus to make a post-foaming gel is disclosed in U.S. 4,405,489. The filling of an aerosol can containing an interior plastic bag which holds the product to be dispensed is disclosed in U.S. 4,589,452.

The U. S. Patent 4,405,489 discloses metering pumps 24 and 25 having a single device mechanism 26 on their own drive mechanism.

SUMMARY OF THE INVENTION

A principal feature of the present invention is the provision of an apparatus for making a post-foaming gel.

The apparatus of the present invention comprises, means for pumping a gel base, means for introducing a foaming agent to the gel base, and means for forming the post-foaming gel or emulsion from the introducing means.

A feature of the present invention is the provision of means for measuring the flow rate of the pumped gel base.

Another feature of the invention is the provision of means responsive to the measuring means for pumping the foaming agent at a flow rate in a predetermined ratio to the flow rate of the gel base.

A feature of the invention is that the desired ratio of the base and foaming agent is automatically determined.

Another feature of the invention is that the desired ratio of base and foaming agent may be varied.

A further feature of the invention is that the base and gel are controlled in a simplified manner.

Another feature of the invention is that the apparatus is flame proof.

A feature of the invention is that the apparatus is of significant construction at reduced cost.

Yet another feature of the invention is that the rate of the base pumping means may be controlled.

Still another feature of the invention is the provision of means for smoothing out the flow pulsation from the base pumping means.

A feature of the invention is that the foaming agent pumping means is variable.

Another feature of the invention is the provision of means for measuring the flow rate of the foaming agent passing through the foaming agent pumping means.

Thus, a feature of the invention is that the flow rates of the base and foaming agent can be compared.

Another feature of the invention is the provision of means for bleeding air and vapor from the foaming agent.

Yet another feature of the invention is the provision of means for storing the foamed gel or emulsion under pressure.

Another feature of the invention is that the gel or emulsion may be selectively passed to a plurality of storage cylinders.

A feature of the invention is that maximum and minimum filled conditions of the container may be determined.

Another feature of the invention is that the apparatus provides a continuous gel manufacture with simultaneous can filling capacity.

Still another feature of the invention is that the pumping means may be interrupted in the event of the maximum and minimum filled conditions of the container.

Further features will become more fully apparent in the following description of the embodiments of this invention and from the appended claims.

DESCRIPTION OF THE DRAWINGS

In the drawings:

Fig. 1 is a diagrammatic view of an apparatus for making a post-foaming gel of the present invention;

Fig. 2 is a diagrammatic view of a pair of storage cylinders for the apparatus of Fig. 1;

Fig. 3 is a sectional view of a metering pump for the apparatus of Fig. 1;

Fig. 4 is a sectional view of a storage cylinder for the apparatus of Fig. 1; and

Fig. 5 is a diagrammatic view of a pneumatic stroke positioner.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Fig. 1, there is shown an apparatus generally designated 10 for making a post-foaming gel from a gel base and foaming agent. The apparatus 10 has a storage container 12 for retaining the gel base, with the container 12 being connected to a pump 14 by a conduit 16. Typically, the pump 14 is capable of pumping 1,000 liters/ hour, and the rate of the pump 14 may be manually varied by a control device 18 on the pump 14.

The pump 14 is connected by a conduit 20 to a non-return valve 22 to prevent passage of the foaming agent to the pump 14 and render the apparatus flame-proof. The valve 22 is connected by a conduit 24 to a pressure relief valve 26 to prevent excessive pressure in the apparatus 10. The gel base is passed through a conduit 28 to a pulsation dampener 30 to smooth out flow pulsation of the pumped gel base. The gel base passes from the dampener 30 through a conduit 32 to a flow meter 34 which determines the flow rate of the gel base between minimum and maximum limits, such as a range of 0-1000 liters per hour. The flow meter 34 generates an electrical signal indicative of the base flow rate. The signal is fed to a current-to-pressure convertor which transforms the electrical signal into a pneumatic signal for a purpose which will be described below. The gel base then passes through a conduit 36 to a location 38 in the apparatus 10.

