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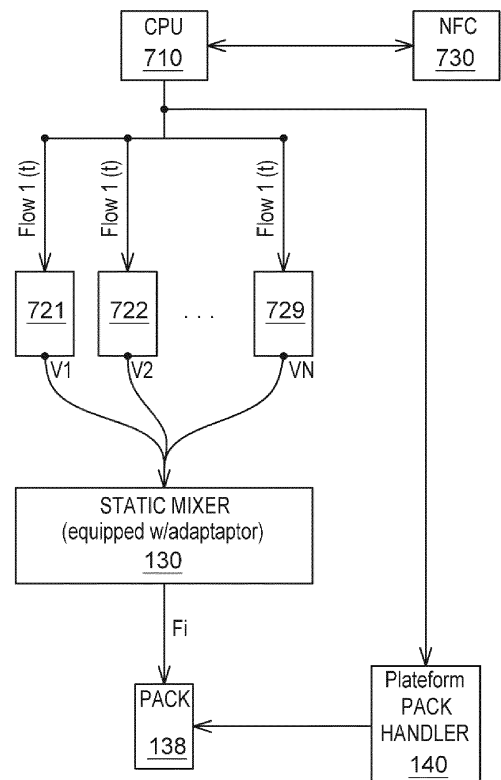
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(54) **APPARATUS WITH CAROUSEL FOR DISPENSING AND MIXING COSMETIC COMPOSITIONS AND MIXING METHOD**

(57) The invention relates to an apparatus for mixing a first composition and a second cosmetic composition to deliver a targeted cosmetic product, the apparatus comprising a cartridge holder (111) for receiving cartridges (121, 122, 123), a static mixer (130), an optional tight duct between the cartridge (121, 122, 123) and the static mixer (130), further comprising:
(iii) a plunger driving system; and
(iv) a circuitry including an electronic control unit (710) coupled to the cartridge holder (111) comprising a micro-controller for controlling the plunger driving system.

[Fig. 4]



Description

Field of the invention

[0001] The present invention relates to a system, apparatus, and method for blending and dispensing at least two cosmetic compositions, in particular to address a particular concern of a user.

[0002] A cosmetic product is in particular a product as defined in EC Regulation N°1223/2009 of the European Parliament and the Council of November 30, 2009, relating to cosmetic products.

Background of the invention

[0003] Many people want to wear makeup to enhance their appearance, especially their face.

[0004] The motivations of these people can fall into two categories:

- Hide certain imperfections, such as spots, wrinkles or pores,
- Enhance the rendering of the face with color changes.

[0005] In these different cases, the operation might consist in providing a colored material and in covering the skin or an area of skin. To obtain an aesthetic effect, the person must successfully choose the colored material.

[0006] The operation is not simple because it is difficult to find the right material which best suits the appearance or the defect of the face.

[0007] Distributors are known which make it possible to deliver a cosmetic composition of variable color or active ingredients for dispensing a personalized cosmetic composition.

[0008] EP 3 463 260 discloses a system for dispensing a targeted product comprising a distributor receiving at least two cartridges, each having a reservoir containing a cosmetic composition. The distributor allows to deliver the at least two compositions, in adjustable proportions, in a static mixer. The cartridges are introduced one by one in the distributor and must be removed one by one before preparing each new targeted product. The cartridges are fixed with respect to the static mixer. They have to be changed manually by the user, which is time consuming.

[0009] US2017151538 discloses a system for dispensing a targeted product, including a carousel for holding at least two cartridges containing a cosmetic composition. The carousel moves selected cartridges to a predetermined location. An output container is held beneath the predetermined location. A mixer causes the output container to move, in order to mix together the compositions of selected cartridges, after that a system of plunger has caused the cartridges to dispense the cosmetic composition into the mixer.

[0010] Coloring products, for example make up such as lip products, are products that are particularly viscous. The mixing thereof does not take place easily with any kind of mixers.

5 [0011] In order to obtain a composition with good properties, it is essential to have a homogeneous mixture, with a constant volume ratio during the distribution, and in particular in a ratio of one to one. A heterogeneous mixture does not make it possible to guarantee satisfactory properties for use, and requires manual action from the user.

10 [0012] WO2017093564 discloses a head for distributing a cosmetic composition formed by mixing a first cosmetic composition with a second cosmetic composition, comprising:

- a duct for preparing and distributing the cosmetic product able to be connected simultaneously to a first reservoir of a first cosmetic composition, and to a second reservoir of a second cosmetic composition, with the duct for preparing and for distributing opening outside of the head;
- a static mixer arranged in the duct for preparing and for distributing, with the static mixer defining a passage for the circulation and the mixing of the first cosmetic composition with the second cosmetic composition.

20 [0013] This head is just intended to be mounted on a receptacle containing at least two cosmetic compositions intended to be mixed. It is not question at all in that document of a system of personalization coupled to an electronic control unit for "personalized" mass production or for a unique use, at home, in a store or by an esthetician.

25 [0014] There is a need to provide a system that allows to choose compositions for making a targeted product without any excessive manual input at placing the right compositions at the entry of a mixer.

30 [0015] There is a need to provide a system that allows an effective mixing of cosmetic compositions, even of high viscosity, in order to simply deliver a product, without further mixing from the user.

35 [0016] There is therefore a need to facilitate a personalized manufacture for a makeup product that meets the expectations of a consumer, and allowing:

- the latter to make by reliable mixtures in small quantities,
- a professional in a store or an institute to deliver such products,
- a factory to manufacture personalized products, following digital orders.

40 [0017] The invention thus aims, according to some of its aspects, to facilitate make-up of the face and in particular the search for the most suitable products for the various areas thereof.

