



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
02.05.2018 Bulletin 2018/18

(51) Int Cl.:
A24C 5/32 (2006.01)

(21) Application number: **17198834.8**

(22) Date of filing: **27.10.2017**

(84) Designated Contracting States:
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
Designated Extension States:
BA ME
Designated Validation States:
MA MD

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(30) Priority: **27.10.2016 IT 201600108688**

(54) **UNIT FOR FEEDING FILTERS, AND APPARATUS AND METHOD FOR THE PRODUCTION OF ARTICLES COMPRISING SAID FILTERS**

(57) Feed unit configured to feed filters (F) toward a user machine (101), wherein the feed unit comprises a container (11) to contain a plurality of filters (F), and a removal device (12) configured to remove the filters from a removal zone (16) associated with the container (11) and to take them to a transfer zone (17). The feed unit

is provided with a plurality of housing seatings (15) each configured to receive one of the filters (F). The feed unit comprises a plurality of delivery nozzles (24) and transfer pipes (31) disposed in the transfer zone (17) upstream and respectively downstream of the removal device (12).

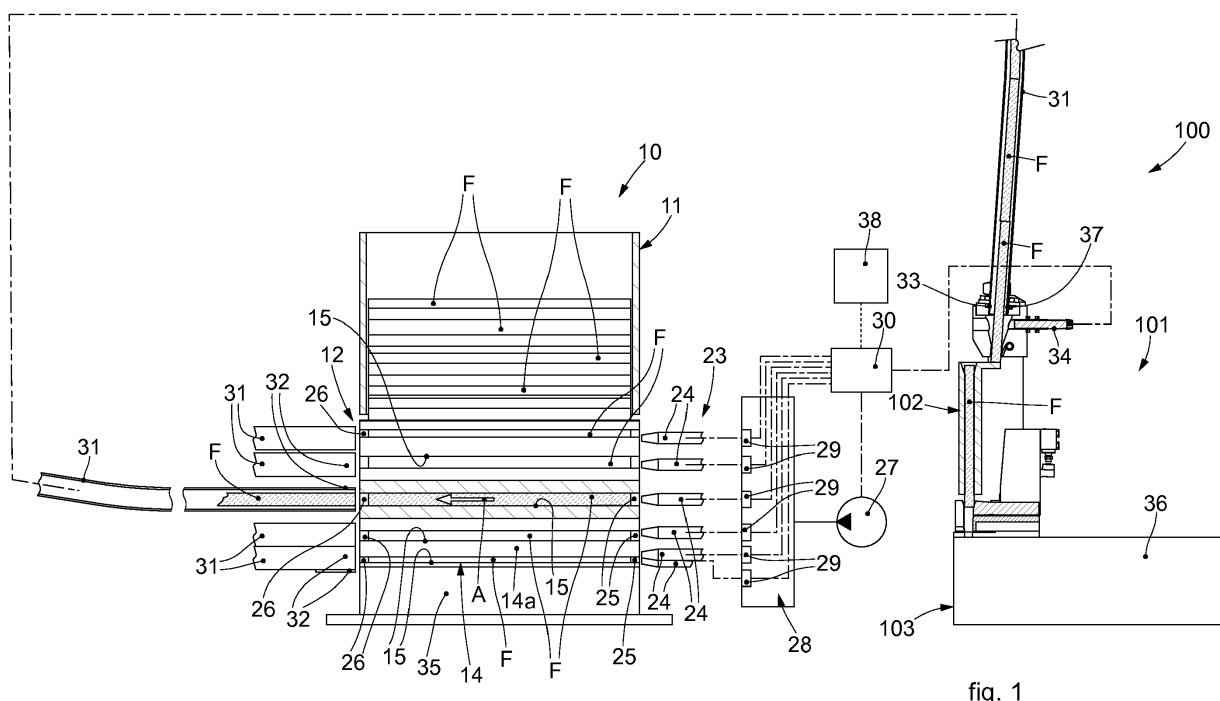


fig. 1

Description

FIELD OF THE INVENTION

[0001] Embodiments described here concern a unit to feed filters used, for example, for the production of encapsulated articles containing a reagent product, such as tobacco.

[0002] By way of example only, the encapsulated articles can be used in electronic cigarettes or other vaporization or flavoring devices. However, it is not excluded that the filters can be used for the production of other types of articles, such as, by way of example only, cigarettes, semi-finished articles, or smoking articles in general.

[0003] Other embodiments of the present invention also concern an apparatus that comprises the unit to feed filters.

BACKGROUND OF THE INVENTION

[0004] Smoking articles are known, such as encapsulated articles for electronic cigarettes or cigarettes, which comprise at least one filter element provided to filter a stream of fluid that is generated by the inhalation of a user.

[0005] The filter element can be obtained by cutting to size a filter provided in the form of a stick, generally having an elongated cylindrical shape.

[0006] The encapsulated articles normally comprise a capsule in which a reagent product is located, such as granular tobacco, or other aromatic substances. The reagent product is closed and held in the capsule by means of the filter element.

[0007] The capsule is provided, usually in a position opposite the filter element, with at least one breathable wall defined by a breathable mesh.

[0008] The encapsulated articles are used in association with vaporization or flavoring devices, which are provided with a cartridge containing a liquid substance, a vaporizer to vaporize the liquid substance, a battery provided to power the vaporizer electrically, and a mouthpiece.

[0009] The encapsulated article is inserted into the vaporization device in correspondence with the mouthpiece, and a user, inhaling, generates a stream of vapors which, from the vaporizer, passes through the breathable wall of the encapsulated article, the reagent product and the filter to reach the user's mouth.

[0010] The vapor that passes through the reagent product is flavored by the latter and gives the user the sensation of smoking, for example, a cigarette.

[0011] The encapsulated articles are made in an apparatus that comprises a filter feed unit and a user machine or assembly machine, in which the filters, possibly after being cut, are assembled to other elements to define the smoking article.

[0012] Apparatuses to transport filters are also known,

used in the field of cigarettes.

[0013] For example, document US-A-3789.744 describes a transport apparatus comprising a production machine where filters are produced, to be sent to a plurality of storage units of user machines.

[0014] The production machine also comprises an auxiliary storage unit in which the filters are temporarily inserted.

