

(19) **DANMARK**

(10) **DK/EP 2793597 T3**



(12)

Oversættelse af europæisk patentskrift

Patent- og
Varemærkestyrelsen

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- (51) Int.Cl.: **A 23 F 5/36 (2006.01)** **A 23 F 5/12 (2006.01)**
- (45) Oversættelsen bekendtgjort den: **2016-10-31**
- (80) Dato for Den Europæiske Patentmyndigheds bekendtgørelse om meddelelse af patentet: **2016-07-20**
- (86) Europæisk ansøgning nr.: **13821965.4**
- (86) Europæisk indleveringsdag: **2013-10-23**
- (87) Den europæiske ansøgnings publiceringsdag: **2014-10-29**
- (86) International ansøgning nr.: **IB2013059580**
- (87) Internationalt publikationsnr.: **WO2014064623**
- (30) Prioritet: **2012-10-24 SM 201200046**
- (84) Designerede stater: **AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR**
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- (54) Benævnelse: **FREMGANGSMÅDE OG APPARAT TIL FREMSTILLING AF EN TABLET AF PULVERFORMEDE PRODUKTER TIL ESPRESSOBRYGGEKSTRAKTION**
- (56) Fremdragne publikationer:
WO-A1-2013/001052
US-A- 5 914 309
US-A1- 2003 127 455
US-A1- 2011 070 286
US-A1- 2011 071 184

DESCRIPTION

Field of the invention

[0001] The present invention generally finds application in the food industry and particularly relates to a method and an arrangement for making a tablet of powdered products for espresso beverage extraction.

Background art

[0002] Certain espresso beverages are known to be obtained by brewing or instantaneous extraction of flavors and active ingredients of more or less edible products, such as coffee, barley, malt, ginseng, infusions and other similar products in powder or particle form, using warm or hot water at ambient pressure or preferably at a pressure above the atmospheric pressure.

[0003] As used herein, the term espresso is intended to designate a beverage that is prepared instantaneously or for a waiting consumer.

[0004] A particular class of base products requires grinding to obtain products of various particle sizes.

[0005] A typical, non-exclusive example of such class of products is coffee, which is previously mixed, roasted and then cold-ground to obtain the classical coffee grounds that are sold in hermetically and vacuum sealed packages for home and public use.

[0006] In order to prepare an espresso coffee, a given amount of coffee grounds is loaded in a perforated container, known as filter container, whereupon the loaded grounds are compressed manually or using a special tamper.

[0007] Then, hot water is forced through the compressed grounds at a given pressure, using a special machine.

[0008] A high-quality espresso coffee, as typically requested in bars, requires some skill and a high-cost professional machine.

[0009] For domestic preparation of high-quality espresso coffee, portions of coffee grounds have been long available, which are pre-packaged as pods made of filter paper or plastic capsules of various shapes and sizes. These items are introduced into relatively inexpensive machines, which are affordable to private consumers or small-size businesses and communities, to prepare a top-quality espresso.

[0010] Examples of these pre-packaged items are disclosed, for instance, in FR 1 029 940, US 1 951 357, US 4 394 395, IT 1 213 385.

[0011] One drawback of such prior art methods and items for preparing espresso coffee consists in the relatively high costs for manufacturing and packaging capsules or pods, which results in accordingly high sales costs for the final consumer.

[0012] A further drawback is that this known type of packaging requires the presence of enclosures made of plastic, paper, aluminum or other materials to contain the products to be filtered, which make the manufacturing process more complex and problematic.

[0013] Yet another drawback relates to environment-friendly disposal and environmental impact reduction issues, due to such enclosures, after coffee dispensing.

[0014] In an attempt to obviate the above drawbacks, a novel process has been developed for producing tablets or pastilles, that does not require any kind of enclosure, but requires moistening of the tablet and application of energy thereto, in the form of vibrations, namely high-frequency ultrasonic vibrations.

[0015] Processes of this type are disclosed and claimed, for instance, in EP1956921 e WO2001/027426.