A source of the foaming agent is retained in a container 40, and the foaming agent passes from the container 40 through a conduit 42 to a pump 44 which maintains the foaming agent in liquid form. The foaming agent passes from pump 44 through a conduit 46 to a valve 48.

The apparatus 10 has a pneumatic stroke positioner 51 based on a highly responsive, fast acting wedge/cylinder mechanism which adjusts the setting in proportion to 0.2 to 1 bar (3 to 15 lb/in.^{2}) air signal 49. Failure of the air signal or absence of air pressure, returns the stroke setting to zero.

With reference to Figs. 1, 3, and 5, the foaming agent then passes through a conduit 50 to the pump-head 53 of a metering pump 52. The pump 52 has a first one-way ball valve 54 which moves between a first position away from a seat 56 to permit passage of the foaming agent through the valve 54 into a chamber 58, and a second position against the seat 56 to prevent passage of the foaming agent from the chamber 58 to the conduit 50. The pump 52 has a second one-way ball valve 60 which moves from a first position away from a seat 62 to permit passage of the foaming agent from the chamber 58 to a conduit 64, and a second position against the seat 62 to prevent passage of the foaming agent or gel base from the conduit 64 to the chamber 58. The pump 52 has an elongated cylinder 66 which slidibly receives a piston 68 connected to a shaft 70, and the piston 68 is reciprocated in the cylinder 66 while cooperating with the

first and second valves 54 and 60 in order to pump the foaming agent into and out of the chamber 58. The rate of reciprocation of the piston 68 is controlled by the pneumatic signal from the flow meter 34 in order to control the pumping rate of the foaming agent at a predetermined ratio relative to the flow rate of the gel base. The pump 52 is calibrated to obtain the desired ratio of gel base and foaming agent, and the ratio may be changed by suitable calibrations if desired.

The pumped foaming agent passes through the conduit 64 to a pressure relief valve 72 to prevent excessive pressure of the foaming agent in the apparatus 10, and the foaming agent then passes through a non return valve 74 which prevents backward movement of the foaming agent in the apparatus 10. The foaming agent passes through a flow meter 75 which determines the flow rate of the foaming agent such that the flow ratio of the gel base and foaming agent can be compared. The foaming agent then passes through a conduit 76 to a bleed off valve 78 to bleed off air or vapor while a manual valve 80 is closed to verify that the foaming agent is in liquid form. Once air or vapor is bled from the foaming agent, the valve 80 is opened to permit passage of the pumped foaming agent to the location 38 to permit contact with the pumped gel base.

Both the gel base and foaming agent are pumped from location 38 through a conduit 82 to a mixer 84 which may be a static or dynamic mixer or both. The mixer 84 forms the post-foaming gel or an emulsion from the gel base and foaming agent depending upon the conditions of the apparatus 10, such as temperature. The gel or emulsion then passes through a conduit 86 to a valve 88 for a purpose which will be described below.

The apparatus 10 has a storage cylinder 90 having a chamber 92 and a piston 94 slidibly received in the chamber 92, with the piston 94 having a shaft 96 which extends out of the cylinder 90. The piston 94 separates the chamber 94 into a first compartment 98 to receive the gel or emulsion and a second compartment 100 to receive a compressed gas through a conduit 102 from a source of pressurized gas, such as 50-100 pounds/square inch, which may be varied to control pressure on the piston 94. The gel or emulsion is pumped into the first compartment 98 against the pressure on the piston 94 which is controlled to obtain a pressure in the preferred range of 60-100 pounds/square inch in order to maintain the foaming agent in a liquid condition without vaporizing.