[0015] The auxiliary storage unit comprises a distributor system provided with a plurality of transfer units to transfer the filters through respective pipes.

[0016] The distributor system comprises a conveyor drum with grooves to receive the filters.

[0017] Respective transfer units are associated with the conveyor drum, to transfer the filters contained in the grooves to the pipes.

[0018] Channels are made in the conveyor drum that open toward the bottom surface of each of the grooves. A depression is selectively generated in the channels to hold the filters in the groove, and a pressure is generated to expel the filters from the groove to the transfer units in a radial direction with respect to the conveyor drum.

[0019] Each transfer unit is located on the periphery of the drum, on the external surface of the drum, and provides a channel to deliver a jet of pressurized air that sends the filter received from the groove to the feed pipe of the user machine.

[0020] However, this solution is particularly complex to achieve and is often subject to jams, due to the need to move the filters radially from the grooves to the transfer units.

[0021] Furthermore, this known solution provides a continuous and uncontrolled rotation of the drum, and the selective delivery of a stream of compressed air to the specific transfer unit for which it is required to feed the filter.

[0022] Another apparatus is also known from document GB-A-1.133.097, to feed filters for cigarettes pneumatically. The apparatus comprises a container for bars of filters that have a multiple length with respect to the final filter to be transferred, and a rotating drum positioned partly in the container and provided with grooves to receive the bars of filters of the container.

[0023] On a peripheral portion of the rotating drum, outside the container, cutting blades act, provided to cut the bars of filters to a predefined length and define a plurality of filtering segments (having multiple length with respect to the final filter used for the cigarette).

[0024] On another peripheral portion of the rotating drum a pneumatic device is installed to transfer the filtering segments.

[0025] The pneumatic device comprises compressed air delivery nozzles disposed in intermediate positions along the longitudinal extension of the drum, each of which is provided to transfer, along the respective pipe, a filtering segment. In particular, the nozzles are disposed angularly offset on the periphery of the rotating drum and in positions suitable to transfer, in order, the

filtering segment located in correspondence with a first end of one of the grooves with a first nozzle, the filtering segments located in intermediate positions of respective grooves with respective second nozzles, and the filtering segment located in correspondence with the second end of the grooves with a third nozzle. The rotation of the rotating drum, on each occasion, takes each groove in order in correspondence with the first nozzle, the second nozzles, and the third nozzle.

[0026] Even in this solution, however, the nozzles are located outside the rotating drum and on its periphery. In this case too, therefore, a radial movement of the filtering segments from the drum to the respective pneumatic devices is required.

[0027] Even this solution, however, is particularly complex to make, it is often subject to jamming and therefore needs technical interventions to restore the machine.

[0028] Furthermore, this solution provides a continuous rotation of the rotating drum without being able to control, in an individual and desired manner, the delivery of the filters to the station located downstream.

[0029] Given the needs of the market, the unit to feed filters and the apparatus to make articles that comprise the filters must be able to withstand high production conditions.

[0030] One purpose of the present invention is to provide a filter feed unit that is quick and efficient in transferring the filters to the user machine.

[0031] Another purpose of the present invention is to provide a filter feed unit that does not interfere with the operations performed by the user machine located downstream.

[0032] Another purpose of the present invention is to provide a filter feed unit on which maintenance operations can be easily carried out, or operations to control its functioning.

[0033] Another purpose of the present invention is to provide a filter feed unit which allows to optimize the feed of the filters downstream in a selectively desired manner.

[0034] Another purpose of the present invention is to provide a filter feed unit which allows to control, precisely and individually, the feed of the filters downstream.

[0035] There is also the need to obtain an apparatus for the manufacture of articles of the kind described above, which allows to perform the assembly operations of the articles quickly and in an automated manner.

[0036] Another purpose of the present invention is to provide an apparatus and method to obtain articles provided with complete filters very quickly and with an extremely high quality level.

[0037] Another purpose of the present invention is to provide an apparatus to make articles that is simple to obtain and efficient.

[0038] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0039] The present invention is set forth and characterized in the independent claims, while the dependent claims describe other characteristics of the invention or variants to the main inventive idea.

[0040] In accordance with the above purposes, a feed unit, according to the present invention, is configured to feed at least a filter toward a user machine.

[0041] According to one aspect of the present invention, the feed unit comprises a container to contain a plurality of filters.

[0042] Moreover, the feed unit comprises a rotating drum provided with housing seatings for the filters and selectively rotatable around an axis of rotation to take at least part of the rotating drum, that is provided with housing seatings, into a removal zone and into a transfer zone.

[0043] The removal zone is located in the container and, in this zone, the rotating drum can receive the filters in the housing seatings.

[0044] In accordance with another aspect of the present invention, the feed unit comprises a plurality of delivery nozzles and transfer pipes disposed in the transfer zone upstream and respectively downstream of the rotating drum. Each of the delivery nozzles is configured to deliver, selectively and independently from the other delivery nozzles, a jet of air under pressure into one of the housing seatings, and each of the transfer pipes is configured to receive the filters from one of the housing seatings and to transfer them, along their longitudinal development, toward the user machine.

[0045] In accordance with another aspect of the present invention, the feed unit comprises a movement member configured to move the rotating drum between the removal zone and the transfer zone, and a controller associated with the movement member and configured to control the angular movement of the rotating drum and selectively position, possibly with a step-wise movement, at least one group of the housing seatings each aligned to a respective delivery nozzle and to a respective end of the transfer pipe.

[0046] This configuration allows to obtain a feed unit which is extremely rapid and efficient and able to satisfy the high production rhythms required by the user machine located downstream.

[0047] The controller allows to determine a precise positioning of the rotating drum with respect to the delivery nozzles and the transfer pipes, in order to selectively take the housing seatings that contain the filters into a position suitable for the subsequent transfer through the transfer pipes.

[0048] Moreover, thanks to the fact that the delivery nozzles can be driven selectively and independently one from the other, it is possible, according to the production needs of the production machines located downstream, to command the feed of single filters through the transfer pipes.

[0049] Furthermore, the feed unit can be structurally

separate from the user machine, in this way preventing movements of one or the other compromising and/or influencing their reciprocal functioning.