Summary of the invention

[0018] The present invention aims at satisfying this need and exemplary embodiments of the invention relate to an apparatus for mixing a first composition and a second cosmetic composition to deliver a targeted cosmetic product, the apparatus comprising:

- a cartridge holder with holding elements for receiving a first cartridge that stores a first cosmetic composition in a first predetermined dispensing region and a second cartridge that stores a second cosmetic composition in a second predetermined dispensing region,
- a static mixer comprising a container and protruding elements defining a passage for the circulation and the mixing of the first cosmetic composition with the second cosmetic composition,
- an optional tight duct for distributing the first cosmetic composition at a first output flow rate into the static mixer and the second cosmetic composition at a second output flowrate into the static mixer,
- a first plunger driving system having a first drive head adapted to move a first plunger into the first cartridge in an operating mode and a second plunger driving system having a second drive head adapted to move a second plunger into the second cartridge in the operating mode; and
- a circuitry including an electronic control unit coupled to the cartridge holder comprising a microcontroller for controlling independently or dependently the first plunger driving system and the second plunger driving system and deliver respectively the first composition at a first output flow rate and the second composition at a second output flow rate based on the targeted product.

[0019] The apparatus according to the invention enables to generate a homogeneously mixture of a precise amount of first composition and second composition, even if they are viscous compositions, through the static mixer and dispense an obtained homogeneous mixture in a receptacle.

[0020] The apparatus can for example be used to produce personalized cosmetics at home or in point of sale or in a factory. In particular, the apparatus according to the invention can be part of an industrial installation for manufacturing cosmetic products.

[0021] In order to vary the quantity of composition to be mixed from each cartridge and allow large possibilities of mixtures, it is possible with the apparatus according to the invention:

- To independently adjust the flowrate of each cartridge,
- To vary the diameter from a cartridge to another.

[0022] The invention also relates to a method for mix-

ing a first composition and a second cosmetic composition to deliver a targeted cosmetic product, the method comprising the operations consisting of:

- Providing an apparatus as described above,
- In the cartridge holder, determining the first cosmetic composition and the second cosmetic composition depending on the targeted product,
- Positioning the first cosmetic composition at the first predetermined dispensing region,
- Positioning the second cosmetic composition at the second predetermined dispensing region,
- Controlling the first driving system and the second driving system based on the targeted cosmetic product and moving the first plunger into the first cartridge towards the static mixer and the second plunger into the second cartridge and towards the static mixer,
- Optionally, moving the container away from the cartridge holder.

First composition and second composition

[0023] The first composition and the second composition can be of any kind, such as liquid lipsticks, wax or foundation. The raw material of the composition can include can pearls, nacles or pigments.

[0024] The first cosmetic composition and the second cosmetic composition can each have a viscosity ranging from 1 000 mPa.s to 60 000 mPa.s preferably from 5 000 mPa.s to 40 000 mPa.s. For example, the viscosity of the first cosmetic product is in particular between 10 000 mPa.s and 40 000 mPa.s. The viscosity of the second cosmetic product is in particular between 5 000 mPa.s and 15 000 mPa.s. The viscosity of the compositions is measured at 25°C using a Brookfield LVT viscometer equipped with a mobile M4 rotating at a speed of 12 revolutions per minute. The measurement is taken after 1 minute.

Static mixer

[0025] A static mixer is a precision engineered device for the continuous mixing of fluid materials, without moving components. A static mixer is for example disclosed in Paul, Edward L. (2004). Handbook of Industrial Mixing- Science and Practice. Hoboken NJ: John Wiley & Sons. pp. 399 section 7-3.1.4. Normally the fluids to be mixed are liquid, but static mixers can also be used to mix gas streams, disperse gas into liquid or blend immiscible liquids. The energy needed for mixing comes from a loss in pressure as fluids flow through the static mixer as explained in Albright, Lyle F. (2008). Albright's Chemical Engineering Handbook. Boca Raton FL: CRC Press. p. 682. One design of static mixer is the plate-type mixer and another common device type consists of mixer elements contained in a cylindrical (tube) or squared housing. Mixer size can vary from about 6 mm to 6 meters diameter. Typical construction materials for static mixer

components included stainless steel, polypropylene, Teflon, PVDF, PVC, CPVC and polyacetal. The latest design involve static mixing elements made of glass-lined steel.

Duct

[0026] The duct can be fastened to the first cartridge, to the second cartridge and to the static mixer by clipping, stapling, gluing, welding, snapping, force fitting or strength fitting.

[0027] The duct can be obtained by molding in a thermoplastic material. In particular, it can be obtained by bi-injection.

[0028] Preferably, the junction between the duct and the first cartridge and the second cartridge is tight, as well as the junction between the duct and the static mixer.

[0029] A sealing member might be added at the junctions. It may comprise a seal made of a material selected from elastomeric rubbers and thermoplastics.

[0030] The duct might have any hollow transversal cross section having a shape selected from: a U, a circle, an oval, a C, an X, a square, a trapezium.

[0031] The cartridges are preferably terminated by a tip directed so that the cartridge can be easily inserted into the duct.

Cartridges

[0032] Preferably, the cartridges are removably received on the cartridge holder.

[0033] Each composition leaves the cartridge through a cartridge outlet channel.

[0034] More preferable, the outlet channel is defined by a tip of the cartridge extending the cartridge body. The tip of the cartridge might comprise a valve drive mechanism for dispensing the composition contained in the cartridge.

[0035] The cartridge might comprise a dispensing nozzle through which is performed the output of the composition. The tip may include at least one relief anti-rotation, better two lugs of diametrically opposing anti-rotation for connecting the duct.