[0016] While this novel preparation method has provided a number of advantages over prior art products, such as the elimination of the plastic enclosure for coffee grounds, which considerably reduces environmental impact, it still has the drawback that vibrations are required to be transferred by contact or through an interposed medium, which increases the complexity and

costs of the manufacturing process.

[0017] Furthermore, the tablet is not uniformly compacted, as ultrasonic waves are progressively attenuated as they pass through the tablet, and the tablet cannot be compacted above a given thickness limit.

[0018] From US 2011/070286 a process for making a nicotine-comprising chewing gum is known by dispensing a powder portion from a gum-base-comprising powder, optionally shaping said powder portion into a powder aggregate (e.g. a tablet), and applying electromagnetic energy to said powder portion or said powder aggregate to transform said powder portion or said powder aggregate into said chewing gum.

[0019] From US2011/071184 is known a process for making a tablet by compacting a powder blend in a die to form a tablet shape, wherein the powder blend contains a pharmaceutically active agent and a meltable binder and applying radio frequency or microwave energy to the tablet shape for a sufficient period of time to soften or melt the binder within said tablet shape to form the tablet.

[0020] From US5914309 a microwave process is known for producing detergent tablets comprising precompacting a detergent composition, transporting said detergent composition on a conveyor belt through a microwave radiation zone, exposing said detergent composition to microwave radiation and treating said detergent composition with hot air, wherein said microwave radiation has an output effective to produce break-resistant tablets.

[0021] US2003/127455 teaches a process and device to roast green coffee beans using a combination of microwave, conduction, convection, infrared, and latent steam heating. The device is a sealed cartridge that is semi-porous and is used in a conventional or purpose built microwave oven discloses a device and process to roast green coffee beans using a combination of microwave and other heating means.

Disclosure of the invention

[0022] The object of the present invention is to overcome the above drawbacks, by providing a method of producing a tablet of ground powdered products for hot espresso beverage extraction, that is highly efficient and relatively cost-effective.

[0023] A particular object of the present invention is to provide a method as described above which avoids the use of enclosures for tablets of brewable products.

[0024] A further object is to conceive a method as described above which affords a considerable reduction of manufacturing process and equipment costs.

[0025] Yet another object is to provide a tablet for espresso beverage preparation that has a substantially integral self-supporting construction.

[0026] These and other objects, as more clearly shown hereinafter, are fulfilled, as defined in claim 1.

[0027] In a second aspect, the invention relates to an arrangement for making a tablet of ground powdered products for hot espresso beverage extraction as defined in claim 13.

[0028] Particular embodiments of the method and arrangement of the invention are described in the dependent claims.

Brief description of the drawings

[0029] Further features and advantages of the invention will be more apparent upon reading of the detailed description of a few preferred, non-exclusive embodiments of a method and apparatus for producing a tablet for hot espresso beverage extraction, which are described as non-limiting examples with the help of the annexed drawings, in which:

FIG. 1 is a block diagram of the inventive method;

FIG. 2 is a schematic view of a first embodiment of an apparatus for carrying out the main steps of the method of FIG. 1;

Fig. 3 is a schematic view of a variant embodiment of several components of the apparatus of FIG. 2.

Detailed description of a preferred embodiment

[0030] Particularly referring to the above mentioned figures, the method for producing a tablet for hot espresso beverage extraction may be advantageously used for brewable products of various types, as long as they can be actually brewed, including without limitation coffee, barley, malt, gingseng, tea, hibiscus tea, infusions and other similar products in powder or particle form.

[0031] While the method is described below with reference to a coffee tablet, it is applicable to any of the above mentioned products.

[0032] As briefly shown in the block diagram of FIG. 1 the method comprises a previous preparation of a blend of coffee grains, after conventional roasting.

[0033] Then, the coffee blend undergoes a grinding step a) to obtain grounds having a substantially uniform particle size, herein referred to as "powered product" substantially in the dry state or with a very low residual moisture content.

[0034] The powdered product will undergo a dosing step b) by special volumetric dosing or weighing units, such that a dose of a predetermined amount of product is isolated.

