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(54) **APPARATUS AND METHOD FOR PRODUCING AERATED CONFECTIONERY MASSES**
GERÄT UND VERFAHREN ZUR HERSTELLUNG VON GESCHÄUMTEN KONFEKTMASSEN
APPAREIL ET PROCEDE DE PRODUCTION DE PATE DE CONFISERIE AEREES

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(56) References cited:
WO-A-01/30174
FR-A- 2 616 043
GB-A- 2 181 068
US-A- 4 273 793
US-A- 4 542 028
US-A- 5 484 614
US-A- 5 727 713

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Description

Technical field

[0001] The invention relates to a method and an apparatus for producing an aerated confectionery mass and in particular a confectionery product. A raw confectionery mass is fed by a feed pump from a supply to an aeration unit wherein the confectionery mass is aerated by introducing gas bubbles into the mass. The aerated mass is then fed to a production line for the production of confectionery or micro-aerated massive tablets.

[0002] The confectionery mass is typically a chocolate mass but could also be a filling mass. The chocolate mass is supplied from a mass tank to a tempering unit. In the mass tank the chocolate mass is usually heated to about 45°C in order to melt all crystals. The chocolate mass is cooled down in the tempering unit to about 25 to 26°C and then reheated to about 29 to 31°C in order to melt all crystal structures with exception of the β- structure. The apparatus comprises further a back-pressure regulating valve in an outlet conduit from the aeration unit for adjusting the pressure in the aeration-unit and a depositor hopper into which the aerated mass is fed from the back-pressure valve and from which the mass is dispensed to a downstream production line for manufacturing a desired product. If the product is a tablet it is preferred that the depositor hopper of the production line is replaced by a pressurized manifold comprising multiple nozzles.

Background art

[0003] WO 01/30174 discloses a confectionery aeration system of this type, wherein the depositor hopper includes a weir, to return excess chocolate to the mass tank or the tempering unit. Alternatively, the aerated confectionery mass can be re-circulated from the depositor hopper to the aeration unit and back to the depositor hopper and the depositor hopper includes a level probe which controls the supply of fresh confectionery mass via the tempering unit to the aeration unit.

[0004] EP 0 724 836 discloses a similar system wherein excess aerated confectionery mass is returned via a restriction valve to the tempering unit and the returned portion of the confectionery mass is de-aerated.

[0005] FR 2 616 043 discloses a system for manufacturing expanded products, in particular ice cream, the system comprising a volumetric pump controlled by a central computer to which the signal of a throughput sensor is transmitted. The pump feeds water, milk, sugar and flavours to a container in which these components are mixed and air is introduced in order to expand the mixture. The homogenized and expanded product is fed to a refrigeration unit in which the product is agitated by a paddle wheel in order to keep solid particles in suspension and by an Archimedean screw for transporting it to an outlet conduit. The computer controls the rotation speed of the volumetric pump in accordance with the demand of the expanded product. The system also comprises temperature and pressure sensors for controlling the temperature and the introduced quantity of gas. FR 2 616 043 is considered the closest prior art document.

Disclosure of the invention

[0006] The invention as claimed in claims 1 and 5 solves the problem of how to obtain gas bubbles in the aerated confectionery mass which are rather small so that they are not visible through an as low as possible energy consumption.

[0007] The invention avoids the necessity of de-tempering, de-aeration and re-tempering of the returned portion of the confectionery mass.

[0008] The feed rate with which the confectionery mass is fed to the aeration device is controlled such that it corresponds to the demand of the production line. The confectionery mass is cooled within the aeration device such that the confectionery mass is not heated within the aeration device above a predetermined limit.

[0009] The invention makes thus available a one-pass process by which the desired aeration level is achieved in one go. The invention makes possible a continuous aeration operation without the necessity of returning any portion of the confectionery mass. A larger amount of energy is saved thereby.

[0010] Because the confectionery mass is fed to the aeration device in accordance with the demand of the production line, no portion of the confectionery mass has to be returned. This means that the throughput of the aeration device varies and the heat developed within the aeration device is transferred to a varying amount of confectionery mass. It is therefore necessary to cool the confectionery mass within the aeration device in order to avoid overheating.

[0011] The process is carried out in such a way that the gas bubbles are rather small so that they are not visible. The gas bubbles can have a size of less than about 50 μm.

[0012] The aeration device comprises a stator and a rotor between which the confectionery mass and the gas, usually N_2 gas, are introduced. Shearing forces are developed by the rotation of the rotor and the gas bubbles are distributed by the shearing forces within the confectionery mass. The size of the gas bubbles depends on the magnitude of the shearing forces which in turn depend on the constructional details of the aeration device, in particular the distance between stator elements and the rotor elements, as well as on the rotational speed of the rotor. Preferably, the rotational speed of the rotor is controlled such that the bubble size is just below 50 μm. The rotational speed is controlled to be not higher than necessary for producing gas bubbles of the desired size. The energy consumption is lowered thereby. In addition the confectionery mass is heated less with lower rotational speed so that less energy is consumed for cooling the mass.

[0013] As mentioned, the feed rate of the aeration device is controlled in response to the demand of the production line. A higher feed rate brings about a higher gas amount and a shorter dwelling time of the confectionery mass within the aeration device. In order to compensate for the shorter dwelling time, it is necessary to enhance the rotational speed of the rotor. Higher shearing forces are produced thereby so that the air bubbles are distributed uniformly within the confectionery mass and the bubble size is reduced. The rotational speed of the rotor is controlled in response to the flow rate in accordance with empirical values. The tendency, however, is that a higher flow rate makes necessary a higher rotational speed of the rotator.

[0014] Preferably, a back-pressure valve is installed in the outlet of the aeration device. The back-pressure produced by the back-pressure valve is the pressure prevailing in the aeration device. The feed pump of the aeration device has to work against the back-pressure maintained by the back-pressure valve. The higher the back-pressure is the smaller are the bubbles produced by the aeration device. Preferably, the value of the back-pressure produced by the back-pressure valve is adjustable and the back-pressure value is controlled in response to the flow rate of the confectionery mass.

[0015] The confectionery mass is supplied from the outlet into a depositor hopper or preferably a pressurized manifold from which the aerated confectionery mass is conducted to a production line, e.g. moulds for forming the desired product. The depositor hopper includes a level indicator from which the signal indicating the demand of the production line is derived. In case of depositing via a pressurized manifold the production line includes a speed indicator from which the demand of the production line is derived.