[0050] Moreover, this solution allows to position the feed unit and the user machine separate and distanced from each other in order to adapt to specific positioning needs of the latter. Furthermore, the distanced positioning of the feed unit and the user machine allows to define operating spaces in which the operators can move, for example, in order to carry out maintenance operations.

[0051] The presence of transfer pipes to connect the feed unit to the user machine also allows to simplify possible maintenance or operations to remove possible blockages. For example it can be provided to quickly replace the feed unit simply by disconnecting the transfer pipes from the user machine and connecting another feed unit to it.

[0052] Embodiments of the present invention also concern an apparatus that comprises a feed unit to feed filters, as described above, and a user machine of filters that is structurally separate from the rotating drum of the feed unit, and in which at least a transfer pipe of the filters is connected to the user machine.

[0053] Further formulations of the present invention concern a method to make articles provided with filters that comprises:

- inserting a plurality of filters into a container;
- removing the filters from a removal zone associated with the container by receiving the filters in housing seatings of a rotating drum selectively rotatable around an axis of rotation;
- taking the filters contained in the housing seatings into a transfer zone;
- delivering independently, one from the other, one or more jets of air under pressure into one or more of the housing seatings to discharge the filters from the housing seatings;
- receiving the filters from the housing seatings in respective transfer pipes;
- moving the filters, with the jet of air under pressure, along the transfer pipes to supply them to the user machine.

[0054] In accordance with one aspect of the method according to the present invention, a movement member moves the rotating drum between the removal zone and the transfer zone, and a controller associated with the movement member controls the angular displacement of the rotating drum and selectively positions at least one group of the housing seatings each aligned to a respective delivery nozzle and to a respective end of the transfer pipe.

[0055] These and other aspects, characteristics and advantages of the present disclosure will be better understood with reference to the following description, drawings and attached claims.

[0056] The drawings, which are integrated and form

part of the present description, show some forms of embodiment of the present invention, and together with the description, are intended to describe the principles of the disclosure.

[0057] The various aspects and characteristics described in the present description can be applied individually where possible. These individual aspects, for example aspects and characteristics described in the attached dependent claims, can be the purpose of divisional applications.

[0058] It is understood that any aspect or characteristic that is discovered, during the patenting process, to be already known, shall not be claimed and shall be the purpose of a disclaimer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0059] These and other characteristics of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a schematic view of an apparatus to make articles according to the present invention;
- fig. 2 is a schematic front view of a feed unit of filters in accordance with the present invention;
- fig. 3 is a lateral view of fig.2;
- fig. 4 is a section view of an article obtainable with an apparatus according to the present invention.

[0060] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can conveniently be incorporated into other embodiments without further clarifications.

DETAILED DESCRIPTION OF SOME EMBODIMENTS

[0061] We shall now refer in detail to the various embodiments of the present invention, of which one or more examples are shown in the attached drawings. Each example is supplied by way of illustration of the invention and shall not be understood as a limitation thereof. For example, the characteristics shown or described insofar as they are part of one embodiment can be adopted on, or in association with, other embodiments to produce another embodiment. It is understood that the present invention shall include all such modifications and variants.

[0062] Before describing these embodiments, we must also clarify that the present description is not limited in its application to details of the construction and disposition of the components as described in the following description using the attached drawings. The present description can provide other embodiments and can be obtained or executed in various other ways. We must also

clarify that the phraseology and terminology used here is for the purposes of description only, and cannot be considered as limitative.

[0063] Embodiments of the present invention concern a feed unit of filters F indicated in its entirety by the reference number 10.

[0064] Other embodiments of the invention concern an apparatus 100 for the production of articles provided with said filters F that comprises at least the feed unit 10 and a user machine 101 in which the filters F fed by the feed unit 10 are used, for example assembled with other elements to define an article such as, merely by way of example, an encapsulated article C shown for example in fig. 4.

[0065] The filters F can be stick-shaped, substantially cylindrical, with sizes and conformation suitable and selected as a function of its final use.

[0066] Merely by way of non-restrictive example, the filter F can be made of at least a material chosen from a group comprising cellulose acetate, cotton, paper, or a combination thereof.

[0067] The feed unit 10 comprises a container 11 configured to contain a plurality of filters F.

[0068] The filters F can be positioned in the container 11, adjacent and overlapping each other.

[0069] The feed unit 10 also comprises a removal device 12 configured to remove from the container 11, singly, at least one filter F, in this specific case, a group of filters F at a time.

[0070] In accordance with possible solutions, the removal device 12 can comprise a rotating drum 14a provided on its external surface with housing seatings 15 for the filters F.

[0071] The removal device 12, or the rotating drum 14a, and possibly the container 11 associated therewith, is installed on a support element 35. According to a possible embodiment of the present invention, the support element 35 is structurally separate from the user machine 101. By the term structurally separate we mean that the removal device 12, or the rotating drum 14a, is installed on a support element 35 that is not structurally connected and independent from the user machine 101, for example from a support structure of the latter.

[0072] In accordance with a possible embodiment, shown for example in figs. 1-3, the removal device 12, or the rotating drum 14a, is at least partly positioned in the container 11 in order to remove the filters F from the latter.

[0073] In some embodiments, it can be provided that the removal device 12 is mobile between a removal zone 16 associated with, in this specific case positioned in, the container 11 and in which the filters F are removed from the latter, and a transfer zone 17 from which the filters F are transferred toward the user machine 101, as described hereafter.

[0074] The rotating drum 14a is selectively rotatable around an axis of rotation Z in order to take at least one of its parts, provided with the housing seatings 15, into

a removal zone 16, located in the container 11, in order to remove and insert the filters F in the housing seatings 15, and into a transfer zone 17.

[0075] The transfer zone 17 can be positioned externally to the container 11 to facilitate the subsequent transfer operations of the filters F toward the user machine 101.

[0076] In particular, the removal device 12, or the rotating drum 14a, can be at least partly positioned through an aperture 13 made in the container 11. In this way one part of the removal device 12, or the rotating drum 14a, is positioned in the container 11, that is, facing the latter, and one part is external to the container 11.

[0077] The removal device 12, or the rotating drum 14a, can be positioned in correspondence with at least a bottom wall 19 of the container 11 on which the filters F are positioned resting. This positioning allows to supply, by gravity, without the help of other devices, the filters F to the removal device 12, or the rotating drum 14a.

