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(54) **APPARATUS AND METHOD FOR FEEDING AND FORMING ORGANIZED GROUPS OF SMOKING ARTICLES**

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(57) **ABSTRACT**

The apparatus (10) for feeding and forming organized groups of smoking articles (20) comprises a containing compartment (11) configured to contain smoking articles (20) and provided with a lower aperture (16), a plurality of conveying channels (30), each one having an upper aperture (34) communicating with the lower aperture (16) of the containing compartment, and a conveying device (40) comprising a support structure (41) on which there are mounted two or more conveying members (42) with an elongated shape, parallel to each other and disposed in correspondence with the upper apertures (34) of the conveying channels (30).

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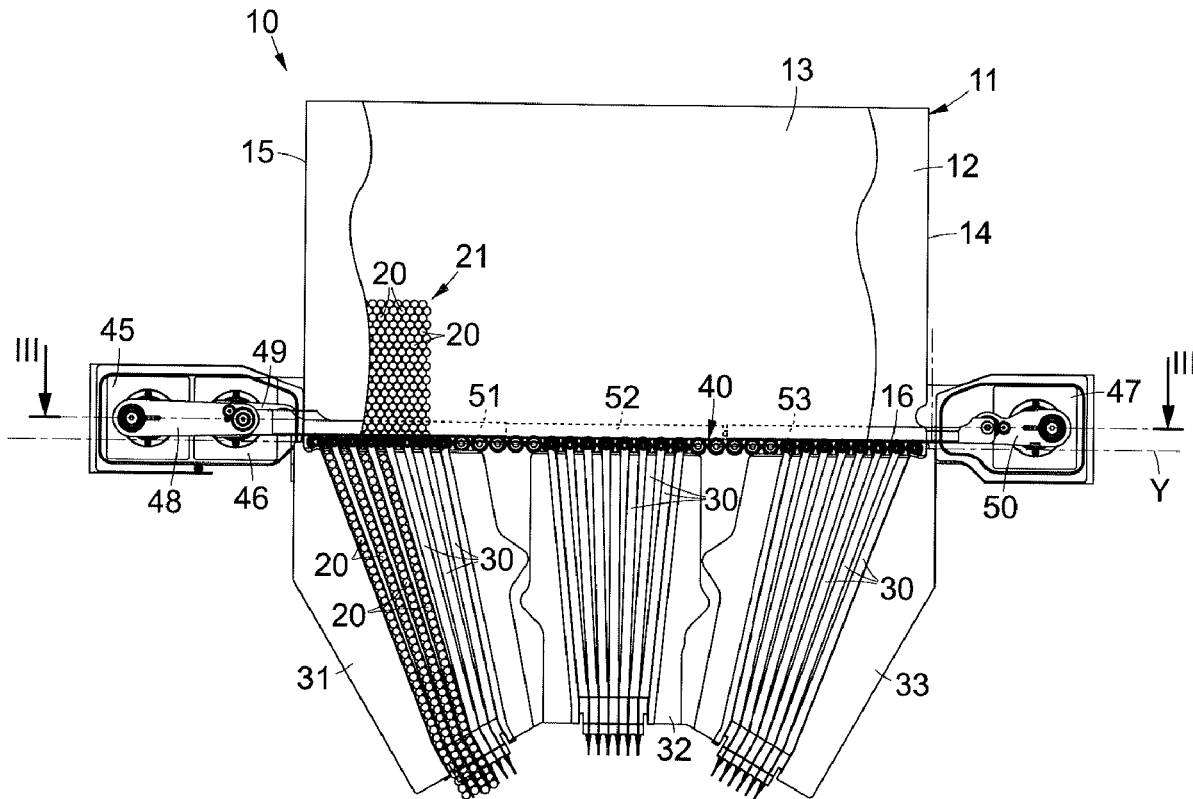
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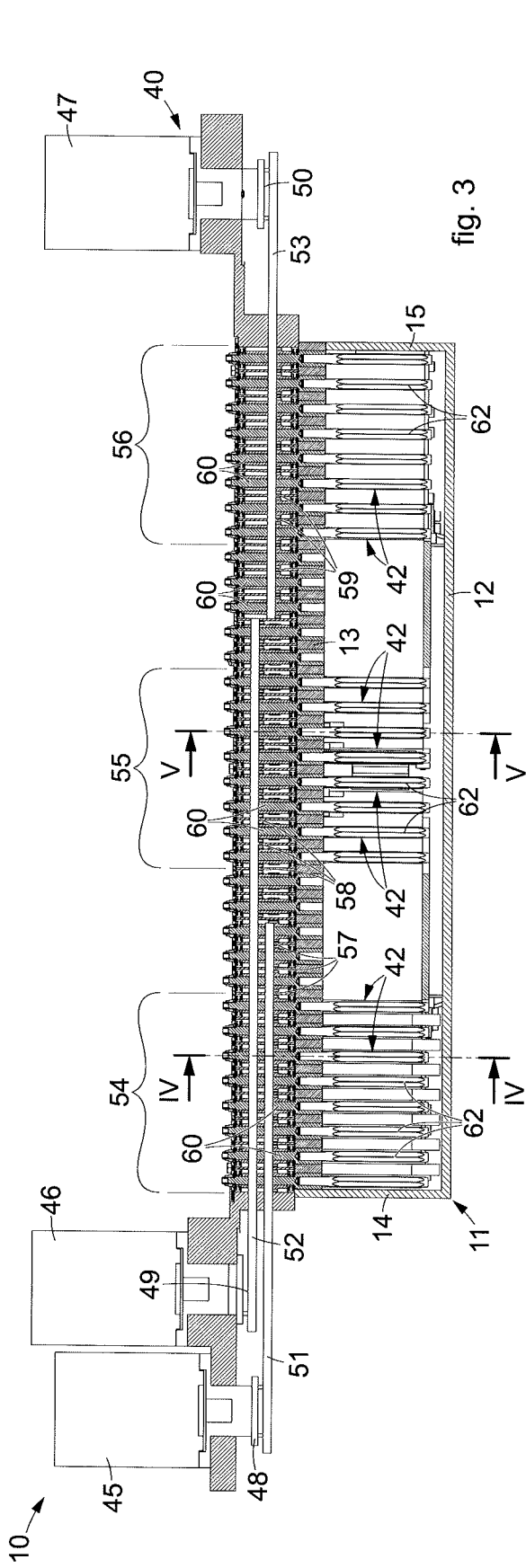