[0016] The pressurized manifold is in general commercially available and comprises multiple nozzles, e.g. 10 to 150 nozzles, through which the aerated mass is filled into moulds which are positioned on a moulding line. The pressure of preferably 3-4 bars is maintained until the mass leaves the nozzle. Usually the moulds are overfilled and the overfilled portion of the product is scraped off. Subsequently the moulds are transported to a vibration section and vibrated in order to better distribute the product in the mould. The product is then cooled to about 16 °C and demoulded. Due to the high viscosity of the mass and the reduced time between filling and solidifying of the mass, the small bubble size of the micro-aeration process may be maintained. A further advantage of the pressurized filling is that the mechanical stress on the mass can be minimized.

[0017] In the most preferred form the apparatus includes a cascade control, including the following steps:

- controlling the feed pump of the aeration device in response to the demand of the production line;
- controlling the gas feed rate to be a predetermined percentage of the confectionery mass feed rate;
- controlling the rotational speed of the rotor of the aeration device in response to the feed rate of the confectionery mass such that the size of the gas bubbles is below a predetermined level;
- controlling the pressure within the aeration device in response to the confectionery mass feed rate;
- controlling the cooling power such that the temperature of the confectionery mass is in the aeration device within a predetermined temperature range.

[0018] The rotational speed of the rotor, the pressure and the cooling power are controlled according to empirical tables by a control unit.

[0019] The parameters and the working principle are as follows for chocolate mass:

The following parameters are entered into the control unit:

- desired aeration level of chocolate mass (preferably online-density)
- chocolate mass flow
- gas flow
- rotational speed of rotor
- back pressure
- chocolate temperature
  - at the inlet of the aeration device
  - at the outlet of the aeration device
- temperature of cooling media

[0020] Working principle:

based on the demand of the downstream production line the aeration unit will either increase or decrease the throughput while ensuring required aeration level (e.g. 10%)

[0021] Increase of chocolate mass throughput:

- amount of chocolate mass and gas flow will be adjusted accordingly to defined ratio resp. online density reading
- increase of rotor speed
- increase of back pressure, e.g. up to a maximum of 5 - 7 bar (if the confectionery mass is a filling mass the back pressure may be increased up to 16 bar)
- control of temperature difference between inlet and outlet
- in case of temperature increase of chocolate mass at the outlet decrease of the temperature of the cooling media to maintain initial difference
- in case of still increasing chocolate outlet temperature while minimum temperature for cooling media is achieved, a decrease of rotor speed is required

[0022] Decrease of chocolate mass throughput:

- amount of chocolate mass and gas flow will be adjusted accordingly to defined ratio resp. online density reading
- decrease of back pressure (minimum 3-4 bars)
- decrease of rotor speed
- control of temperature difference between inlet and outlet
- in case of temperature increase of chocolate mass at outlet decrease of the temperature of the cooling media to maintain initial difference

[0023] During continuous operation no portion of the mass will be returned from the aeration unit to the mass tank. The control unit controls the feed pump of the aeration unit in order to increase or decrease the throughput of the aeration unit in accordance with the demand of the production device or line for forming the desired product.

[0024] Flow depending control of gas input, rotation speed of the rotor, back-pressure and the temperature of the aerated mass are the key working principle. Any flow variations of units operating down-stream of the aeration unit are balanced by the control unit. Back-pressure, gas input, rotation speed and temperature of the aerated mass are adjusted to ensure the desired aeration level independently of flow variations caused by units placed down-stream of the aeration unit.

[0025] The advantages obtained by the claimed invention are primarily reduced start-up time and avoidance of any recirculated masses, which would need to be de-tempered, de-aerated and re-tempered.

[0026] The invention is applicable primarily to chocolate and filling masses.

Brief Description of the Drawings

[0027] A preferred embodiment of the invention will now be described with reference to the drawings in more details, in which:

Figure 1 shows a first embodiment of the invention.
Figure 2 shows a second embodiment of the invention.
Figure 3 shows a flow diagram of the control principle which constitutes a cascade control.
Figure 4 shows a table of the mass flow vs. pressure.
Figure 5 shows a table of mass flow vs. rotation speed.
Figure 6 shows a third embodiment of the invention and represents a variation of the first embodiment with a pressurized manifold.
Figure 7 shows a fourth embodiment of the invention and represents a variation of the second embodiment with a pressurized manifold.

Best Mode for Carrying Out the Invention

[0028] As shown in Figure 1 fresh chocolate mass is fed into a mass tank 10 at a temperature of about 45°C. The fresh chocolate mass is withdrawn from the bottom of the mass tank 10 and fed to a tempering unit 12 by a feed pump 14. The feed pump 14 is a positive displacement pump. The temperature of the chocolate mass is first decreased to about 27°C and then raised to about 29 to 31°C in the tempering unit 12. From the tempering unit the chocolate mass is fed to a micro-aeration unit 18. The micro-aeration unit 18 includes a stator and a rotor which is driven by a motor 20. The rotor has the form of a paddle wheel. The chocolate mass is stirred and kneaded in the micro-aeration unit 18 between the stator and the rotor and N_2 gas is added with a pressure of about 3 bar so that an aeration level of about 10% is achieved. The aerated chocolate mass is fed from the outlet 22 of the micro-aeration unit through a back-pressure regulating valve 22 into a depositor hopper 24 of a production line 32 from which the aerated chocolate mass is further processed.

[0029] A switch 26 is provided at the outlet of the micro-aeration unit 18 so that the aerated chocolate can be returned to the mass tank 10 during start-up of the system in order to drain the system. A decrystallizer 34 is arranged in this return conduit. Apart from the start-up operation, the aerated chocolate mass is not re-circulated or returned to the mass tank 10.

[0030] The depositor hopper 24 has a level detector 28. The signal of the level detector 28 indicates the demand of the production line 32. The higher the level is, the lower is the demand and vice versa. The signal of the level detector 28 is transmitted to a control unit 30 which controls the feed rate of the feed pump 14 such that the level of the confectionery mass in the depositor hopper 24 corresponds to a nominal level.

[0031] The control unit 30 controls also the pressure in the N_2 feed line such that the N_2 feed rate is proportional to the feed rate of the confectionery mass, whereby a constant aeration level in the confectionery mass delivered from the aeration device 18 is obtained.

[0032] The control unit 30 controls also the rotational speed of the rotor of the aeration unit 18 and the back-pressure adjusted by the back-pressure valve 22. These two parameters are decisive for the size of the air bubbles. A higher rotational speed of the rotor and a higher pressure in the aeration unit bring about a smaller bubble size. A higher feed rate of the feed pump 14 results in a shorter dwelling time of the confectionery mass within the aeration unit 18, which, in turn, results in a larger bubble size. A higher feed rate of the feed pump 14 has therefore to be compensated for by a higher rotational speed of the rotor and higher pressure in the aeration unit 18.