[0036] The cartridges and the cartridge holder may be received in a housing, the housing comprising the plunger driving system for moving the plunger of the cartridge.

[0037] The cartridge may comprise a hollow screw on which the plunger is screwed, the plunger being axially displaceable on the screw when the latter is rotated; the plunger is prevented from rotating in the body of the cartridge. For example, the friction of the plunger on the body of the cartridge may be sufficient to prevent rotation when the screw rotates.

[0038] Preferably, the rotation is made impossible with a non-circular section of the cartridge body and a non-deformable plunger.

Plunger driving system

[0039] The plunger mechanism comprising motors to move the plunger, it is possible to deliver precisely mixtures in very small amounts. Thus, the drive mechanism can deliver with a lower minimum flow or equal to 50 mL / s, more preferably lower than or equal to 20 mL / s, more preferably less than or equal to 10 μ L / s. Preferably, the drive mechanism delivers flow rates between 20 and 100 mL / s, more preferably between 40 μ L / s and 60 μ L / s. It is therefore possible to easily produce a mixture of about 10 mg. Such a distribution system is therefore ideal for making small cosmetic touches to cover such an area of 1 cm², more an area of 0,5 cm².

[0040] It is also possible to produce larger amounts of mixing as those needed to make a play, or a face. These amounts are however relatively small, for example an amount between 100 and 500 mg, more preferably between 150 and 250 mg.

Preferred apparatus embodiments

[0041] The apparatus according to the invention can include one or more of the following features, considered alone or in any combination that is technically possible:

- the viscosity of the first cosmetic composition is greater than 1000 mPa.s, in particular greater than 5000 mPa.s;
- the viscosity of the second cosmetic composition is greater than 1000 mPa.s, in particular greater than 10,000 mPa.s;
- the electronic control unit is coupled to a diagnostic algorithm performed by a circuitry or to a formulation table, notably a color formulation table, for controlling the first plunger driving system and the second plunger driving system;
- the first plunger driving system is independent from the second plunger driving system;
- the first plunger driving system is identical to the second plunger driving system;
- the duct comprises a collector;
- the electronic control unit is coupled to an actuator to move the container away from the cartridge holder at a constant container speed or at a speed servo controlled by the first output flow rate and the second output flow rate;
- the cartridge holder is fixed;
- the container is the packaging of the targeted cosmetic product.
- the electronic control unit is connected to a user interface.

[0042] In a particular embodiment of the invention, the cartridge holder is mobile. Preferably, the cartridge holder comprises a carousel with:

- a first holding wheel for receiving the first cartridge,

the first holding wheel having predetermined inner and outer diameters,

- a second holding wheel for receiving the second cartridge, the second holding wheel having an inner diameter greater than said outer diameter of said first holding ring,
- a first carousel driving motor which operates to rotate a transmitting mechanism, optionally comprising a first transmitting gear, which in turn moves a first receiving gear, to move the first composition to the first predetermined dispensing region;
- a second carousel driving motor which operates a second transmitting mechanism, optionally comprising a second transmitting gear, which in turn moves a second receiving gear, to move the second composition to the second predetermined dispensing region;

the electronic control unit is coupled to the first carousel motor and to the second carousel motor for controlling the first carousel driving motor and the second carousel driving motor.

[0043] According to the invention, a "container" designate an element that serves as an interface between the cartridge and the static mixer. It is an interface element for conducting directly a composition to the static mixer. It is an intermediate chamber between the cartridge and the static mixer. Notably, it conducts the composition without any contamination of colors or else.

Circuitry

[0044] In an embodiment, circuitry includes, among other things, one or more computing devices such as a processor (e.g., a microprocessor, a quantum processor, qubit processor, etc.), a central processing unit (CPU), a digital signal processor (DSP), an application-specific integrated circuit (ASIC), a field programmable gate array (FPGA), or the like, or any combinations thereof, and can include discrete digital or analog circuit elements or electronics, or combinations thereof. In an embodiment, a module includes one or more ASICs having a plurality of predefined logic components. In an embodiment, a module includes one or more FPGAs, each having a plurality of programmable logic components.

[0045] In an embodiment, circuitry includes one or more components operably coupled (e.g., communicatively, electromagnetically, magnetically, ultrasonically, optically, inductively, electrically, capacitively coupled, wirelessly coupled, or the like) to each other. In an embodiment, circuitry includes one or more remotely located components. In an embodiment, remotely located components are operably coupled, for example, via wireless communication. In an embodiment, remotely located components are operably coupled, for example, via one or more communication modules, receivers, transmitters, transceivers, or the like.

[0046] In an embodiment, any of the CPU or other com-

ponents may be substituted with alternative circuitry elements. Examples of circuitry includes memory that, for example, stores instructions or information. Non-limiting examples of memory include volatile memory (e.g., Random Access Memory (RAM), Dynamic Random Access Memory (DRAM), or the like), non-volatile memory (e.g., Read-Only Memory (ROM), Electrically Erasable Programmable Read-Only Memory (EEPROM), Compact Disc Read-Only Memory (CD-ROM), or the like), persistent memory, or the like. Further non-limiting examples of memory include Erasable Programmable Read-Only Memory (EPROM), flash memory, or the like. In an embodiment, memory is coupled to, for example, one or more computing devices by one or more instructions, information, or power buses.

[0047] In an embodiment, circuitry includes one or more computer-readable media drives, interfaces, sockets, Universal Serial Bus (USB) ports, memory card slots, or the like, and one or more input/output components such as, for example, a graphical user interface, a display, a keyboard, a keypad, a trackball, a joystick, a touchscreen, a mouse, a switch, a dial, or the like, and any other peripheral device. In an embodiment, a module includes one or more user input/output components that are operably coupled to at least one computing device configured to control (electrical, electromechanical, software-implemented, firmware-implemented, or other control, or combinations thereof) at least one parameter associated with, for example, determining one or more tissue thermal properties responsive to detected shifts in turn-ON voltage.