Once the cylinder 90 is full, the valve 88 may be closed and the gel or emulsion is passed through a valve 104 to suitable containers. In the event of the gel, it is passed into container 106 with an open top after which a valve is attached to the container 106 for dispensing the gel once the container 106 is prepared with a suitable propellant known to the art. In the event of the emulsion, it is passed through the activated valves 108 of suitable containers 110 know to the art in order to obtain a secondary mixing by the valves 108 and form the emulsion into the post-foaming gel in the containers 110. The containers are prepared with a suitable propellant as known to the art in order to dispense the gel from the containers 110 when the valves 108 are activated.

In a preferred form, with reference to Fig. 2, the apparatus has a pair of cylinders 90 and 112 of the type previously described. The gel or emulsion is passed from the mixer 84 through a conduit 114. The gel or emulsion passes from conduit 114 through a conduit 116 with a manual valve 118 associated with the conduit 116 connected to the container 90. The gel or emulsion also passes from conduit 114 through a conduit 120 with a manual valve 122 associated with the conduit 120 to the cylinder 112. The valves 118 and 122 may be controlled as desired to sequentially fill the cylinders 90 and 112, after which the gel or emulsion is emptied from the cylinders 90 and 112 in a manner as previously described. As shown, the conduit 120 may have a temperature probe 124 in order to measure the temperature of the gel or emulsion.

A preferred form of the cylinder 90 is shown in Fig. 4, in which like reference numerals designate like parts. In this embodiment, the gel or emulsion G passes through a conduit 126 into the first compartment 98 of the cylinder 90, in a manner as previously described, and the gel or emulsion passes from the cylinder 90 out of a conduit 128 to fill the containers for dispensing of the product. As shown, the apparatus 10 has a high level lower switch 130 and a low level upper switch 132 which may be activated by the position of a pin 134 on the piston shaft 96. When the cylinder 90 is sufficiently full of the gel or emulsion G, the switch 130 is activated, and the apparatus, including the pumps, is turned off to prevent the build up of pressure in the apparatus when a maximum quantity of the product is in the cylinder 90. Normally, the piston 94 of cylinder 90 may be used as a buffer to pass the product from the conduit 126 through the cylinder 90 into the conduit 128 until activation of the switch 132 is discontinued, and passage of the product through the cylinder is thereafter maintained unless the switch 132 is contacted again in which event the filling apparatus downstream from conduit 128 is switched off to prevent 'starvation' of gel or emulsion to the filling apparatus.

The gel base is made in the following manner according to the formulation set forth below:

(1) Add approximately 20% of the water to a closed mixing vessel.

(2) Add fatty acid to the mixing vessel and then the GMS/color then heat to 80-85 ° C until all powders are molten.

(3) Add the triethanolamine to the vessel with agitation to form a soap. Cool to 60 ° C. Add the Hydroxyethyl cellulose.

(4) Cool to 40 ° C and add the Hydroxypropyl cellulose.

(5) Add the sorbitol solution, with agitation, to the aqueous soap.

(6) Cool the mixture to 30 ° C, add the perfume with agitation.

The gel base has the following formulation:

BASE	%
Palmitic Acid	8.0 - 10.0
Stearic Acid	1.0 - 3.0
Triethanolamine	5.5 - 7.5
Sorbitol - 70% solution	up to 3.0
Hydroxyethyl cellulose	0.1 - 0.4
Hydroxypropyl cellulose	0.05 - 0.15
Glyceryl Monostearate	0.4 - 0.6
Perfume	q.s.
Coloring Material	q.s.
Water	to 100%

The finished product has the following formulation:

FINISHED PRODUCT	
Base as above	97.0 - 98.0
Iso-Pentane	1.5 - 1.8
Iso-Butane	0.5 - 1.2

In accordance with the present invention, the apparatus 10 provides continuous gel manufacture with simultaneous can filling capacity. The present invention is thus an improvement over batch process gel manufacture due to reduced production time, and the product can be filled immediately (within 1-2 minutes) of being formed.

The foregoing detailed description is given for clearness of understanding only, and no unnecessary limitations should be understood therefrom, as modifications will be obvious to those skilled in the art.