[0033] Control of the rotational speed of the rotor and of the back-pressure is preferred in order to save energy. It is possible to run the aeration device 18 continuously with the maximum rotational speed of the rotor and the maximum back-pressure, as they are necessary for a maximum feed rate of the feed pump 14. This results in an unnecessary high power consumption at lower feed rates because at lower feed rates the size of the gas bubbles will then be smaller than necessary. The size of the gas bubbles needs not to be smaller than 50 μm in order not to be visible. The smaller size of the gas bubbles does not detract from the quality of the product but is a waste of energy.

[0034] Control of the temperature is, however, important. The rotating rotator develops heat within the aeration unit. The amount of heat depends on the rotational speed of the rotator as well as on the dwelling time of the mass within the aeration unit 18, i. e. on the feed rate of the feed pump 14. The aeration unit 18 includes therefore means for controlling the temperature of the confectionery mass. The inner walls of the aeration unit 18 can include a cooling jacket or pipe through which a cooling medium like water circulates. The inlet temperature of the cooling medium and the flow rate are adjusted in order to produce the desired cooling effect. The temperature of the confectionery mass at the outlet of the aeration unit 18 is measured and transmitted to the control unit 30, which also controls the cooling equipment of the aeration unit 18.

[0035] In summary the control unit 30 constitutes a cascade control, whereas the demand of the production line 32 leads to a predetermined ratio of the gas feed rate relative to the confectionery mass feed rate. Dependent on this, the rotational speed of the rotor is adjusted. The cascade continues with an adjustment of pressure which requires changing the temperature of the cooling media adapted to the new conditions.

[0036] Aeration units 18 having suitable cooling means are inter alia the models Rotoplus 3000 and Rotoplus 1000 of Tanis Food Tec and the models T-2000 and T-750 of Trefa Continu Aerating systems. Figure 4 and Figure 5 show the dependency of the pressure and rotation speed respectively on the mass flow for the Aeration unit T-2000 of Trefa Continu Aerating system.

[0037] The conduits between the tempering unit 12 and the dispensing nozzle of the aeration unit 18 are temperature controlled. The temperature is controlled to maintain chocolate temperature between 28 and 31 degrees centigrade when processing chocolate mass.

[0038] Figure 2 shows an embodiment of the invention wherein the single feed pump 14 is replaced by a first and a second feed pump 15, 16. The first feed pump 15 is arranged between the mass tank 10 and the tempering unit 12 and the second feed pump 16 is arranged between the tempering unit 12 and the micro-aeration unit 18. The second feed pump 16 is a positive displacement pump and controlled in the same way as the single feed pump 14 of the first embodiment shown in Figure 1.

[0039] Figure 6 shows a third embodiment of the invention wherein the depositor hopper 24 of the production line is replaced by a pressurized manifold 40. The production line has a speed detector 38. The signal of the speed detector 38 indicates the demand of the production line 32. The higher the speed is, the higher is the demand and vice versa. The signal of the speed detector 38 is transmitted to a control unit 30 which controls the feed rate of the feed pump 14 such that the speed of the confectionery mass into the pressurized manifold 40 corresponds to a predetermined speed. The confectionery mass is then filled under pressure through the pressurized manifold 40 into moulds 44 which are positioned on a moulding line 42. After filling the moulds 44 with the confectionery, the moulds 44 are transported to a vibration section 46 and the moulds 44 are vibrated.

[0040] In Figure 7 the single feed pump 14 is replaced by a first and second feed pump 15, 16 according to the embodiment shown in Figure 2. The depositing unit is realized by a pressurized manifold 40 in accordance to Figure 6.

<u>List of reference number</u>

[0041]

10	mass tanks
12	tempering unit
14	feed pump
15	first feed pump
16	second feed pump
18	micro-aeration unit
20	motor
22	outlet
24	depositor hopper
26	switch
28	level detector
30	control unit
32	production line
34	decrystallizer
38	speed detector
40	pressurized manifold
42	moulding line
44	mould
46	vibration section

Claims

1. Method for producing an aerated confectionery mass,
wherein a raw confectionery mass is fed at a feed rate from a supply (10, 12) to an aeration unit (18) for introducing gas into the confectionery mass, the aeration unit (18) comprising a stator and a rotor between which the confectionery mass and the gas are introduced;
wherein the confectionery mass containing the introduced gas is stirred and kneaded by the rotor of the aeration unit (18);
wherein the feed rate of the raw confectionery mass

is controlled such that it corresponds to the demand of the production line (32);
wherein the amount of introduced gas in response to the feed rate of the confectionery mass is controlled such that the aeration level of the confectionery mass remains substantially constant;
wherein the temperature of the aeration mass within the aeration unit (18) is controlled such that it remains substantially constant and independent from the feed rate; and
wherein the aerated confectionery mass is fed to a production line (32) for the production of confectionery,
characterized in
that the rotational speed of the rotor being controlled such that it is enhanced for higher feed rates and reduced for lower feed rates in order to produce gas bubbles of approximately the same size independent from the feed rate.

2. Method according to claim 1, wherein the pressure in the aeration unit (18) is enhanced for higher feed rates and reduced for lower feed rates.

3. Method according to claim 1 or 2, wherein the production line comprises a pressurized manifold (40) through which the confectionery mass is filled into moulds (44) of a moulding line (42) under pressure.

4. Method according to any one of claims 1 to 3, wherein the confectionery mass is a chocolate mass or filling mass.

5. Apparatus for carrying out the method of any one of claims 1 to 4, comprising:

a supply (10, 12) for the raw confectionery mass;
an aeration unit (18) for incorporating gas into the confectionery mass, the aeration unit (18) including a stator and a rotor between which the confectionery mass and the gas are introduced, wherein the rotor of the aeration unit (18) is adapted for stirring and kneading the confectionery mass containing the introduced gas;
a feed pump (14) for feeding the confectionery mass to the aeration unit, means (24) for measuring the throughput of aerated confectionery mass demanded by a production line; and
a control unit (30) for controlling the feed rate of the feed pump (14) to correspond to the demand of the production line (32) and for controlling the temperature of the confectionery mass during aeration in the aeration unit (18) such that it remains substantially unchanged;
characterized in that the control unit (30) is adapted to control the speed of the rotor such that it is enhanced for higher feed rates and reduced for lower feed rates in order to produce gas bubbles of approximately the same size independent from the feed rate.

6. Apparatus according to claim 5, wherein a back-pressure regulating valve (22) is arranged in the outlet line from the aeration unit (18) the back-pressure generated by the valve (22) being controlled by the control unit (30) such that it is enhanced for higher feed rates and reduced for lower feed rates.

7. Apparatus according to claim 5 or 6, wherein the aerated confectionery mass is dispensed from the aeration unit (18) into a depositor hopper (24), the depositor hopper (24) including a level indicator (28) which generates a signal indicating the demand of the production line (32).