fig. 3

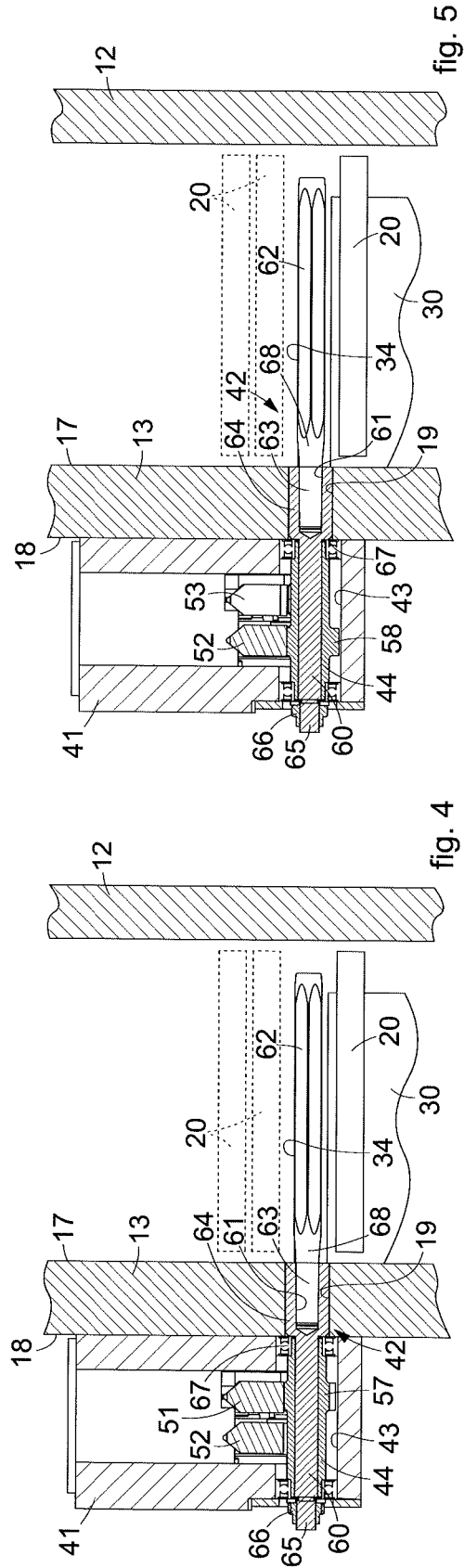


fig. 4

fig. 5

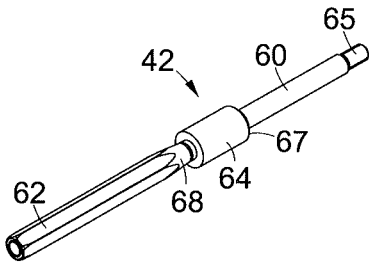


fig. 6

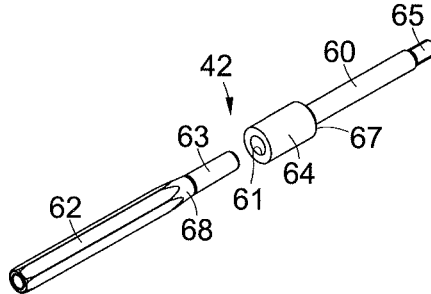


fig. 7

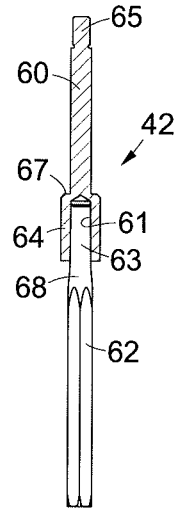


fig. 8

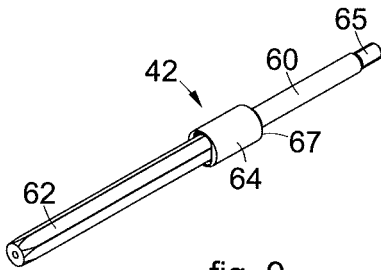


fig. 9

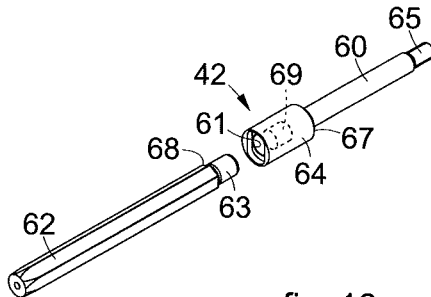


fig. 10

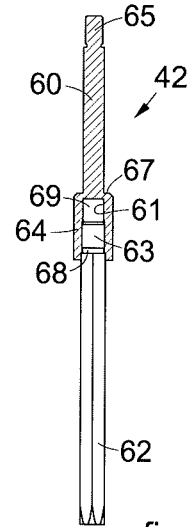


fig. 12

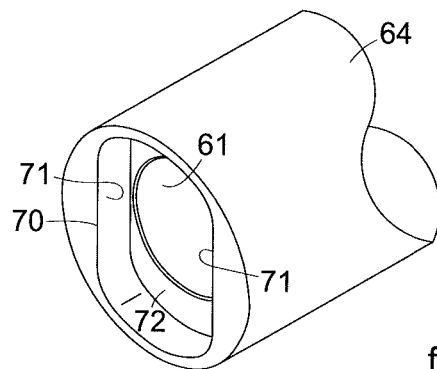


fig. 11

## APPARATUS AND METHOD FOR FEEDING AND FORMING ORGANIZED GROUPS OF SMOKING ARTICLES

### FIELD OF THE INVENTION

[0001] The present invention concerns an apparatus and a method for feeding and forming organized groups of smoking articles, such as for example cigarettes, cigars, cigarillos or suchlike, for making packets of smoking articles.