[0048] In an embodiment, circuitry includes a computer-readable media drive or memory slot that is configured to accept signal-bearing medium (e.g., computer-readable memory media, computer-readable recording media, or the like). In an embodiment, a program for causing a system to execute any of the disclosed methods can be stored on, for example, a computer-readable recording medium, a signal-bearing medium, or the like. Non-limiting examples of signal-bearing media include a recordable type medium such as a magnetic tape, floppy disk, a hard disk drive, a Compact Disc (CD), a Digital Video Disk (DVD), Blu-Ray Disc, a digital tape, a computer memory, or the like, as well as transmission type medium such as a digital or an analog communication medium (e.g., a fiber optic cable, a waveguide, a wired communications link, a wireless communication link (e.g., receiver, transmitter, transceiver, transmission logic, reception logic, etc.). Further non-limiting examples of signal-bearing media include, but are not limited to, DVD-ROM, DVD-RAM, DVD+RW, DVD-RW, DVD-R, DVD+R, CD-ROM, Super Audio CD, CD-R, CD+R, CD+RW, CD-RW, Video Compact Discs, Super Video Discs, flash memory, magnetic tape, magneto-optic disk, MINIDISC, non-volatile memory card, EEPROM, optical disk, optical storage, RAM, ROM, system memory, web server, or the like.

[0049] In an embodiment, circuitry includes acoustic

transducers, electroacoustic transducers, electrochemical transducers, electromagnetic transducers, electromechanical transducers, electrostatic transducers, photoelectric transducers, radioacoustic transducers, thermoelectric transducers, or ultrasonic transducers.

[0050] In an embodiment, circuitry includes electrical circuitry operably coupled with a transducer (e.g., an actuator, a motor, a piezoelectric crystal, a Micro Electro Mechanical System (MEMS), etc.) In an embodiment, circuitry includes electrical circuitry having at least one discrete electrical circuit, electrical circuitry having at least one integrated circuit, or electrical circuitry having at least one application specific integrated circuit. In an embodiment, circuitry includes electrical circuitry forming a general purpose computing device configured by a computer program (e.g., a general purpose computer configured by a computer program which at least partially carries out processes and/or devices described herein, or a microprocessor configured by a computer program which at least partially carries out processes and/or devices described herein), electrical circuitry forming a memory device (e.g., forms of memory (e.g., random access, flash, read only, etc.)), electrical circuitry forming a communications device (e.g., a modem, communications switch, optical-electrical equipment, etc.), and/or any non-electrical analog thereto, such as optical or other analogs.

Preferred method embodiment

[0051] Preferably, the method further comprises the operation consisting in controlling the first carousel driving motor to move the first cosmetic composition from to the first predetermined dispensing region and controlling the second carousel driving motor to move the second cosmetic composition to the second predetermined dispensing region.

Brief description of the drawings

[0052] The invention will be better understood in view of the following description of non-limitative embodiments and in view of the appended drawings, schematic and partial, in which:

Fig. 1 illustrates a front view of a first apparatus according to the invention,

Fig. 2 illustrates a top view of a carousel to be placed on a cartridge holder of a second apparatus according to the invention,

Fig. 3 illustrate a perspective view of a carousel,

Fig. 4 shows a block diagram of the first process performed by the apparatus according to Fig. 1,

Fig. 5 shows a block diagram of the second process performed by the apparatus according to Fig. 2 and 3.

Detailed description

[0053] As shown in FIG. 1, the apparatus 100 includes a cartridge holder 111 for holding a cartridges 120: a first cartridge 121, a second cartridge 122 and a third cartridge 123. These cartridges each have different cross section, to adjust separately the flow rate of the compositions leaving the cartridges. The apparatus further includes a static mixer 130 that is disposed on a platform 140. The static mixer includes a mixing part 139 and a container 138. The apparatus includes a housing for the cartridge that includes outer panels 150, and a top panel 160 that can act as an access door that opens and closes to introduce or remove the cartridges manually on the cartridge holder 111.

[0054] The apparatus 100 further includes a driving system having a dispensing motor and a first dispensing plunger 131 for the first composition, a second dispensing plunger 132 for the second composition and a third dispensing plunger 133 for the third composition. The apparatus further includes a static mixer receiving area 170, disposed below the cartridge receiving area 140, which includes a base plate 164 and a container holder 162 for holding the container 138 of the static mixer 130 receiving the targeted product 133.

[0055] On the figures, the duct is not represented.

[0056] The cartridges 121, 122, 123 are introduced manually on the cartridge holder 111. They can be stored in a cartridge reserve 129.

[0057] The plunger driving systems allow the transfer of a precise and independent volume dose of each composition from the cartridges 121, 122, 123, simultaneously, to the static mixer, depending on the respective cross section of the cartridge and on the speed of the plungers 131, 132, 133 moving down into the cartridges. Each plunger is driven by a single electrical motor pertaining to the first driving system, to the second driving system and to the third driving system. All the electrical motors are controlled by an electronic control unit, allowing to drive each of them independently, for example their speed, in order to dispense a right and precise amount of composition from each cartridges 121, 122, 123. The goal is to mix one or more compositions, especially viscous compositions like liquid lipstick, through the static mixer and dispense the obtained mixture in the final packaging.