8. Apparatus according to claim 5 or 6, wherein the aerated confectionery mass is dispensed from the aeration unit (18) to a pressurized manifold (40) of the production line (32) with a speed detector (38) indicating the demand of the production line (32).

Patentansprüche

1. Verfahren zur Herstellung einer belüfteten süßwarenmasse,
bei dem eine Süßwarenrohmasse mit einer Förderrate von einer Versorgung (10, 12) zu einer Belüftungseinheit (18) zum Einführen von Gas in die Süßwarenmasse zugeführt wird, wobei die Belüftungseinheit (18) einen Stator und einen Rotor umfasst, zwischen denen die Süßwarenmasse und das Gas eingeführt werden;
bei dem die Süßwarenmasse, die das eingeführte Gas enthält, durch den Rotor der Belüftungseinheit (18) gerührt und geknetet wird;
bei dem die Förderrate der Süßwarenrohmasse so gesteuert wird, dass sie dem Bedarf der Produktionslinie (32) entspricht;
bei dem die eingeführte Gasmenge ansprechend auf die Förderrate der Süßwarenmasse so gesteuert wird, dass das Belüftungsniveau der Süßwarenmasse im Wesentlichen konstant bleibt;
bei dem die Temperatur der Belüftungsmasse in der Belüftungseinheit (18) so gesteuert wird, dass sie im Wesentlichen konstant und unabhängig von der Förderrate bleibt; und
bei dem die belüftete Süßwarenmasse zu einer Produktionslinie (32) zur Herstellung von Süßwaren zugeführt wird,
dadurch gekennzeichnet,
dass die Drehgeschwindigkeit des Rotors so gesteuert wird, dass sie für höhere Förderraten erhöht und für niedrigere Förderraten verringert wird, um Glasblasen von ungefähr derselben Größe unabhängig von der Förderrate zu erzeugen.

2. Verfahren nach Anspruch 1, bei dem der Druck in der Belüftungseinheit (18) für höhere Förderraten erhöht und für niedrigere Förderraten verringert wird.

3. Verfahren nach Anspruch 1 oder 2, bei dem die Produktionslinie einen druckbeaufschlagten Verteiler (40) umfasst, durch den die Süßwarenmasse in Formen (44) einer Formgebungslinie (42) unter Druck gefüllt wird.

4. Verfahren nach einem der Ansprüche 1 bis 3, bei dem die Süßwarenmasse eine Schokoladenmasse oder Füllmasse ist.

5. Vorrichtung zur Durchführung des Verfahrens nach einem der Ansprüche 1 bis 4, umfassend:

eine Versorgung (10, 12) für die Süßwarenrohmasse;
eine Belüftungseinheit (18) zum Einbringen von Gas in die Süßwarenmasse, wobei die Belüftungseinheit (18) einen Stator und einen Rotor umfasst, zwischen denen die Süßwarenmasse und das Gas eingeführt werden, wobei der Rotor der Belüftungseinheit (18) angepasst ist, um die Süßwarenmasse, die das eingeführte Gas enthält, zu rühren und zu kneten;
eine Zuführpumpe (14), um die Süßwarenmasse zur Belüftungseinheit zuzuführen,
eine Einrichtung (24), um den von einer Produktionslinie geforderten Durchsatz von belüfteter Süßwarenmasse zu messen; und
eine Steuereinheit (30), um die Förderrate der Zuführpumpe (14) zu steuern, um dem Bedarf der Produktionslinie (32) zu entsprechen und um die Temperatur der Süßwarenmasse während einer Belüftung in der Belüftungseinheit (18) so zu steuern, dass sie im Wesentlichen unverändert bleibt;
dadurch gekennzeichnet, dass die Steuereinheit (30) angepasst ist, um die Geschwindigkeit des Rotors so zu steuern, dass sie für höhere Förderraten erhöht und für niedrigere Förderraten verringert wird, um Glasblasen von ungefähr derselben Größe unabhängig von der Förderrate zu erzeugen.

6. Vorrichtung nach Anspruch 5, bei der ein Rückdruckregelventil (22) in der Auslassleitung von der Belüftungseinheit (18) angeordnet ist, wobei der Rückdruck, der durch das Ventil (22) erzeugt wird, durch die Steuereinheit (30) so gesteuert wird, dass er für höhere Förderraten erhöht und für niedrigere Förderraten verringert wird.

7. Vorrichtung nach Anspruch 5 oder 6, bei der die belüftete Süßwarenmasse von der Belüftungseinheit (18) in einen Ablagetrichter (24) abgegeben wird, wobei der Ablagetrichter (24) einen Niveauanzeiger (28) umfasst, der ein Signal erzeugt, das den Bedarf der Produktionslinie (32) anzeigt.

8. Vorrichtung nach Anspruch 5 oder 6, bei der die belüftete Süßwarenmasse von der Belüftungseinheit (18) zu einem druckbeaufschlagten Verteiler (40) der Produktionslinie (32) abgegeben wird, wobei ein Geschwindigkeitsdetektor (38) den Bedarf der Produktionslinie (32) anzeigt.

Revendications

1. Procédé de production d'une pâte de confiserie aérée,
dans lequel, une pâte de confiserie brute est alimentée à une certaine vitesse d'alimentation depuis une alimentation (10,12) jusqu'à une unité d'aération (18) pour introduire un gaz dans la pâte de confiserie, l'unité d'aération (18) comprenant un stator et un rotor entre lesquels la pâte de confiserie et le gaz sont introduits ;
dans lequel la pâte de confiserie contenant le gaz introduit est malaxée et pétrie par le rotor de l'unité d'aération (18) ;
dans lequel la vitesse d'alimentation de la pâte de confiserie brute est régulée de telle sorte qu'elle corresponde à la demande de la chaîne de production (32) ;
dans lequel la quantité de gaz introduit en réponse à la vitesse d'alimentation de la pâte de confiserie est régulée de telle sorte que le niveau d'aération de la pâte de confiserie reste sensiblement constant ;
dans lequel la température de la pâte à aérer dans l'unité d'aération (18) est régulée de telle sorte qu'elle reste sensiblement constante et indépendante de la vitesse d'alimentation ; et
dans lequel la pâte de confiserie aérée est passée à une chaîne de production (32) pour la production de la confiserie,
caractérisé en ce que
la vitesse de rotation du rotor est régulée de telle sorte qu'elle soit augmentée pour des vitesses d'alimentation supérieures et réduite pour des vitesses d'alimentation inférieures afin de produire des bulles de gaz d'approximativement la même dimension indépendamment de la vitesse d'alimentation.

2. Procédé selon la revendication 1, dans lequel la pression dans l'unité d'aération (18) est rehaussée pour des vitesses d'alimentation supérieures et réduite pour des vitesses d'alimentation inférieures.