[0078] The bottom wall 19 can be disposed inclined downward in the direction of the aperture 13 in order to convey the filters F, by gravity and toward the latter, or toward the removal device 12.

[0079] In accordance with a possible solution, not shown, at least the bottom of the container 11 can be conformed like a hopper provided with said aperture 13 in correspondence with which the removal device 12 is positioned.

[0080] According to possible embodiments of the present invention, the removal device 12, or at least part of the rotating drum 14a, is mobile between the removal zone 16 and the transfer zone 17, and is provided with a plurality of housing seatings 15 each configured to receive one of the filters F. This allows to remove the filters F present in the container 11 singly.

[0081] In accordance with possible solutions, the removal device 12 comprises a transfer body 14 provided with said housing seatings 15, and a movement member 20 configured to move the transfer body 14 from the removal zone 16 to the transfer zone 17.

[0082] According to possible solutions, the movement member is configured to move part of the rotating drum 14a between the removal zone 16 and the transfer zone 17.

[0083] In accordance with possible embodiments, shown for example in figs. 1-3, the transfer body 14 comprises the rotating drum 14a provided on its peripheral surface with the housing seatings 15 and rotatable around an axis of rotation Z in order to take at least one part of it into the removal zone 16 and into the transfer zone 17.

[0084] In accordance with some variants, not shown in the drawings, the transfer body 14 can comprise a drawer provided, in at least one of its surfaces, with said housing seatings 15 and connected to the movement member 20 to take the drawer alternately from the removal zone 16 to the transfer zone 17, for example with a linear motion.

[0085] According to the solution shown in figs. 1-3 the housing seatings 15 are defined by grooves made open toward the outside and each configured to receive a filter F.

[0086] The housing seatings 15 have cross section sizes bigger than or equal to those of the cross section of the filter F.

[0087] The housing seatings 15 can extend for the entire axial length of the transfer body 14, in this case of the rotating drum 14a, or for a length at least equal to or more than the length of the filter F.

[0088] The housing seatings 15 can be made equidistant from each other, by a predefined angular pitch, along the circumference of the rotating drum 14a.

[0089] The rotating drum 14a can be positioned partly in the container 11 and partly outside it.

[0090] On each occasion, the portion of the rotating drum 14a that is positioned in or facing toward the container 11 defines the removal zone 16 of the filters F from the container 11, while the portion of the rotating drum 14a located externally to the container 11 defines the transfer zone 17 of the filters F toward the user machine 101, as described hereafter.

[0091] The filters F present in the container 11 are removed by the transfer body 14, or by the rotating drum 14a, entering into the housing seatings 15. The pressure or weight exerted by the filters F located above the transfer body 14, or the rotating drum 14a, thrusts the filters F into the housing seatings 15 of the latter.

[0092] According to possible embodiments, the transfer body 14, or the rotating drum 14a, is associated at least with a holding element 18 configured to at least partly close some of the housing seatings 15 and hold the filters F in them.

[0093] According to possible solutions, the holding element 18 can be located on the periphery of the rotating drum 14a to cover a predefined angular section of the latter.

[0094] The holding element 18 can be located in correspondence with the transfer zone 17 of the rotating drum 14a, that is, it can occupy the entire angular section not affected by the removal zone 16.

[0095] The movement member 20 associated with the transfer body 14, or the rotating drum 14a, can comprise a motor 21 and motion transmission devices 22 connected to the motor 21 and to the rotating drum 14a in order to make the latter rotate.

[0096] In accordance with other embodiments, for example applicable if the transfer body 14 is mobile linearly, the movement member 20 can comprise a linear actuator, or articulated linear movement mechanisms, such as rod-crank mechanisms.

[0097] The rotation of the transfer body 14, or the rotating drum 14a, can be controlled by a controller 38 configured to determine and/or control the angular displacement of the rotating drum 14a. The controller 38 allows to manage the functioning of the removal device 12 and the modality/cadence of feed of the filters F, as described

hereafter.

[0098] In accordance with possible embodiments of the present invention, the movement member 20 can be configured to rotate the rotating drum 14a step-wise. The step-wise rotation allows to define a correct and desired angular positioning of the rotating drum 14a.

[0099] A pneumatic ejection device 23 can be associated with the removal device and is configured to deliver a plurality of jets of air under pressure into the removal device 12 and pneumatically expel the filters F from the latter.

[0100] In particular, the pneumatic ejection device 23 is configured to generate jets of air under pressure toward the filters F contained in the transfer zone 17. The pressure of the air allows to transfer the filters F to the user machine 101 as described hereafter.

[0101] In accordance with possible embodiments, the pneumatic ejection device 23 comprises a plurality of delivery nozzles 24, each of which is provided to deliver, independently from the other delivery nozzles 24, a respective jet of air under pressure and define the expulsion of a respective filter F.

[0102] In accordance with possible embodiments of the invention, the delivery nozzles 24 are positioned so as to deliver a jet of air under pressure in a direction substantially parallel to the oblong development of the housing seatings 15.

[0103] In accordance with a possible embodiment of the invention, each delivery nozzle 24 can be positioned in correspondence with a first end 25 of one of the housing seatings 15, when it is located in the transfer zone 17, to deliver a jet of air under pressure into the latter and determine the expulsion of one filter F through a second end 26 of the respective housing seating 15, as identified by the arrow A in fig. 1.

[0104] In accordance with the solution shown in figs. 1 and 3, the housing seatings 15 extend for the entire length of the transfer body 14, or the rotating drum 14a, and therefore their first ends 25 and second ends 26 are made open toward the outside also in a direction parallel to the axis of rotation Z of the rotating drum 14a, in correspondence with the lateral ends of the latter.

[0105] According to possible embodiments, the delivery nozzles 24 are installed in the transfer zone 17 according to a pattern coordinated to the positioning pattern of at least some of the housing seatings 15 of the removal device 12.

[0106] In this way, when the filters F of the container 11 are inserted into the housing seatings 15, the transfer body 14, or the rotating drum 14a, is moved to take the housing seatings 15 filled in correspondence with the delivery nozzles 24.