[0035] The product dose will undergo a moistening step c) with 2% to 20%, preferably about 10% liquid, preferably untreated water, based on the weight of dry powdered product.

[0036] Possibly, appropriate binders may be used for improving mutual adhesion of the powder particles in the later steps.

[0037] The powdered product, after addition of water and other binders, if any, will preferably undergo a homogenization step d), e.g. by stirring with a special spindle or vibration mixer, or with any other means that can provide a substantially uniform moistened mixture.

[0038] Now, the moistened and homogenized mixture undergoes a forming step e) to assume a predetermined shape.

[0039] Particularly, the forming step e) may be carried out by an apparatus as described below, which is adapted to compress the moistened mixture into an item, e.g. a disk-shaped or prismatic item, hereinafter referred to as tablet C or pastille.

[0040] Preferably, the pressure applied to the powdered product ranges from 1 bar to 5 bar, and is preferably about 2.5 bar. Conveniently, compression will be carried out by pneumatic, hydraulic or technically equivalent means.

[0041] The tablet C so formed shall be anyway adapted to be introduced into a hot water or steam coffee machine of a known type and also suitable for use in home environments.

[0042] A key step of the step is the supply g) of a given amount Q of energy, which causes heating of the previously formed tablet C, to impart a substantially compact and integral construction thereto.

[0043] A peculiar feature of the invention is that the step f) of supplying said energy is carried out by irradiating the tablet C with an electromagnetic wave beam.

Conveniently, the irradiation step starts as soon as the forming step is completed, and while continuously holding the tablet under pressure throughout the irradiation step, to stabilize the shape and structure of the tablet C.

[0044] Electromagnetic waves are known to be a form of energy that is transferred through space without requiring any interface of contact medium, whereby this step may be carried out at a distance, by simply directing the beam toward the tablet.

[0045] Tests and analyses showed that the best results are obtained by selecting an electromagnetic wave frequency in the microwave range.

[0046] Particularly the frequency of microwaves may advantageously range from 0.915 to 5.8 GHz, and preferably be about 2.45

GHz.

[0047] Microwave irradiation is conducted in a substantially constant fashion, for a predetermined time T, ranging from a few seconds to 2 minutes, and preferably less than 60 seconds.

[0048] Preferably, the electromagnetic beam has a specific power P ranging from 30 to 500 W per gram of powdered product, preferably of about 150 W per gram of powdered product.

[0049] It will be appreciated that the powdered product that forms the tablet C contains a given amount of water, whose molecules behave like electric dipoles having a given dipole moment.

[0050] Since the wavelength of microwaves is of the same order of magnitude as that of the tablet, the microwaves will cause an increase of the rotational energy of such dipoles in the mass of the tablet C, thereby almost instantaneously heating water and the surrounding product.

[0051] Since water molecules are substantially evenly distributed in the mass of the tablet, the base material of the tablet will undergo substantially uniform and "core" heating, without creating zones with differentiated hardness.

[0052] Therefore, the compressed and microwave-irradiated granular product will be somewhat "baked" and/or "sintered" in a very short time, typically a few seconds, thereby creating a self-supporting and integral structure, which is considerably porous and extractable, in the tablet.

[0053] The need is thus avoided for any outer enclosure, which would also have some barrier effect, and may limit flavor extraction from the product.

[0054] At the end of the energy supply step f), a short rest step h) may be envisaged for the tablet C, followed by a step in which the latter undergoes individual or multiple packaging i).

[0055] An arrangement that may be used for carrying out the above mentioned process comprises in sequence volumetric dosing or weighting units for isolating a dose of a predetermined amount of product, a special spindle, vibration mixer or any other homogenizing means for stirring the powdered product and providing a substantially uniform moistened mixture and an apparatus that may be used for carrying out the forming step e) and the electromagnetic wave irradiation step g).

[0056] FIG. 2 shows a first embodiment of an apparatus which is generally designated with numeral 1 and comprises a forming device 2 and an irradiation device 3.