3. Procédé selon la revendication 1 ou 2, dans lequel la chaîne de production comprend un collecteur pressurisé (40) à travers lequel la pâte de confiserie est remplie dans des moules (44) d'une chaîne de moulage (42) sous pression.

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel la pâte de confiserie est une pâte de chocolat ou une pâte de fourrure.

5. Appareil pour exécuter le procédé selon l'une quelconque des revendications 1 à 4, comprenant :

une alimentation (10, 12) de la pâte de confiserie brute ;
une unité d'aération (18) pour incorporer un gaz dans la pâte de confiserie, l'unité d'aération (18) comprenant un stator et un rotor entre lesquels la pâte de confiserie et le gaz sont introduits ; le rotor de l'unité d'aération (18) étant adapté pour malaxer et pétrir la pâte de confiserie contenant le gaz introduit ;
une pompe d'alimentation (14) pour alimenter la pâte de confiserie jusqu'à l'unité d'aération, un moyen (24) pour mesurer le débit de la pâte de confiserie aérée demandée par une chaîne de production ; et
une unité de régulation (30) pour réguler la vitesse d'alimentation de la pompe d'alimentation (14) pour qu'il corresponde à la demande de la chaîne de production (32) et pour réguler la température de la pâte de confiserie durant l'aération dans l'unité d'aération (18) de telle sorte qu'elle reste sensiblement inchangée ;
caractérisé en que l'unité de régulation (30) est adaptée pour réguler la vitesse du rotor de telle sorte qu'elle soit rehaussée pour les vitesses d'alimentation supérieures et réduite pour les vitesses d'alimentation inférieures afin de produire des bulles de gaz d'approximativement la même dimension indépendamment de la vitesse d'alimentation.

6. Appareil selon la revendication 5, dans lequel une vanne de régulation de contre-pression (22) est disposée dans la conduite de sortie de l'unité d'aération (18), la contre-pression générée par la vanne (22) étant régulée par l'unité de régulation (30) de façon à être rehaussée pour les vitesses d'alimentation supérieures et réduite pour les vitesses d'alimentation réduites.

7. Appareil selon la revendication 5 ou 6, dans lequel la pâte de confiserie aérée est distribuée depuis l'unité d'aération (18) dans une trémie de dépôt (24), la trémie de dépôt (24) comportant un indicateur de niveau (28) qui génère un signal indiquant la demande de la chaîne de production (32).

8. Appareil selon la revendication 5 ou 6, dans lequel la pâte de confiserie aérée est distribuée depuis l'unité d'aération (18) dans un collecteur pressurisé (40) de la chaîne de production (32), un détecteur de vitesse (38) indiquant la demande de la chaîne de production (32).