[0107] The delivery nozzles 24, in turn, each deliver a pressurized jet of air to expel the filters F from the housing seatings 15.

[0108] In accordance with a possible embodiment of the present invention, a selector member 29 is associated with each delivery nozzle 24 and is configured to con-

trol the stream of compressed air which is delivered by the delivery nozzle 24 to a respective housing 15.

[0109] The selector members 29 can comprise at least one of either an interception valve, a flow regulation valve, a pressure regulation valve.

[0110] In accordance with a possible solution, the pneumatic ejection device 23 can comprise a collector member 28 to which the selector members 29 are connected and configured to provide the latter with compressed air.

[0111] According to a possible solution, the pneumatic expulsion device 23 comprises a compressor 27 configured to generate compressed air to be fed to said collector member 28.

[0112] According to a possible variant, a respective pressurized air feed device can be associated with each selector member 29.

[0113] The selector members 29 can be connected to a management and control unit 30 configured to selectively drive the delivery of compressed air through the respective delivery nozzle 24 and therefore regulate the transfer action of the filters F.

[0114] The feed unit comprises a plurality of transfer pipes 31 disposed in the transfer zone 17 downstream of the removal device 12 and each configured to receive filters F from one of the housing seatings 15 and transfer them to the user machine 101.

[0115] In particular, it is provided that each jet of pressurized air delivered by the delivery nozzles 24 is delivered not only through the removal device 12 but also through a respective transfer pipe 31, thus generating the transfer of the filters to the user machine 101.

[0116] In accordance with possible solutions, each transfer pipe 31 has an introduction end 32 positioned in the transfer zone 17, according to a pattern coordinated to the positioning pattern of the housing seatings 15 of the transfer body 14.

[0117] In accordance with the solutions shown in figs. 1 and 3, the introduction ends 32 are installed angularly equidistant from each other by an angular pitch substantially equal to the angular positioning pitch of the housing seatings 15 on the rotating drum 14a.

[0118] The introduction ends 32 of the transfer pipes 31 are installed in correspondence with and substantially aligned with the second ends 26 of at least some of the housing seatings 15 when they are in the expulsion condition of the filters F.

[0119] In this way, the filters F, discharged from the housing seatings 15 by means of the jets of air, are introduced directly into the transfer pipes 31 and transferred to the user machine 101.

[0120] In particular, the controller 38 allows to selectively position, by rotating the rotating drum 14a, at least one group of housing seatings 15 each aligned with a respective delivery nozzle 24 and with a respective end of the transfer pipe 31.

[0121] Furthermore, the controller 38 is configured to position each of the housing seatings 15 of the group that

is located in the transfer zone 17 aligned with its first end 25 to one of the delivery nozzles 24 and, with its second end 26, aligned to the introduction end 32 of a respective transfer pipe 31.

[0122] In the transfer condition of the filter F from the housing seatings 15 to the transfer pipes 31, each of the housing seatings 15 that is located in the transfer zone 17 has its axis of longitudinal development aligned with the axis of the respective delivery nozzle 24, and the end of one of the transfer pipes 31.

[0123] According to possible solutions, the controller 38 can comprise a detection device 39 configured to detect the angular position of the rotating drum 14a. The controller 38 also defines the stable, and at least instantaneous, angular positioning of the rotating drum 14a to allow the subsequent transfer of the filters F through the transfer pipes 31.

[0124] In particular, it can be provided that the rotating drum 14a can be kept in a fixed position at least for the discharge time of the filter from the respective housing seating 15, and that the rotating drum 14a is subsequently moved step-wise to take another group of housing seatings 15 containing the filters F into the transfer zone 17.

[0125] The detection device 39 can comprise, for example, an encoder able to detect the amplitude of angular rotation that is imparted to the rotating drum 14a when driven, and to position the group of housing seatings 15 in an at least temporarily fixed position, in order to discharge the filters. The encoder can also allow to detect the angular position taken by each housing seating 15 during rotation of the rotating drum 14a.

[0126] The controller 38 can therefore manage the movement of the rotating drum 14a in order to position, possibly with a step-wise movement, the housing seatings 15 containing the filters F, each aligned with a respective delivery nozzle 24.

[0127] In accordance with another aspect of the present invention, the apparatus can comprise a control and management unit, for example the same control and management unit 30 as described above, which is associated with the delivery nozzles and the controller 38 to determine the selective delivery of respective jets of pressurized air when the housing seatings 15 are located in a predefined angular position, which corresponds to an alignment condition of a group of housing seatings 15, both with respective delivery nozzles 24 and also with respective ends of the transfer pipes 31.

[0128] In accordance with possible embodiments of the present invention, the introduction ends 32 are positioned substantially horizontally to receive the filters F in a horizontal direction.

[0129] The transfer pipes 31 are each provided with a terminal end 33 connected to the user machine 101, where the filters F are delivered.

[0130] The terminal ends 33 of the transfer pipes 31 are installed at a different angle from that of the introduction ends 32, in this case at a substantially vertical or sub vertical angle.

[0131] The orientation of the terminal end 33, different from that of the introduction end 32, allows to meet particular feed conditions of the user machine 101.

[0132] According to possible solutions, it can be provided that the transfer pipes 31 extend for a length of at least three times the length of the filters F that are to be transferred, by way of example only, it can be provided that the transfer pipes 31 each extend for at least one length of 1m or more, for example even 5-10m or more.

[0133] In accordance with possible embodiments of the present invention, the transfer pipes 31 can have one or more curved segments, even with very wide curvatures, for example with a radius of more than 0.5m, so as to allow to transfer the filters F avoiding problems of blockages, for example due to jamming.

[0134] In accordance with possible solutions, the transfer pipes 31 can develop according to a straight path, and curved to reach the user machine 101.

[0135] The transfer pipes 31 can be flexible to adapt to the specific path requirements required by the specific installation.

[0136] The jets of air generated by the pneumatic ejection device 23 are such as to move the filters F both through the housing seatings 15, and through the transfer pipes 31 and through the terminal ends 33 of the latter.

[0137] According to possible solutions, the terminal ends 33 can be provided with releasable attachment/detachment elements 37, such as connectors, configured to allow quick connection/disconnection of the transfer pipes 31 to/from the user machine 101. The releasable attachment/detachment elements 37 allow, for example, to quickly remove possible blocking conditions, or to quickly replace the feed unit 10 associated with the user machine 101.