[0057] The forming device 2 comprises a substantially tubular body 4 with a substantially cylindrical inner cavity 5, closed at its bottom and with a top opening designed to be closed by a cover 6, that may be removably locked by screw fastener means 7. Both the inner cavity 5 and the closure means 6, 7 may obviously have a configuration other than that described above, without departure from the scope of the invention.

[0058] A piston 8 is sealingly and slidably housed in the cavity 5 and may be pushed upwards by compressed air or an equivalent pressurized fluid introduced into the cavity through a lateral air duct 9.

[0059] An air exhaust valve 10 is provided in the lower portion of the tubular body 4, to remove compressed air after compression.

[0060] A compression chamber 11 is created between the top face of the piston 8 and the bottom face of the cover 6, for receiving the powdered product dose which is later compressed.

[0061] Possibly, air bleeder means, not shown, may be provided in the compression chamber, to avoid backpressures in the chamber 11 as the piston 8 rises.

[0062] The irradiating device 3 may comprise a bell-shaped shield 12 holding therein a generator 13 of electromagnetic, particularly microwave waves, e.g. a magnetron as typically used in home microwave ovens.

[0063] The generator 13 is equipped with an antenna 15 and deflection mirrors or waveguides 15, which have the purpose of

directing the beam F toward the target, i.e. the forming device 2, from a distance and in contactless fashion.

[0064] As is known per se, the generator 13 receives power from a power source connected to its terminals 16 via a cable and a switch, not shown.

[0065] In operation, once the powdered product dose has been poured into the compression chamber 11, the cover 6 has been secured by the screw fastener means 7 and the valve 10 has been closed, air at an appropriate pressure is introduced, to push the piston 8 upwards, compress the powdered product dose and form the tablet C.

[0066] Immediately after complete formation of the tablet C, i.e. when the piston 8 has reached its uppermost position and has compressed the powdered product dose, the generator 13 is powered and emits the beam F to irradiate the tablet C.

[0067] Of course, for loss- or spark-free irradiation, the forming device 2 shall be entirely formed with microwave transparent materials.

[0068] FIG. 3 shows an alternative embodiment of the forming and irradiating devices shown in FIG. 2, referenced 101, which basically comprises a forming device 102 and an electromagnetic wave beam irradiating device 103.

[0069] Here again the forming device 102 may essentially consist of a hollow body 104 with an inner cavity 105 or a forming die adapted to receive a unit powdered product dose. For this purpose, the inner cavity 105 has a substantially cylindrical shape, or anyway a shape substantially conforming that of the tablet C to be formed.

[0070] The hollow body 104 also has an upper flange and is closed by a removable cover 106 having an upper opening for the passage of the stem 107 of a piston 108. The stem 107 is connected at its top to an actuator 109, e.g. consisting of a pneumatic or hydraulic cylinder, which is connected to a pressurized fluid source, not shown.

[0071] Possibly, a presser 110 may be provided in the lower portion of the hollow body 104, for ejecting the finished tablet C once heat treatment thereon is completed.

[0072] A variable-volume compression chamber 111 is thus formed between the inner cavity 105 and the piston 108, which is designed to compress the powdered product dose and form the tablet C.

[0073] An irradiating device, generally referenced 103 is associated with the forming device 102, and comprises an electromagnetic wave beam emitting antenna 114.

[0074] The antenna 114 is at the end of a waveguide 115 having at its end a connection 116 for a coaxial cable connected to a microwave generator, e.g. a magnetron, both not shown.

[0075] Conveniently, an annular labyrinth shield 117 may be arranged along the outer peripheral edge of the cover 106, for cooperating with the upper flange of the hollow body 102 to hold the microwaves within the radiant device 103.

[0076] While the above described embodiments of the apparatus are both designed to form one tablet at a time, further embodiments may be provided of an apparatus for packaging multiple tablets at a time, which would be designed to be introduced into a mass production line.

[0077] An exemplary process of making a tablet or pastille C is briefly described below.