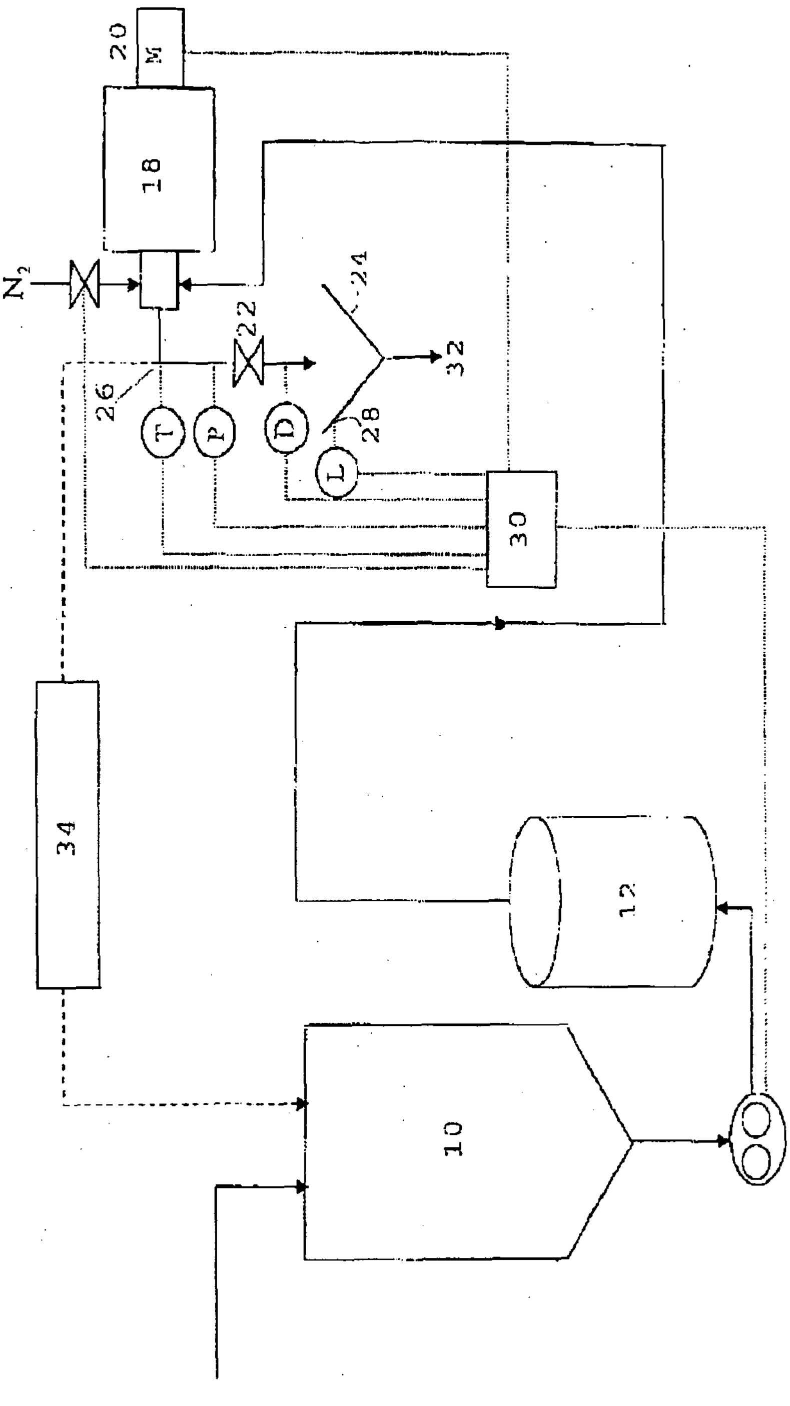

Fig. 1

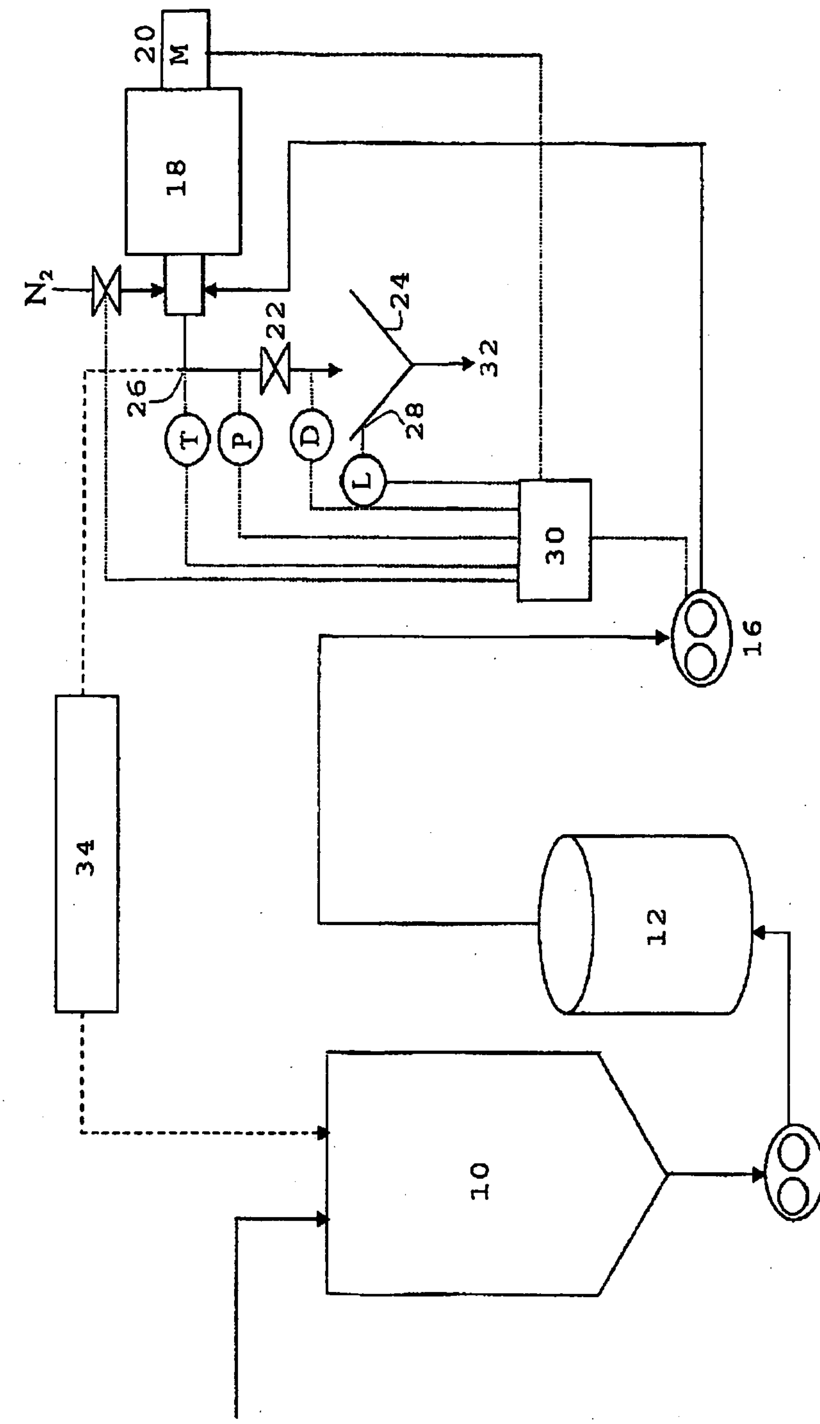

Fig. 2

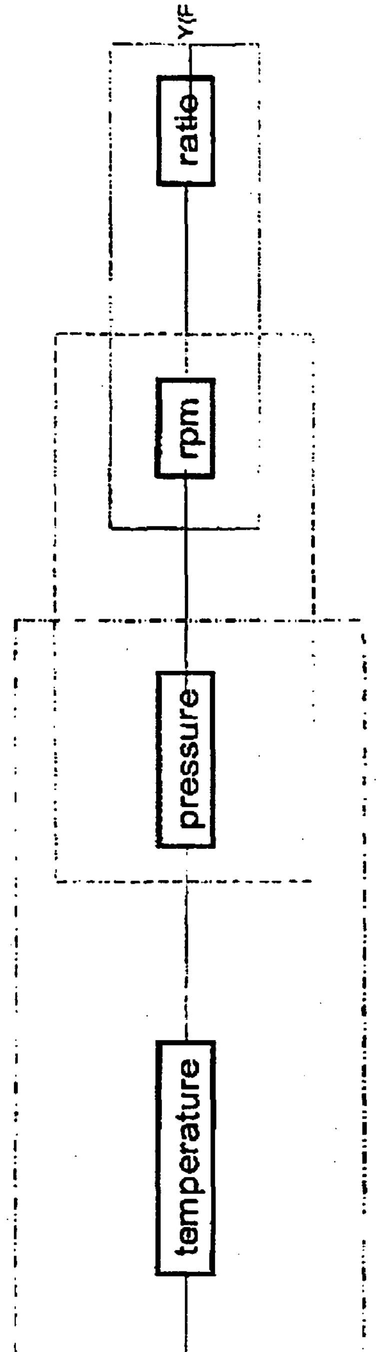

Fig. 3

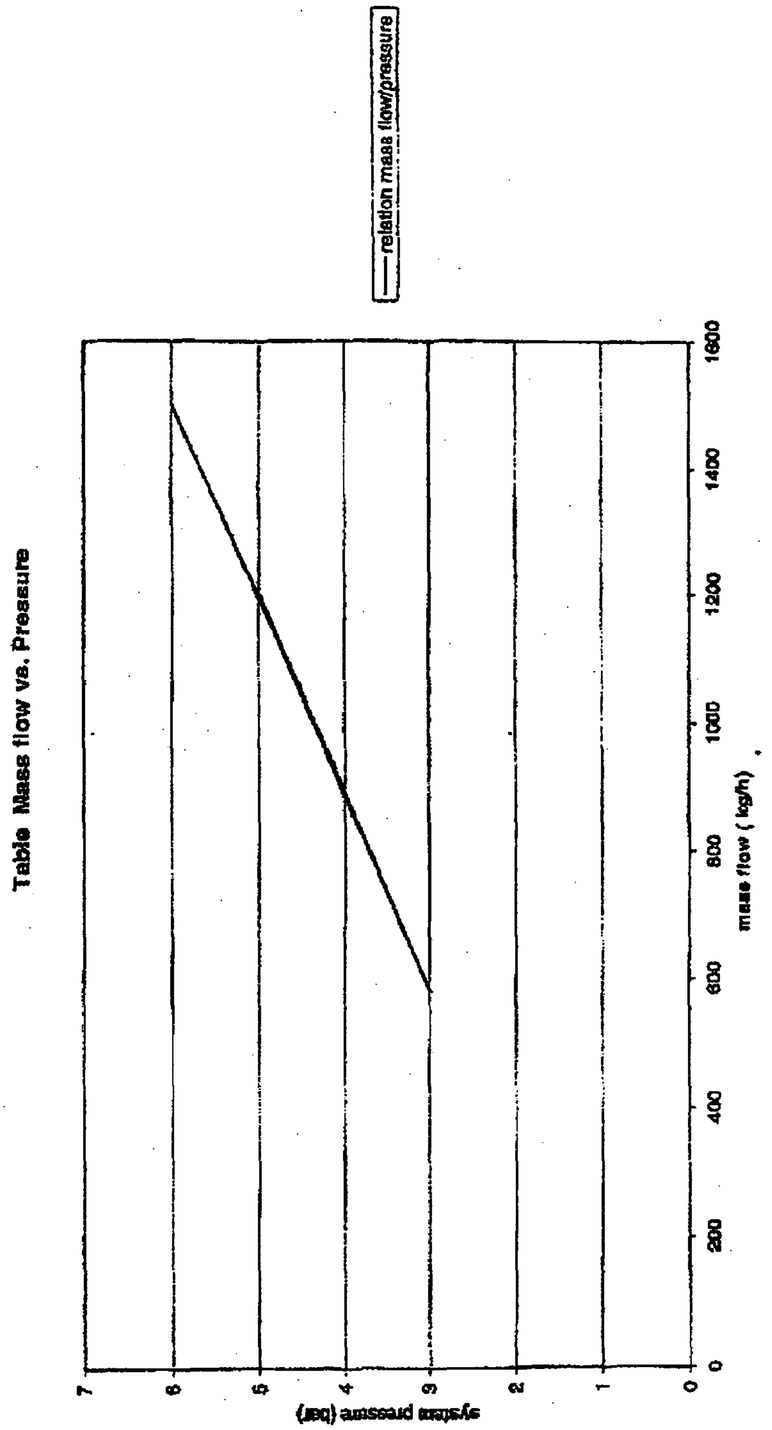
Table Mass flow vs. Pressure
relation mass flow/pressure
system pressure (bar)
7
6
5
4