[0138] In accordance with possible solutions, it can be provided that columns of filters F are generated in the transfer pipes 31, aligned to each other along the longitudinal development of the transfer pipes 31 and that, on each occasion, the filter F discharged from the removal device 12 pushes all the other filters F toward the terminal end 33, causing the progressive expulsion of one filter F at a time to the user machine 101.

[0139] According to a possible solution, at least one respective detection device 34 can be associated with the terminal end 33 of each transfer pipe 31, to detect the presence of at least one filter F.

[0140] In accordance with possible variants, two detection devices 34 can be associated with each terminal end 33, one upstream and one downstream of the terminal end 33 itself. This allows to obtain an accurate control of the movement of the filters F by identifying in a timely manner possible blockages of the filters F for example along the transfer pipes 31.

[0141] If the presence of a filter F is not detected in correspondence with one of the terminal ends 33, the drive of the pneumatic ejection device 23 is commanded, to feed additional filters F to the user machine 101.

[0142] To this purpose, each detection device 34 is

connected to the management and control unit 30 to provide the data detected. The management and control unit 30, on the basis of this data, commands the delivery of one or more streams of air by one or more delivery nozzles 24, possibly by intervening on the selector members 29.

[0143] The user machine 101 can comprise at least one of either a reception station, a cutting station, a separating station, a removal station, a station to assemble the filters F, or a combination of said stations.

[0144] The user machine 101 is structurally separate from the removal device 12, that is, from the support member 35 of the latter.

[0145] The presence of the transfer pipes 31 allows to position the feed unit 10 and the user machine 101 distanced from each other, both to meet any possible positioning requirements of the apparatus 100, and also to avoid the installation of the feed unit 10 on the user machine 101.

[0146] In the latter case, in fact, the apparatus 100 would be particularly bulky and difficult to manage and maintain. Furthermore, the installation of the feed unit 10 on the operating machine 101 could compromise the functioning of the latter, for example by affecting the movement inertias of the user machine 101 itself.

[0147] In accordance with the embodiment shown in fig. 1, the user machine 101 comprises a reception station 102 to receive the filters F installed on a support structure 36, in which the filters F are discharged from the transfer pipes 31.

[0148] The support structure 36 is structurally separate and distanced from the support element 35 of the removal device 12, so that it does not compromise the operation of the user machine 101.

[0149] Furthermore, the distanced positioning of the feed unit 10 and the user machine 101 allows to generate in both of them operating spaces for the operators, needed, for example, to allow maintenance operations.

[0150] By way of example only, it can be provided that the filters F are cut to size, to define a semi-finished article, that is, a filter element 104 to be used, for example, in encapsulated articles C or in other types of articles, for example cigarettes.

[0151] In accordance with possible embodiments of the present invention, the user machine 101 is configured to use the filters F fed by the feed unit 10 in the production of encapsulated articles C defined by a capsule 105, defining a containing compartment 106 suitable to contain inside it a reagent product 107 and the filter element 104.

[0152] According to the invention, the reagent product 107 can be tobacco, or another substance, according to the destination and/or use of the encapsulated article C.

[0153] In accordance with some embodiments, the reagent product 107 can be powdered, minced, ground, in grains, bars, etc.

[0154] The bottom of the capsule 105 is provided with holes for the passage of air, vapors, or suchlike through them, and to prevent the leakage of the reagent product

107.

[0155] An annular holding element 108 is associated with the capsule 105 and is configured to hold inside it the reagent product 107 and the filter element 104.

[0156] The production of the encapsulated article C in the apparatus 100 according to the present invention provides to carry out at least the following operating steps: providing at least one capsule 105, inserting inside it a dose of reagent product 107 suitably measured, inserting the filter element 104 sized according to production needs, closing the capsule 105 with the holding element 108, and providing the encapsulated article C obtained to other work stations in order to perform any other possible working steps.

[0157] It is clear that modifications and/or additions of parts may be made to the unit 10 to feed filters F, the apparatus 100 comprising said unit 10 to feed filters F, and the method to make articles C comprising said filters F as described heretofore, without departing from the field and scope of the present invention.

[0158] For example, it can be provided that one feed unit 10 according to the present invention can be used to feed several user machines 101, for example providing that a first group of transfer pipes 31, or at least one pipe, is connected to a first user machine, and that a second group of transfer pipes 31, or at least one pipe, is connected to a second user machine.

[0159] It is also clear that, although the present invention has been described with reference to some specific examples, a person of skill in the art shall certainly be able to achieve many other equivalent forms of unit 10 to feed filters F, the apparatus 100 comprising the unit 10 to feed filters F, and the method to make articles C comprising said filters F, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

Claims

1. Feed unit configured to feed filters (F) toward a user machine (101), said feed unit comprising
 - a container (11) to contain a plurality of filters (F),
 - a rotating drum (14a) provided with housing seatings (15) for said filters (F) and selectively rotatable around an axis of rotation (Z) to take at least one part of it, with said housing seatings (15), into a removal zone (16) located in the container (11) in order to receive said filters (F) in said housing seatings (15), and into a transfer zone (17),
 - a plurality of delivery nozzles (24) and transfer pipes (31) located in said transfer zone (17) upstream and respectively downstream of said rotating drum (14a), each of said delivery nozzles (24) being configured to deliver, selectively and

independently from the other delivery nozzles (24), a jet of air under pressure into one of said housing seatings (15), and each of said transfer pipes (31) being configured to receive said filters (F) from one of said housing seatings (15) and to transfer them toward said user machine (101), **characterized in that** said feed unit comprises a movement member (20) configured to move at least part of said rotating drum (14a) between said removal zone (16) and said transfer zone (17), and a controller (38) associated with said movement member (20) and configured to control the angular displacement of said rotating drum (14a) and to selectively position at least a group of said housing seatings (15) each aligned with a respective delivery nozzle (24) and with a respective end of the transfer pipe (31).