[0058] The steps of the method are:

First step: The cartridges 121, 122, 123 are chosen depending on the wished personalized mixture, called targeted product 137,

Second step: The cartridges 121, 122, 123 are added manually in the apparatus,

Third step: The static mixer 130 is fixed in the receiving area 160,

Fourth step: The three independent plungers (or more), each driven by an electric motor, drive the compositions into the static mixer 137,

Fifth step: The targeted product is dispensed into the final pack comprising the container 138 of the static mixer 130.

[0059] FIG. 2 and 3 show a carousel 110 serving as a cartridge holder. The carousel comprises a first wheel 1, a second wheel 2 and a third wheel 3. Each wheel rotates independently around the longitudinal axis of the apparatus to move the cartridges 121, 122, 123 to the predetermined location. The arrow on FIG. 2 shows the rotation of the carousel.

[0060] The carousel includes different radial slots 171, 172, 173 for receiving cartridges. The first slots 171 of a first holding wheel 1 are sized to receive a plurality of first identical cartridges 121, each containing a different composition. The slots second 172 of a second holding wheel 2 are sized to receive a plurality of second identical cartridges 122, each containing a different composition. The third slots 173 of a third holding wheel 3 are sized to receive a plurality of third identical cartridges 123, each containing a different composition.

[0061] In the represented example, the transversal cross section of the first cartridges 121 is smaller than the cross section of the second cartridge 122 but bigger than the cross section of the third cartridge 123. The slots 171, 172, 173 have the shape of circular opening, the first slots 171 having a bigger diameter than the third slots 173 and a smaller diameter than the second slots 172. Each slot 171, 172, 173 is surrounded a surface for holding the top of each cartridge, for example by means of tabs 174, 175, 176.

[0062] Once placed on the carousel 110, the body 36 of each cartridge extends between an upper surface for retaining the cartridge 32 on a wheel and a lower mounting surface on the platform 111. The lower mounting surface is the predetermined dispensing regions 166, 167, 168 in the operating mode.

[0063] Preferably, the multiple cartridges 121, 122, 123 of the plurality of wheels 1, 2, 3 move one-by-one to the predetermined location to separately dispense a respective amount of each respective different cosmetic composition into the static mixer 130, more preferably using a rack pinion motor.

[0064] On the figures, It can be seen that the slots 172 of the second holding wheel 2 are larger than the slots of the first holding wheel 171, which in turns are larger than the slots 173 of the third holding ring, depending on the relative volume of the compositions to be added in the static mixer 130.

[0065] Each cartridge 121, 122, 123 can comprise a cartridge outlet channel 12 to guide each composition to the static mixer 130 at when the cartridges are positioned respectively at the first predetermined dispensing region, second predetermined dispensing region and third predetermined dispensing region, in order to deliver the composition at the right place in a collector (not represented) before reaching the static mixer 130.

[0066] The apparatus 100 according to the invention

might include a main circuitry board, a wireless interface, a Near Field Communication (NFC) interface, and a Power Supply. In a non-limiting example, the wireless interface may be a Bluetooth interface, but it may also be a different type of wireless interface as understood to a person of ordinary skill in the art. The NFC interface is positioned to be very close to the cartridges 121, 122, 123, since NFC interface has a maximum communication distance of 4 cm on average.

[0067] The apparatus is used as the one of FIG.1, but instead of manually choosing and positioning the right cartridges in the machine, the system is fully automatized. An automatized triple concentric carousel places two, or more cartridges 121, 122, 123 in the right position (predetermined dispensing region) ready to be dispensed in the static mixer 137 and once mixed, dispensed from the container 138.

[0068] FIG. 4 shows a block diagram of the hardware included in the apparatus. A control unit 710 including a central processing unit (CPU) provides primary control over the separate circuitry components included in the apparatus, such as the plunger motor control circuitry including a first plunger driving system 720, a second plunger driving system 721 up to a nth plunger driving system 729 and the NFC Interface 730. The CPU also controls an optional input/output device (such as a keyboard or mouse), a memory, wireless communication interface circuitry, a universal serial bus (USB) controller, a LED driver, and a display module. The LED driver controls the pulsing of one or more LEDs that illuminate the container holder 152. Optionally, the CPU also controls a dispenser control circuitry (which includes the dispensing motor control circuitry and the inductive sensor circuitry), a load cell conditioning circuitry, a static mixer control circuitry.

[0069] The compositions leaves each cartridge with Act 1, Act 2 and Act n with a respective flow rate V_1 , V_2 and V_n . The first dispensing plunger 131 moves with a speed flow $1(t)$ to push for the first composition out of the first cartridge 121. The second dispensing plunger 132 moves with a speed flow $2(t)$ to push for the second composition out of the second cartridge 122. The third dispensing plunger 133 moves with a speed flow $3(t)$ to push for the third composition out of the third cartridge 123.

[0070] FIG. 5 shows a block diagram of the hardware included in the apparatus with a carousel with concentric wheels 1, 2, 3. A central processing unit (CPU) 710 provides primary control over the separate circuitry components included in the apparatus as indicated for Fig. 4 and controls also the carousel motor control circuitry 720 with a separate carousel driving motors to move the compositions to the each of the predetermined dispensing regions 166, 167, 168.

[0071] Numerous modifications and variations of the present disclosure are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the claimed invention may be practiced otherwise than as specifically described

herein. Of course, according to the invention, there can be much more than two cartridges.