EXAMPLE

[0078] A typical coffee blend is used, which is instantly ground.

[0079] Then a dosed amount of 7,2 grams of coffee grounds is separated. 0,8 grams of water are added, and accurately mixed for moisture homogenization.

[0080] The dose is poured into the compression chamber 11, 111 of the forming device 2, 102. Compressed air at a pressure of about 2,6 bar is introduced into the inner cavity 5 or the pneumatic cylinder of the actuator 109 to compress the powdered

product and form an approximately disk-shaped tablet C having a diameter of 40 mm and a thickness of about 9.5 mm.

[0081] Now, the microwave generator is turned on for a time T of about 10 seconds, to generate a beam F having a power of about 1000 W.

[0082] The weight of the pastille after baking is about 7,6 grams, with a total mass loss of about 0,4 grams due to partial evaporation of water and the liquid components of coffee.

[0083] The above described method and arrangement fulfill the intended objects as stated in the introduction, and particularly provide a tablet of ground powdered products for hot espresso beverage extraction having remarkable efficiency and self-support features, without using any outer enclosure and with a considerable manufacturing cost reduction.

[0084] The method and arrangement of this invention are susceptible to a number of changes or variants, within the inventive concept disclosed in the appended claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departure from the scope of the invention as defined in the claims.

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- [FR1029940 \[0010\]](#)
- [US1951357A \[0010\]](#)
- [US4394395A \[0010\]](#)
- [IT1213385 \[0010\]](#)
- [EP1956921A \[0015\]](#)
- [WO2001027426A \[0015\]](#)
- [US2011070286A \[0018\]](#)
- [US2011071184A \[0019\]](#)
- [US5914309A \[0020\]](#)
- [US2003127455A \[0021\]](#)

Patentkrav

1. Fremgangsmåde til fremstilling af en tablet til varmekstraktion af espresso-drikke, omfattende trinnene at:

- 5 a) formale ét eller flere brygbare produkter for at opnå et pulver med en i det væsentlige ensartet partikelstørrelse;
- b) dosere en forudbestemt mængde af det formalede grundproduktpulver;
- c) befugte den pulveriserede produktosis;
- d) homogenisere den fugtede dosis til en i det væsentlige ensartet restfugt;
- 10 e) forme den fugtede pulverblandingdosis ved kompression for at danne en tablet (C) med en ønsket form;
- f) tilføre en mængde energi til tabletten (C) for at opnå en i det væsentlige kompakt og integreret enhed;

15 hvor trin f) at tilføre energi udføres fjernt ved bestråling g) af tabletten (C) med en elektromagnetisk bølgestråle (F) for at opnå overhedning og delvis bagning og/eller sintring af de pulverformede produktpartikler såvel som at bibringe en relativt kompakt og selv bærende struktur til den færdige tablet (C) uden nogen ydre emballageindpakning.

2. Fremgangsmåde ifølge krav 1, hvor det elektromagnetiske bølgebestrålingstrin g) udføres ved afslutningen af formningstrinnet e) mens kontinuerlig komprimering af dosen sker gennem hele bestrålingstrinnet.

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3. Fremgangsmåde ifølge krav 1, hvor komprimeringen af den pulverformede produktosis i det væsentlige udføres jævnt inde i et lukket kompressionskammer (11) med en form komplementær til den for tabletten (C).

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4. Fremgangsmåde ifølge krav 3, hvor kompressionstrinnet udføres ved et tryk (P) i området fra 1 bar til 5 bar, fortrinsvis på ca. 2,5 bar.