3
2
1
0
mass flow (kg/h)
0
200
400
600
800
1000
1200
1400
1600

Fig. 4

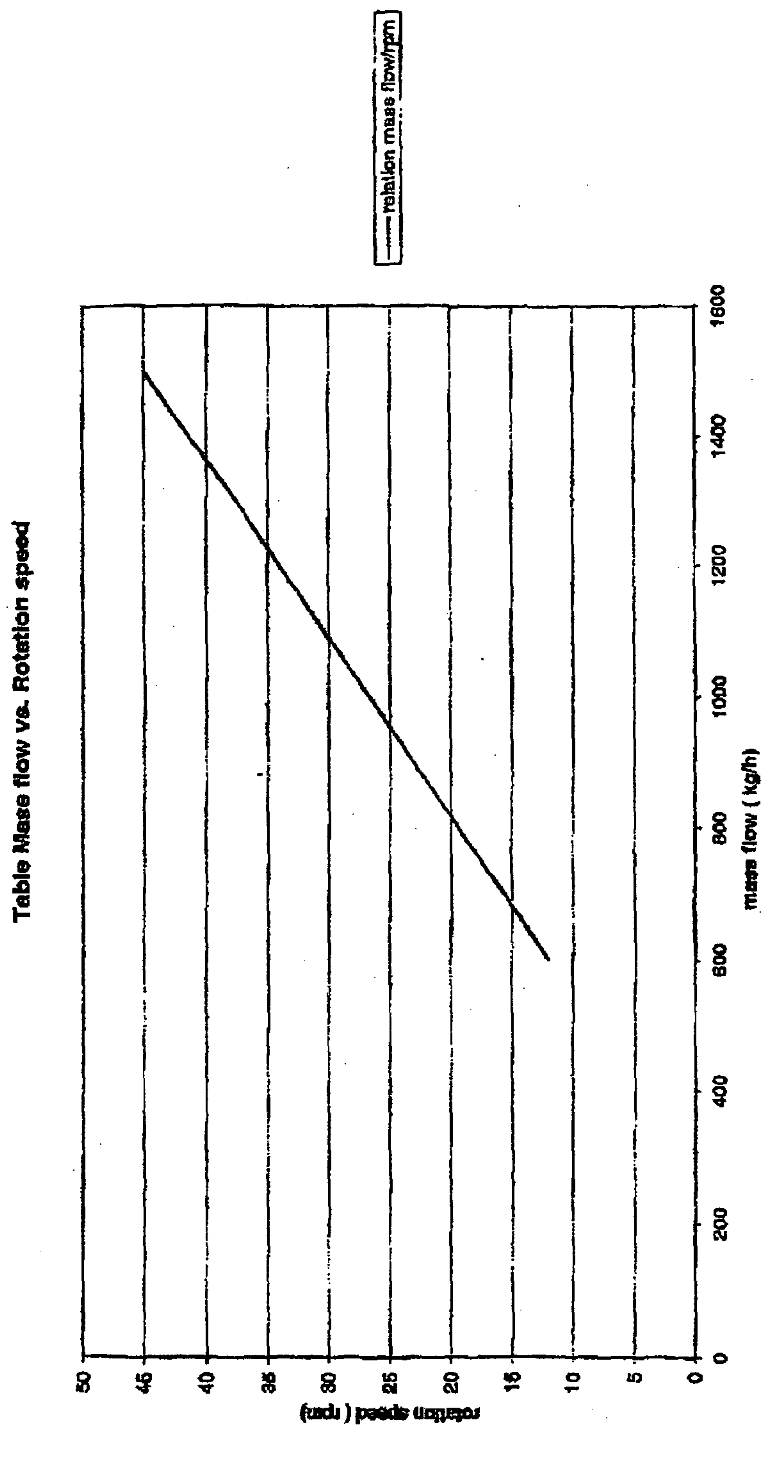
Table Mass flow vs. Rotation speed
rotation mass flow/rpm
mass flow (kg/h)
rotation speed (rpm)
0
200
400
600
800
1000
1200
1400
1600
0
5
10
15
20
25
30
35
40
45
50