Claims

1. An apparatus (100) for mixing a first composition and a second cosmetic composition to deliver a targeted cosmetic product (137), the apparatus comprising:

- a cartridge holder (111) with holding elements for receiving a first cartridge (121) that stores a first cosmetic composition in a first predetermined dispensing region (166) and a second cartridge (122) that stores a second cosmetic composition in a second predetermined dispensing region (167),
- a static mixer (130) comprising a container (138) and a mixing part (139), preferably comprising protruding elements defining a passage for the circulation and the mixing of the first cosmetic composition with the second cosmetic composition,
- an optional tight duct for distributing the first cosmetic composition at a first output flow rate into the static mixer (130) and the second cosmetic composition at a second output flowrate into the static mixer (130),

characterized in that it further comprises:

- (i) a first plunger driving system having a first drive head adapted to move a first dispensing plunger (131) into the first cartridge (121) in an operating mode and a second plunger driving system having a second drive head adapted to move a second dispensing plunger (132) into the second cartridge (122) in the operating mode; and
- (ii) a circuitry including an electronic control unit (710) coupled to the cartridge holder (111) comprising a microcontroller for controlling independently or dependently the first plunger driving system and the second plunger driving system and deliver respectively the first composition at a first output flow rate and the second composition at a second output flow rate based on the targeted product (137).

2. An apparatus according to claim 1, **characterized in that** the electronic control unit (710) is coupled to a diagnostic algorithm performed by a processing unit or to a formulation table, notably a color formulation table, for controlling the first plunger driving system and the second plunger driving system.
3. An apparatus according to claim 1, **characterized in that** the first plunger driving system is independent

from the second plunger driving system.

4. An apparatus according to claim 1, **characterized in that** the first plunger driving system is identical to the second plunger driving system.

5. An apparatus according to any of the preceding claims, **characterized in that** the duct comprises a collector.

6. An apparatus according to any of the preceding claims, **characterized in that** the electronic control unit (710) is coupled to an actuator to move the container (138) away from the cartridge holder (111) at a constant container speed or at a speed servo controlled by the first output flow rate and the second output flow rate.

7. An apparatus according to any of the preceding claims, **characterized in that** the container (138) comprises the end packaging of the targeted cosmetic product (137).

8. An apparatus according to anyone of the preceding claims, **characterized in that** the electronic control unit (710) is connected to a user interface (730).

9. An apparatus according to any of the preceding claims, **characterized in that** the cartridge holder (111) is fixed.

10. An apparatus according to claim 1 to 8, **characterized in that** the cartridge holder (111) comprises a carousel with:

- a) a first holding wheel (1) for receiving the first cartridge (121), the first holding wheel (1) having predetermined inner and outer diameters,
- b) a second holding wheel (2) for receiving the second cartridge (122), the second holding wheel (2) having an inner diameter greater than said outer diameter of said first holding ring,
- c) a first carousel driving motor which operates to rotate a transmitting mechanism, optionally comprising a first transmitting gear, which in turn moves a first receiving gear, to move the first composition to the first predetermined dispensing region (166);
- d) a second carousel driving motor which operates a second transmitting mechanism, optionally comprising a second transmitting gear, which in turn moves a second receiving gear, to move the second composition to the second predetermined dispensing region (167);

the electronic control unit (710) is coupled to the first carousel motor and to the second carousel motor for controlling the first carousel driving motor and the

second carousel driving motor.

11. A method for mixing a first composition and a second cosmetic composition to deliver a targeted cosmetic product (137), the method comprising the operations consisting of: 5
- Providing an apparatus (100) according to anyone of the preceding claims, 10
 - In the cartridge holder (111), determining the first cosmetic composition and the second cosmetic composition, depending on the targeted product (137);
 - Positioning the first cosmetic composition at the first predetermined dispensing region (166); 15
 - Positioning the second cosmetic composition at the second predetermined dispensing region (167);
 - Controlling the first driving system and the second driving system based on the targeted cosmetic product (137) and moving the first plunger (131) into the first cartridge (121) towards the static mixer (130) and the second plunger (132) into the second cartridge (122) towards the static mixer (130). 20 25
 - Optionally, moving the container (138) away from the cartridge holder (111).
12. A method according to claim 11, further comprising the operation consisting in controlling the first carousel driving motor to move the first cosmetic composition from to the first predetermined dispensing region (166) and controlling the second carousel driving motor to move the second cosmetic composition to the second predetermined dispensing region (167). 30 35