2. Unit as in claim 1, **characterized in that** said controller (38) comprises a detection device (39) configured to detect the angular position of said rotating drum (14a) and said controller (38), defining the stable angular and at least instantaneous positioning of said rotating drum (14a).
3. Unit as in claim 1 or 2, **characterized in that** it comprises a control and management unit (30) associated with said delivery nozzles (24) and with said controller (38) in order to determine the selective delivery of respective jets of air under pressure, when said housing seatings (15) are located in a predefined angular position.
4. Unit as in any claim hereinbefore, **characterized in that** a selector member (29) is associated with each delivery nozzle (24) and is configured to control the stream of compressed air that is delivered by said delivery nozzle (24) into a respective housing seating (15).
5. Unit as in any claim hereinbefore, **characterized in that** a detection device (34) to detect the presence of said at least one filter (F) is associated with each transfer pipe (31), in a terminal end (33) thereof.
6. Unit as in claims 3, 4 and 5, **characterized in that** said control and management unit (30) is connected to said selector members (29) and to said detection devices (34), and is configured to command the drive of one or more selector members (29) in order to deliver one or more jets of air under pressure into one or more of said delivery nozzles (24) as a function of the presence data detected by said detection devices (34).
7. Unit as in any claim hereinbefore, **characterized in that** said delivery nozzles (24) are installed in the transfer zone (17) according to a pattern coordinated

with the positioning pattern of at least some of said housing seatings (15) of the rotating drum (14a).

8. Unit as in any claim hereinbefore, **characterized in that** said controller (38) is configured to position each of said housing seatings (15) of said unit aligned with a first end (25) thereof to one of said delivery nozzles (24) and, with a second end (26), aligned to an introduction end (32) of a respective transfer pipe (31). 5
9. Unit as in any claim hereinbefore, **characterized in that** said transfer zone (17) is located externally to said container (11). 10
10. Unit as in any claim hereinbefore, **characterized in that** said housing seatings (15) are located substantially horizontal, **and in that** said transfer pipes (31) comprise an introduction end (32) located parallel to said housing seatings (15) and a terminal end (33) installed according to a different angle from that of the introduction end (32). 15 20
11. Unit as in any claim hereinbefore, **characterized in that** it comprises a support element (35) structurally separate from said user machine (101) and on which at least said rotating drum (14a) is installed. 25
12. Apparatus to make articles (C) provided with filters (F), **characterized in that** it comprises a feed unit (10) as in any claim hereinbefore, and a user machine (101) of said filters (F) that is structurally separate from said rotating drum (14a) of said feed unit (10), and in which at least a transfer pipe (31) of said filters is connected to said user machine (101). 30 35
13. Apparatus as in claim 12, **characterized in that** said user machine (101) comprises a reception station (102) of said filters (F) installed on a support structure (36), and in which said filters (F) are discharged from said transfer pipes (31), said support structure (36) being structurally separate from a support element (35) configured to support said rotating drum (14a). 40
14. Method to make articles (C) provided with filters (F), comprising: 45
 - inserting a plurality of filters (F) into a container (11);
 - removing said filters (F) from a removal zone (16) associated with said container (11) by receiving said filters (F) in housing seatings (15) of a rotating drum (14a) selectively rotatable around an axis of rotation (Z); 50
 - taking said filters (F) contained in said housing seatings (15) to a transfer zone (17); 55
 - delivering independently, one from the other, one or more jets of air under pressure into one or more of said housing seatings (15) to dis-

charge said filters from said housing seatings (15);

- receiving said filters (F) from said housing seatings (15) in respective transfer pipes (31);
- moving said filters (F), with said jet of air under pressure, along said transfer pipes (31) to supply them to said user machine (101), **characterized in that** a movement member (20) moves said rotating drum (14a) between said removal zone (16) and said transfer zone (17), and a controller (38) associated with said movement member (20) controls the angular movement of said rotating drum (14a) and selectively positions at least one group of said housing seatings (15) each aligned to a respective delivery nozzle (24) and to a respective end of the transfer pipe (31).