Claims

1. An apparatus for making a post-foaming gel, comprising:
means for pumping a gel base;
means for measuring the flow rate of the pumped gel base;
means responsive to the measuring means for pumping a foaming agent at a flow rate in a predetermined ratio to the flow rate of the gel base;
means for introducing the foaming agent to the gel base; and
means for forming the post-foaming gel or emulsion from the introducing means.

2. The apparatus of claim 1 wherein the forming means comprises means for mixing the gel base and foaming agent.

3. The apparatus of claim 1 wherein the forming means comprises primary means for mixing the gel base and foaming agent to form the emulsion, and secondary means for mixing the emulsion to form the post-foaming gel.

4. The apparatus of claim 1 including means for controlling the rate of the base pumping means.

5. The apparatus of claim 1 including valve means for preventing the foaming agent from passing to the base pumping means.

6. The apparatus of claim 1 including means for smoothing out the flow pulsation from the base pumping means.

7. The apparatus of claim 1 wherein the foaming agent pumping means is variable.

8. The apparatus of claim 1 wherein the foaming agent pumping means comprises, a piston, means for driving the piston at a variable rate towards and away from a chamber, first one-way inlet valve means to permit passage of the foaming agent to the chamber and prevent passage of the foaming agent out of the chamber, and second one-way valve means to permit passage of the foaming agent out of the chamber and prevent passage of the foaming agent or gel base into the chamber.

9. The apparatus of claim 1 including means for measuring the flow rate of the foaming agent passing from the foaming agent pumping means.

10. The apparatus of claim 1 including means for bleeding air from the foaming agent.

11. The apparatus of claim 10 wherein the bleeding means is located intermediate the foaming agent pumping means and the introducing means.

12. The apparatus of claim 1 including valve means for preventing passage of the foaming agent from the introducing means to the foaming agent pumping means.

13. The apparatus of claim 1 including means for storing the formed gel or emulsion under pressure.

14. The apparatus of claim 13 including means for passing the stored gel or emulsion from the storing means to a container.

15. An apparatus for producing a post-foaming gel, comprising:
means for making the gel or emulsion;
a first storage container to receive the gel or emulsion;
a second storage container to receive the gel or emulsion; and
means for selectively passing the gel or emulsion to the first and second container.

16. The apparatus of claim 15 including a first conduit for passing the gel or emulsion and in which the passing means comprises, a second conduit communicating between the first conduit and first container, a third conduit communicating between the first conduit and second container, first valve means associated with the second conduit to control passage of the gel or emulsion through the second conduit, and second valve means associated with the third conduit to control passage of the gel or emulsion through the third conduit.

17. An apparatus for producing a post-foaming gel, comprising;
means for making and pumping the gel or emulsion;
a storage cylinder having a chamber;
a piston slidibly received in the cylinder and separating the chamber into a first compartment to receive the gel or emulsion, and a second compartment;
means for driving the piston toward the gel in the first compartment;
means for introducing the gel or emulsion into the first compartment, and
means for removing the gel or emulsion from the first compartment.

18. The apparatus of claim 17 wherein the driving means comprises means for passing a compressed gas into the second compartment.

19. The apparatus of claim 17 including means responsive to the location of the piston for determining when the first compartment is at a maximum filled capacity, and means responsive to the determining means for interrupting the making and pumping and filling means.

20. The apparatus of claim 19 wherein the determining means comprises a shaft extending from the piston out of the cylinder, and a switch activated by the shaft when the first compartment is at a maximum filled condition.

21. The apparataus of claim 17 including means responsive to the location of the piston for determining when the first compartment is at a minimum filled condition, and means responsive to the determining means for interrupting the making and pumping and filling means.

22. The apparatus of claim 21 wherein the determining means comprises a shaft extending from the piston out of the cylinder, and a switch activated by the shaft when the first compartment is at a minimum filled condition.