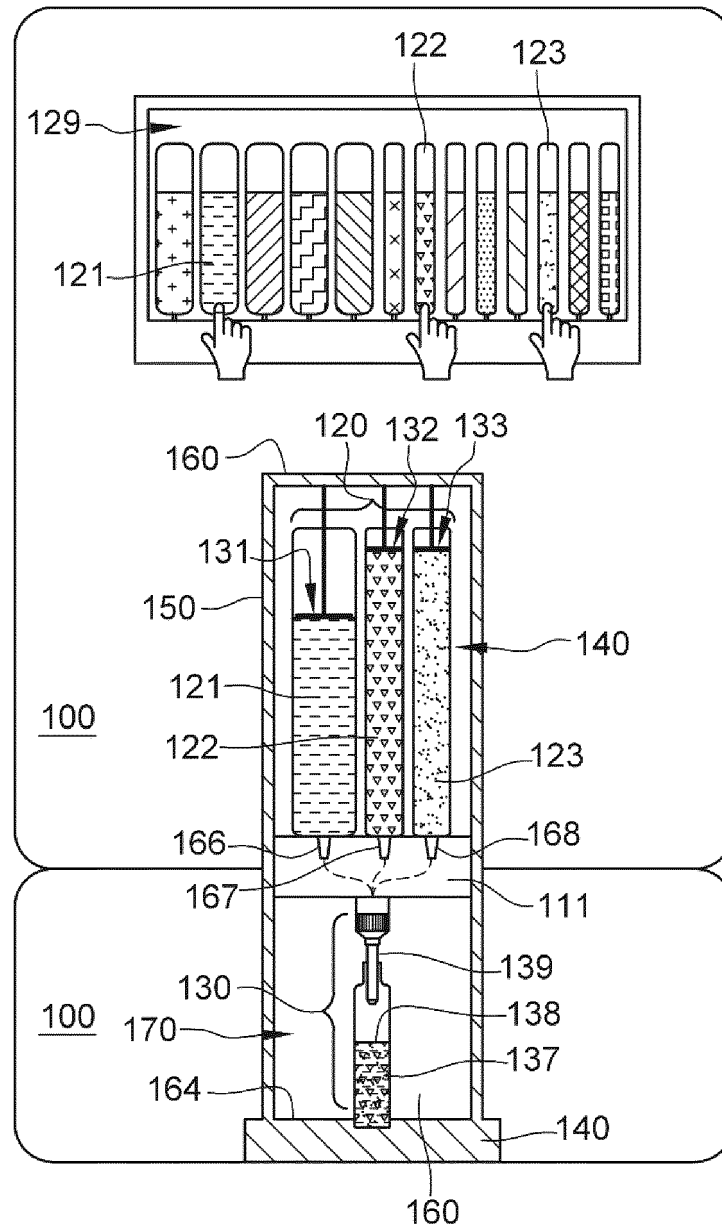
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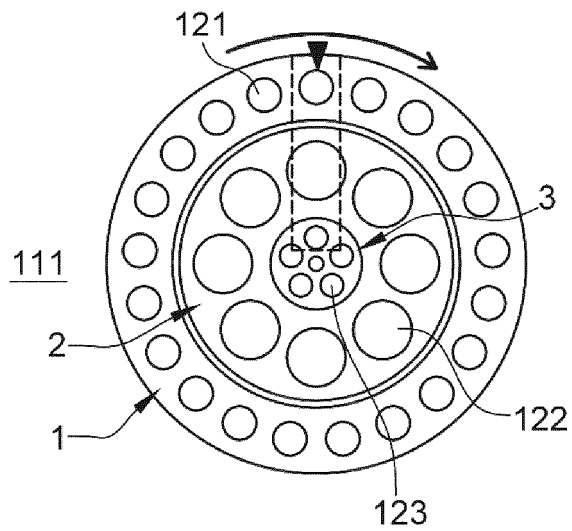
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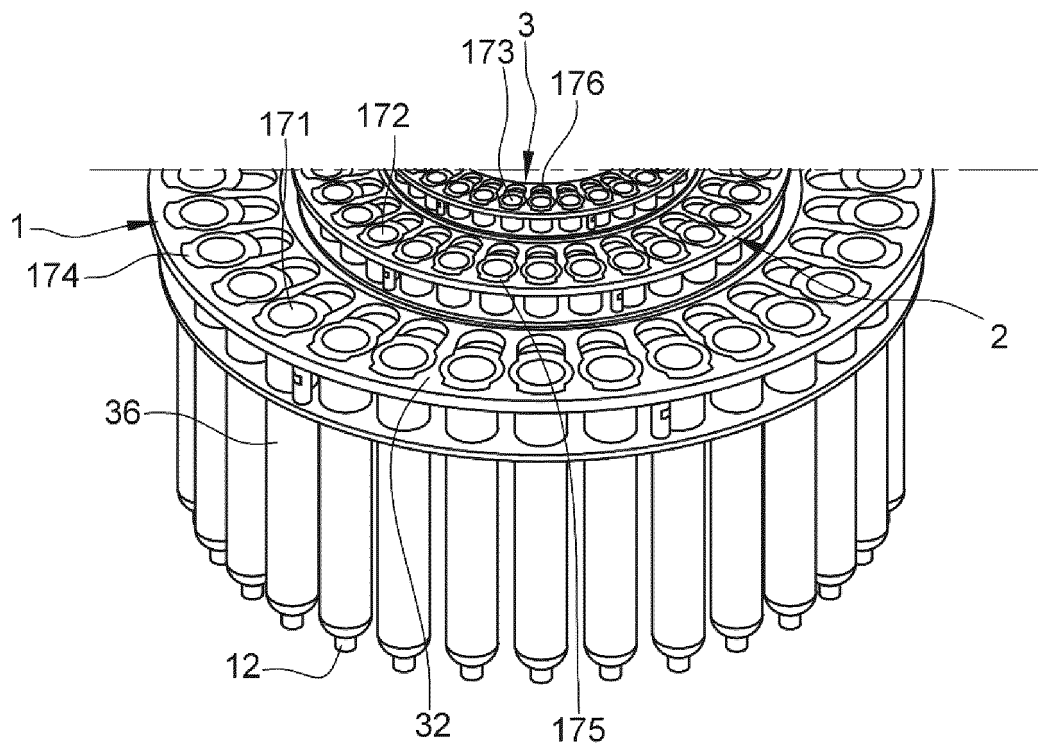
[Fig. 1]