- 5.** Fremgangsmåde ifølge krav 1, hvor de elektromagnetiske bølger har en frekvens liggende inden for mikrobølgeområdet.
- 6.** Fremgangsmåde ifølge krav 5, hvor mikrobølgefrekvensen ligger fra 0,915 til 5,8 GHz.
- 7.** Fremgangsmåde ifølge et af kravene 5 og 6, hvor mikrobølgebestrålingen udføres på en i det væsentlige konstant måde, i en forudbestemt tid (T), liggende fra få sekunder til 2 minutter, og fortrinsvis mindre end 1 minut.
- 8.** Fremgangsmåde ifølge krav 1, hvor det elektromagnetiske felt har en specifik energi (P) liggende fra 50 til 300 W pr. gram pulveriseret produkt, fortrinsvis på ca. 150 W pr. gram pulveriseret produkt.
- 9.** Fremgangsmåde ifølge krav 1, hvor befugtningstrinnet c) udføres ved at tilsætte en forudbestemt mængde vand til det pulverformede produkt, og muligvis yderligere tilsætte bindemiddel, efterfulgt af et homogeniseringstrin, der udføres ved blanding, for at opnå en i det væsentlige ensartet befugtet blanding.
- 10.** Fremgangsmåde ifølge krav 9, hvor den forudbestemte mængde vand ligger fra 2 til 20% og er fortrinsvis ca. 10 vægtprocent af tørpulverproduktet.
- 11.** Fremgangsmåde ifølge ét eller flere af de foregående krav, hvor energitilførselsestrin f) er efterfulgt af et kort hviletrin h) for tabletten, der derefter efterfølges af et trin i hvilket sidstnævnte undergår individuel eller flerpakning i).
- 12.** Fremgangsmåde ifølge ét eller flere af de foregående krav, hvor produktet der skal formales vælges fra gruppen omfattende kaffe, byg, malt, ginseng, te, infusioner og andre lignende brygbare fødevareprodukter.
- 13.** Anordning til fremstilling af en pulverformet produkttablet til varmekstraktion af espressodrik ifølge ét eller flere af de foregående krav, hvilken anordning anvender én eller flere formalede brygbare produkter og omfatter:

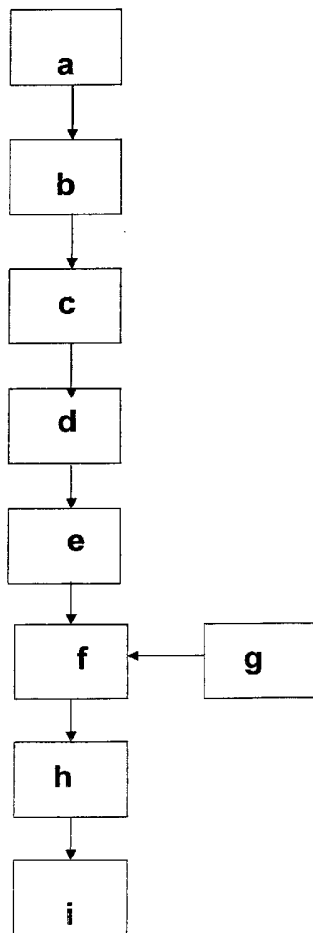
- volumetrisk doserings- eller afvejningsenheder til isolering af en dosis af en forudbestemt mængde formalet produkt;
- et apparat (1) omfattende:
 - formningsorgan (2, 102) med et hult legeme (4, 104) til modtagelse af en pulverformet befugtet produktosis;
 - kompressionsorgan (8, 108) forbundet med det hule legeme (4, 104) til komprimering af den pulverformede produktosis opsamlet deri og danne en tablet (C) med en ønsket form;
 - organ (3, 103) til tilførsel af energi til tabletten (C) dannet inde i det hule legeme (4, 104), hvilket energitilførselsorgan omfatter bestrålingsorgan (14, 114) til at udsende en elektromagnetisk bølgestråle (F);

kendetegnet ved at den yderligere omfatter en speciel spindel, vibrationsblander eller et hvilket som helst homogeniseringsorgan til omrøring af det pulverformede produkt og tilvejebringe en i det væsentlige ensartet befugtet blanding, hvilket bestrålingsorgan (14, 114) omfatter en mikrobølgegenerator (13, 103) forbundet til en antenne (14, 114) til at udsende en elektromagnetisk bølgestråle (F) orienteret mod det hule legeme (4, 104) til at forårsage overophedning og delvis bagning og/eller sintring af de pulverformede produktpartikler såvel som at bibringe en relativ kompakt og selvbærende struktur til den færdige tablet (C) uden nogen yderligere indpakning.