23. An apparatus for producing a post-foaming gel, comprising;
means for continuously making the gel or emulsion; and
means for filling a container with the gel or emulsion substantially simultaneously while making the gel or emulsion by the making means.

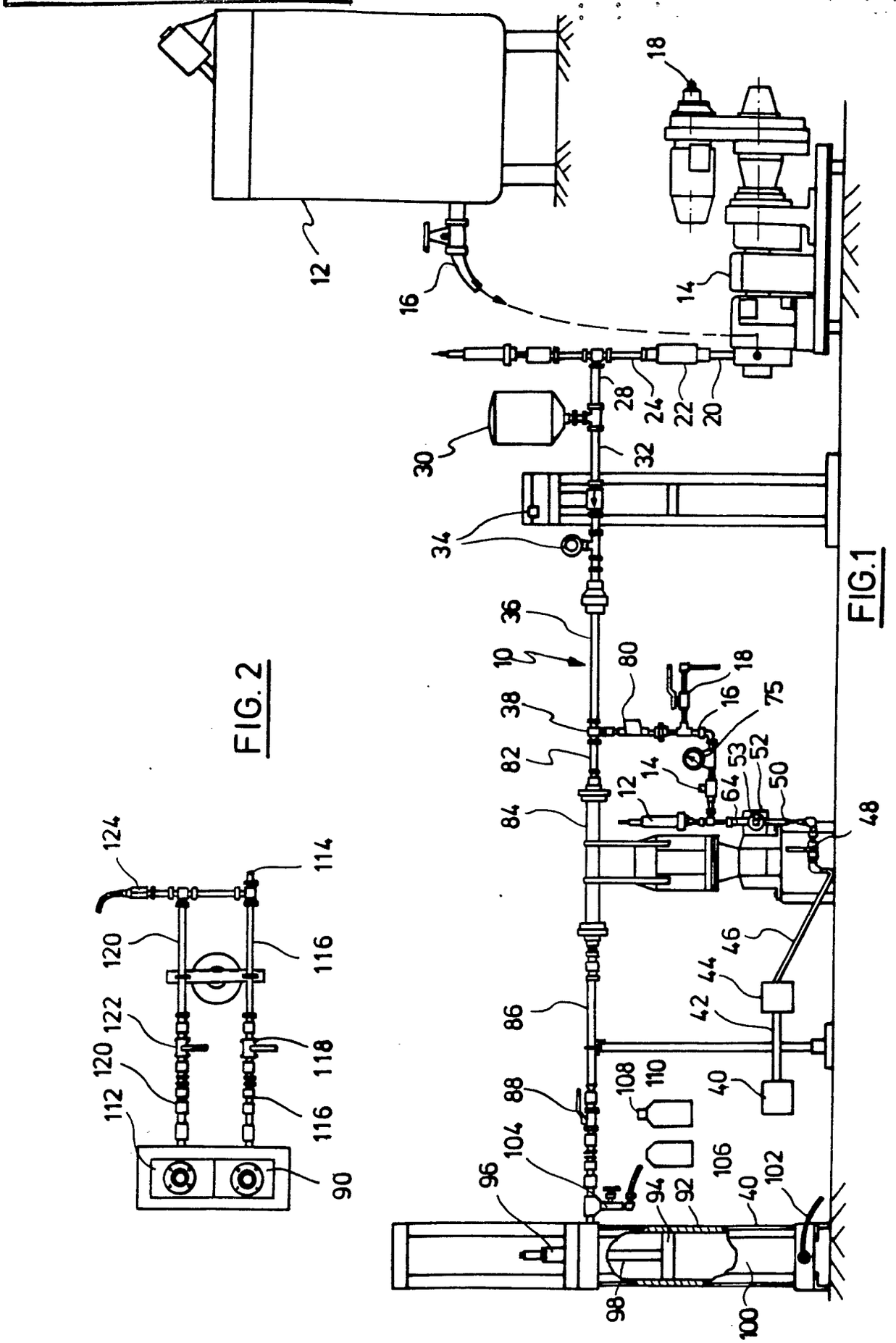


FIG.1

FIG.2

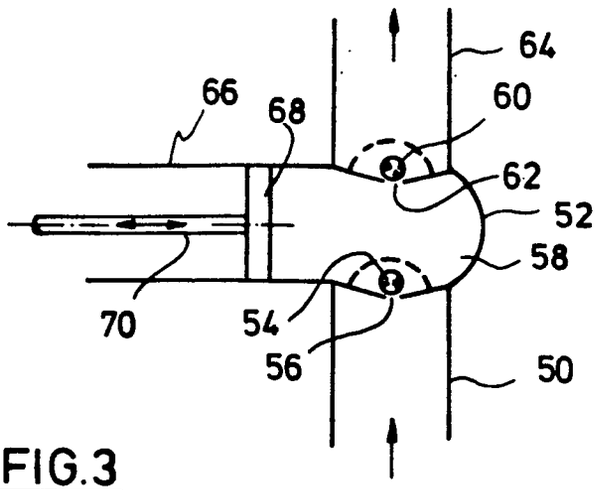
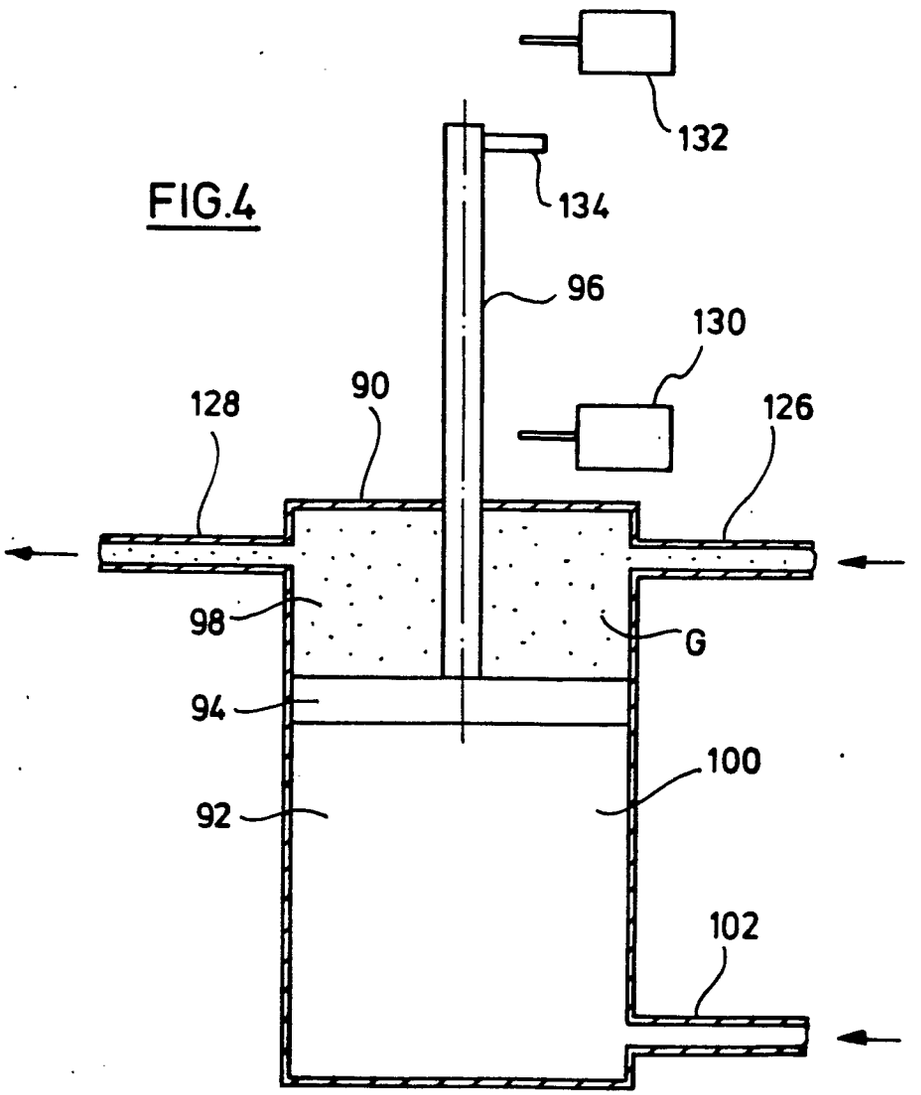