Fig. 5

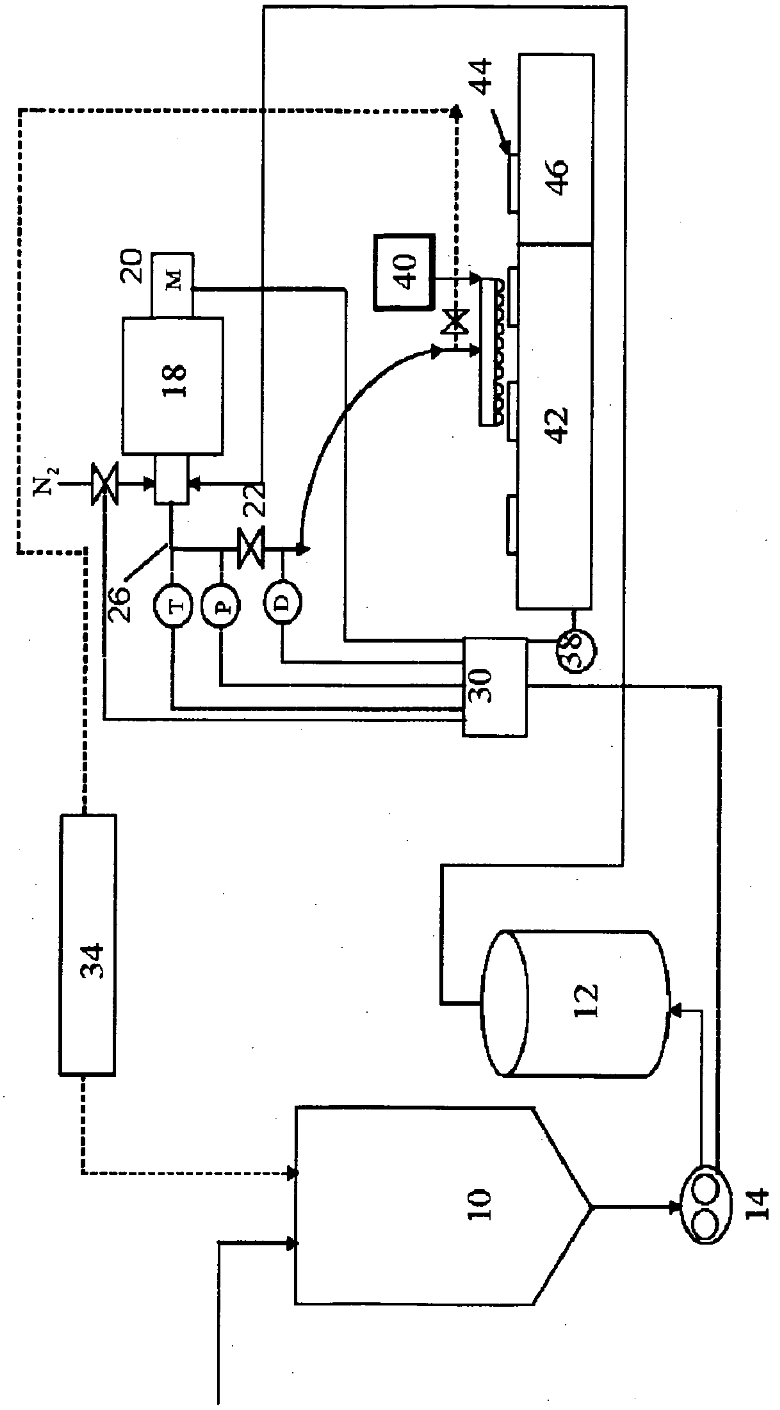

Fig. 6

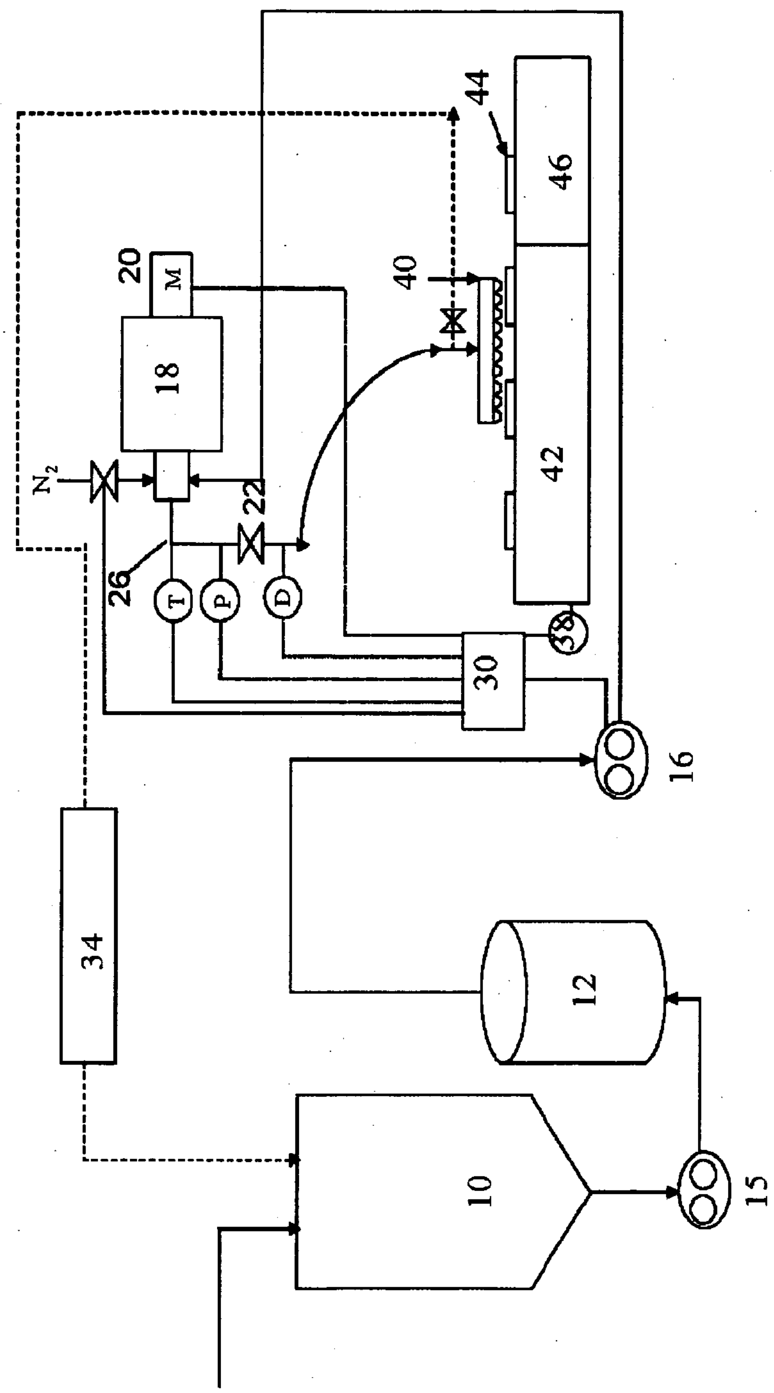

Fig. 7

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- WO 0130174 A **[0003]**
- EP 0724836 A **[0004]**
- FR 2616043 **[0005]**