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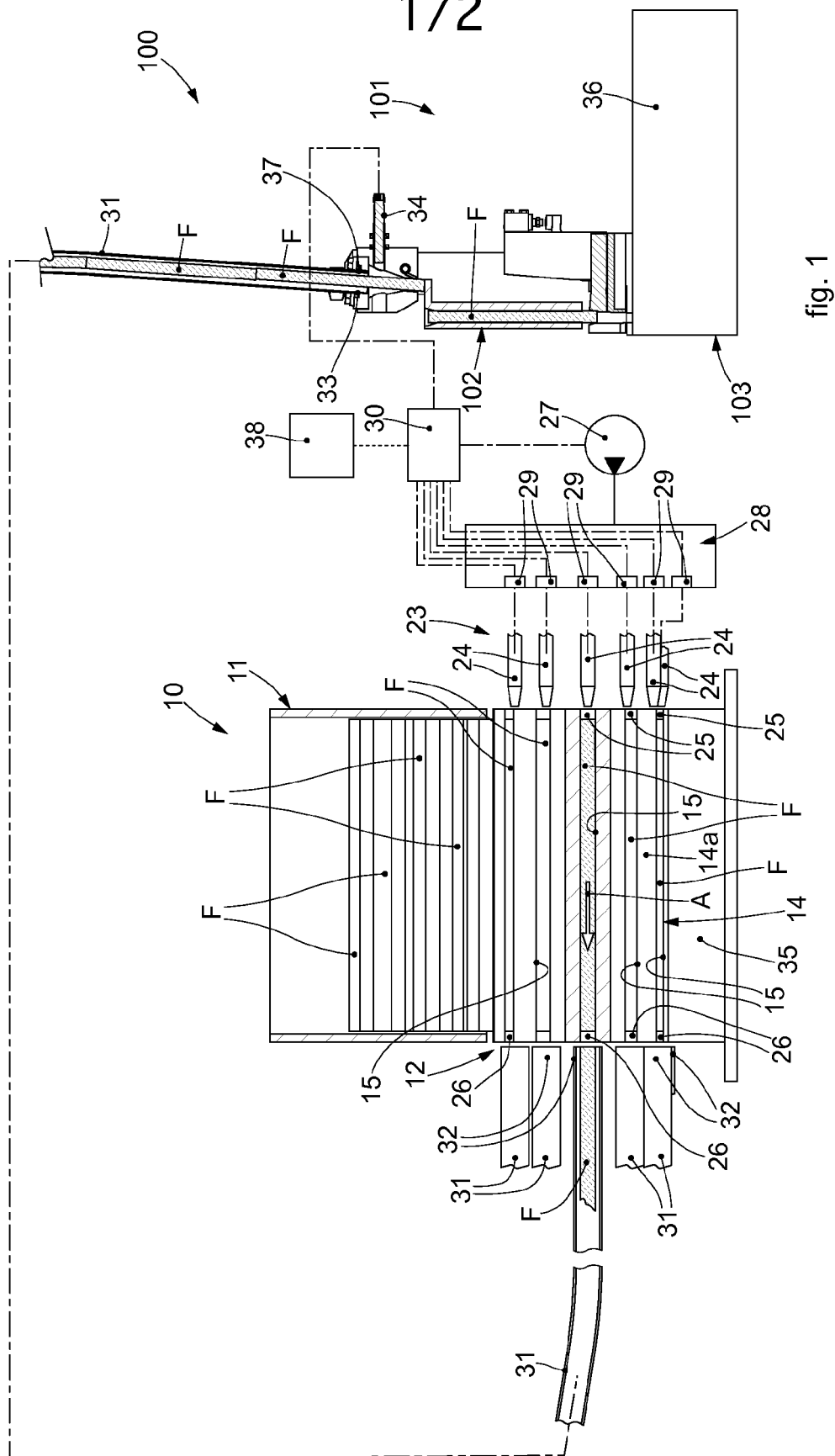
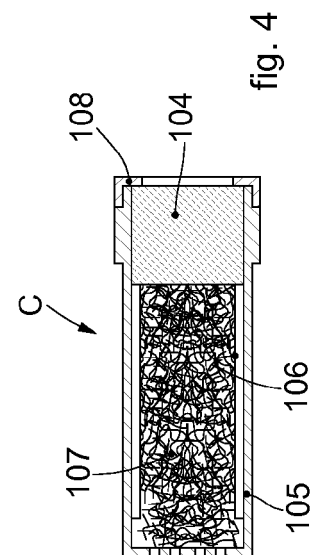
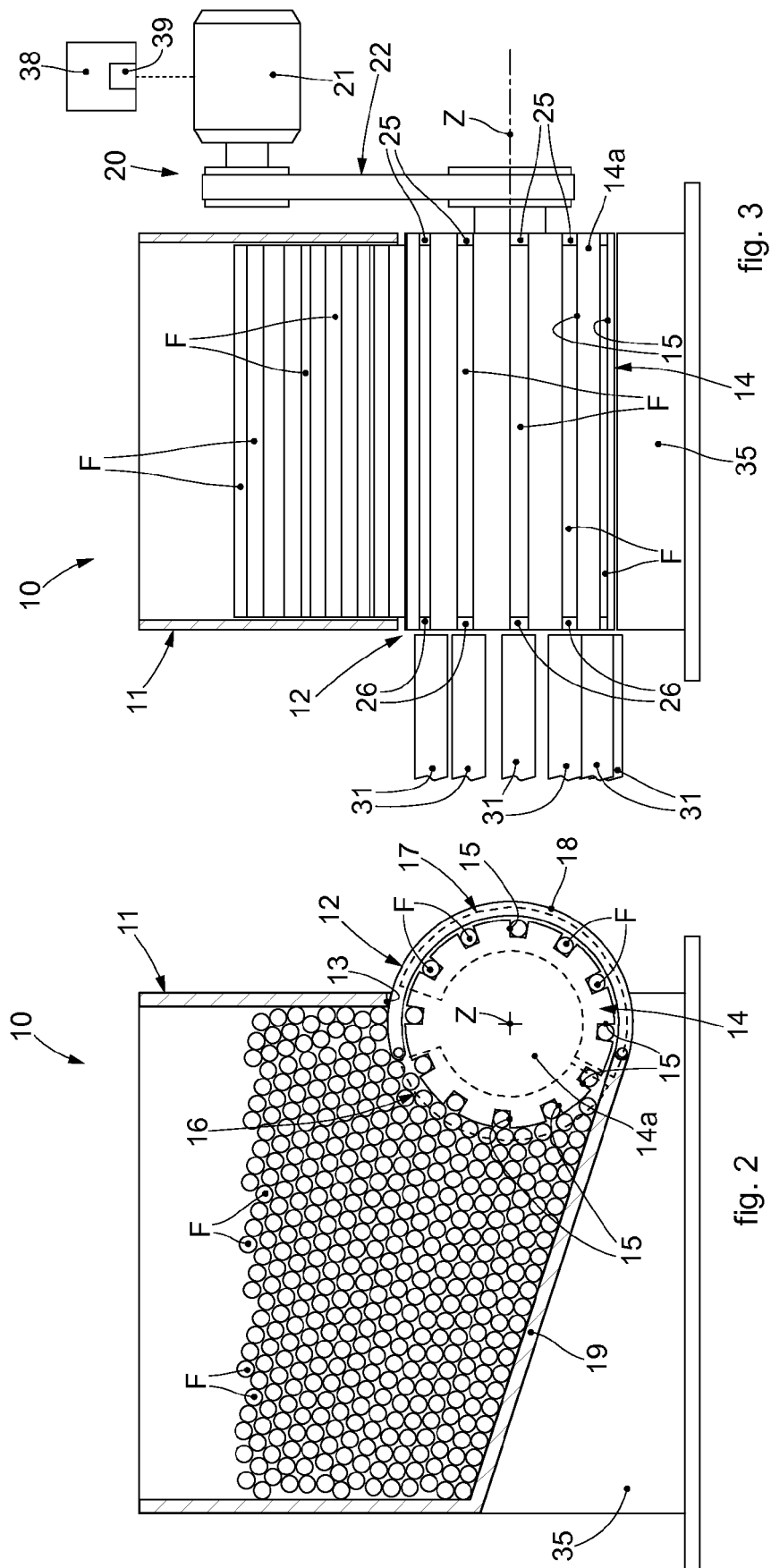


fig. 1





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Place of search Munich		Date of completion of the search 26 February 2018	Examiner Schwarzer, Bernd
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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