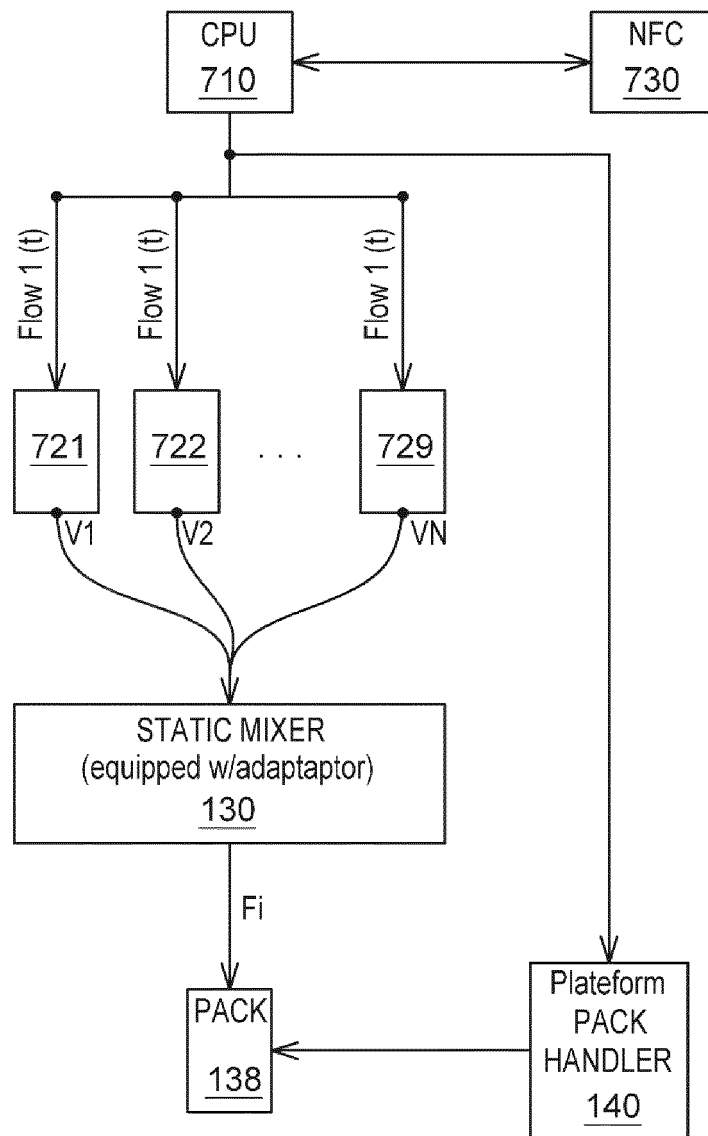
[Fig. 2]



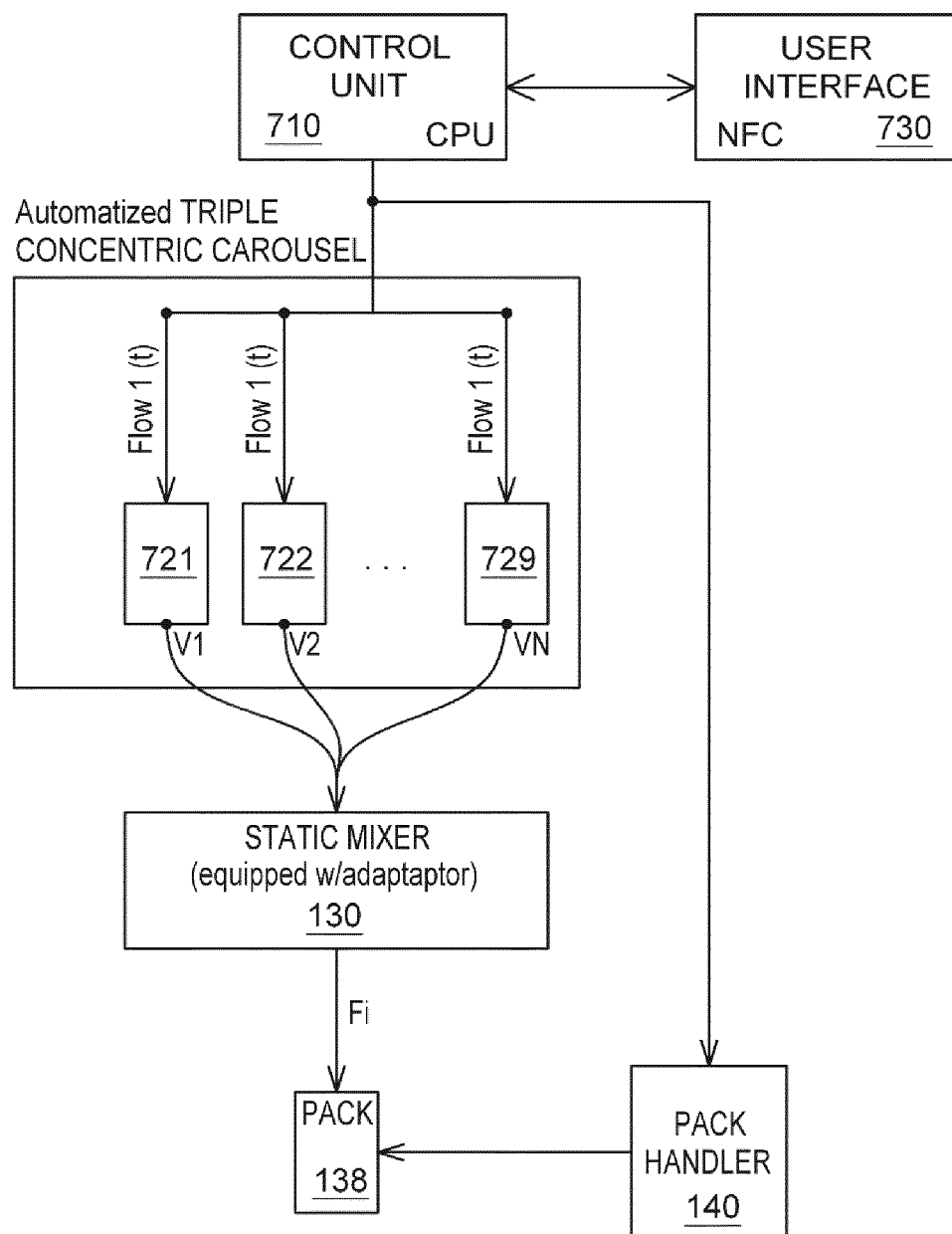
[Fig. 3]



[Fig. 4]



[Fig. 5]





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