FIG.3

FIG.4



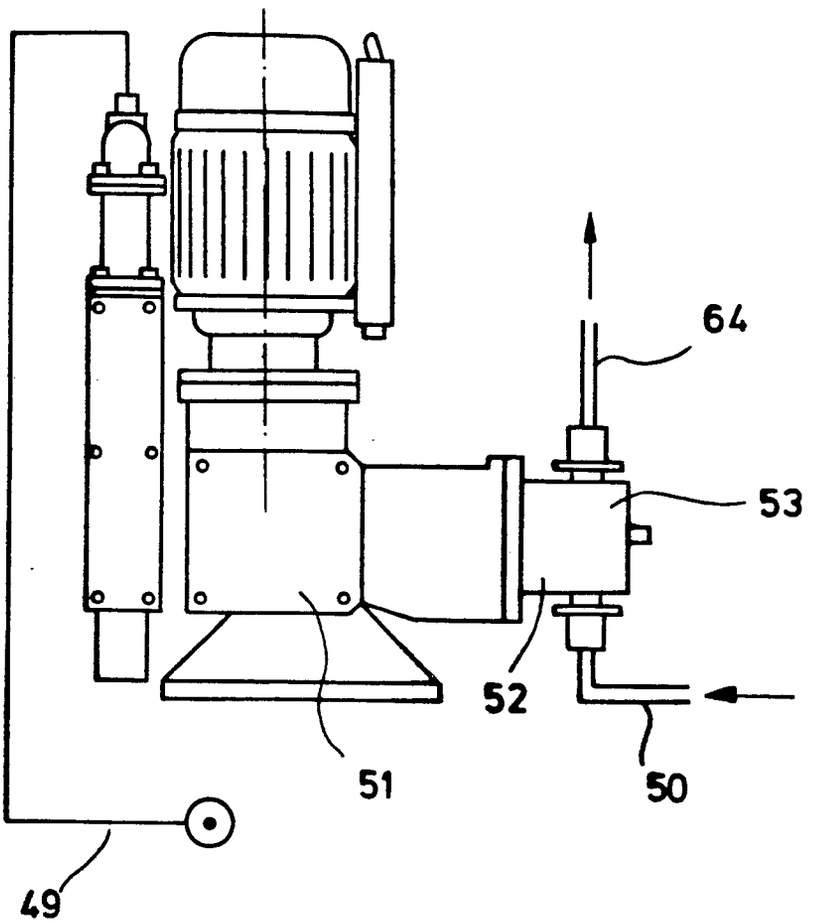


FIG. 5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number

EP 88 12 0038

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.4)
D,X	US-A-4 405 489 (F.P. SISBARRO) * figure 1; column 3, line 67 - column 4, line 35; column 5, lines 19 - 41*	1-7	B 01 F 15/04 B 01 F 3/08 B 01 F 5/06 B 01 F 5/10 B 65 B 31/00
D,A	US-A-3 541 581 (J.A. MONSON)		
A	EP-A-0 148 662 (F. CLANET) & US - A 45 89452 (Cat D,A)		
A	EP-A-0 225 604 (AFROS S.P.A.) * claims 1,2 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.4)

B 01 F 3/00
B 01 F 5/00
B 01 F 15/00
C 11 D 9/00
C 11 D 17/00
A 61 K 7/00
B 65 B 31/00
B 29 B 7/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
BERLIN	22-02-1989	KESTEN W.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P0401)