14. Anordning ifølge krav 13, hvor det hule legeme (4, 104) har et i det væsentlige cylindrisk indre hulrum (5, 105) med en lukket ende og en modstående ende udformet til at blive åbnet for at modtage den pulverformede produktosis, og udformet til at blive lukket til at definere et kompressionskammer (11, 111) med en form svarende til tabletten (C) der skal dannes.

15. Anordning ifølge krav 13, hvor kompressionsorganet (8, 108) omfatter et stempel der er glidbart og tætnende anbragt inde i det indre hulrum (5, 105) og er udformet til at blive eksternt drevet til at komprimere den pulverformede produkt-dosis ved hjælp af dens langsgående vandring.

DRAWINGS

**FIG. 1**

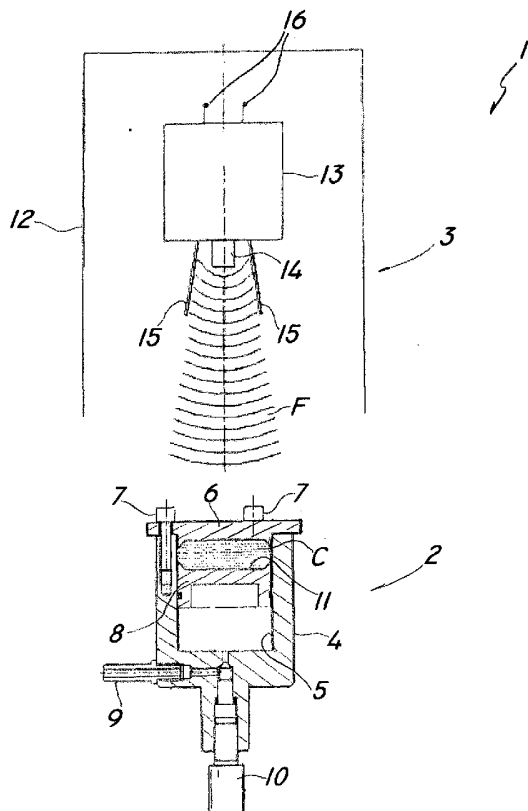


FIG. 2

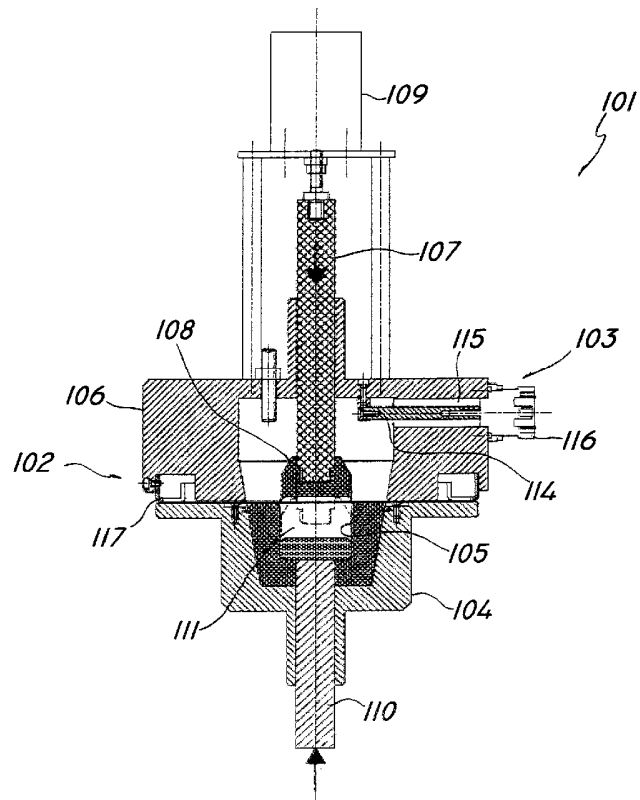


FIG. 3