### BACKGROUND OF THE INVENTION

[0002] Feeding apparatuses are known, for feeding smoking articles and for forming organized groups with them, to be transferred to one or more packing machines.

[0003] Known feeding apparatuses comprise a compartment to contain the articles, usually configured as a hopper, which defines an upper chamber into which the smoking articles can be inserted and then subdivided into organized groups, to then be packaged. The hopper is provided with at least one lower aperture, in communication with a plurality of channels for conveying the articles. Between the lower aperture of the hopper and the plurality of conveying channels a conveying device is disposed, comprising a support structure on which a plurality of conveying members with an elongated shape are mounted, parallel to each other and positioned in correspondence with the upper aperture of the conveying channels.

[0004] The conveying members are configured as a plurality of rods which are oriented parallel to the smoking articles which are present in the upper chamber. The rods are able to rotate alternately in opposite directions, each around its own longitudinal axis, in order to facilitate the conveying of the smoking articles toward the conveying channels below. More specifically, the conveying rods are mounted two by two in proximity to the entrances of the respective channels, on both sides of the upper aperture thereof, so as to convey the smoking articles one by one toward the channels below.

[0005] For this purpose, the conveying members have a sector intended to interfere with the smoking articles, with an elongated shape, typically with a hexagonal cross-section, which is made in a single piece with a cylindrical sector, inserted in the support structure of the conveying device, so as to rotate alternately in both directions around its longitudinal axis.

[0006] Some solutions known in the state of the art provide that, depending on the size of the smoking articles to be packaged, and the number of them in each packet to be made, it is possible to disassemble the rods in order to replace them with other rods of suitable size, or to remove them if the respective channel is not to be used.

[0007] Another solution known in the state of the art is described by the German document DE 69205797, which describes a solution in which each rod comprises at least one tapered end portion. During the rotation of the rod, the tapered end portion facilitates the advance of smoking articles that have accidentally been disposed crosswise, thus obstructing the descent of the other smoking articles toward the channel below.

[0008] One disadvantage of known apparatuses is that the operations to disassemble the rods are complicated, since it is necessary to access inside the apparatus in order to reach the rear ends and thus disassemble the rods from the support

structure on which they are mounted. The solution described by DE 69205797 is also affected by this disadvantage since the rods are all fixed, in correspondence with their rear end, to the drive device which makes them rotate.

[0009] This is a long and laborious operation, which entails a machine downtime of several hours, with a consequent decrease in productivity and an increase in fixed maintenance costs and re-setting of the apparatus.

[0010] Another disadvantage of known apparatuses is that the disassembly of the rods requires the intervention of a specialized technician, as well as the use of suitable tools. This can be particularly problematic if the specialized technician is not available, which can lead to a prolongation of machine downtimes.

[0011] There is therefore a need to perfect an apparatus for feeding and forming organized groups of smoking articles that can overcome at least one of the disadvantages of the state of the art.

[0012] In order to do this, it is necessary to solve the technical problem of simplifying the disassembly and replacement of the conveying members.

[0013] In particular, one purpose of the present invention is to provide an apparatus and to perfect a method for feeding and forming organized groups of smoking articles in which the conveying members of the articles can be disassembled simply, reliably and quickly.

[0014] Another purpose of the present invention is to provide an apparatus and to perfect a method for feeding and forming organized groups of smoking articles in which the disassembly of the conveying members can be performed by even non-specialized personnel, without requiring special equipment or specific training.

[0015] 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

[0016] The present invention is set forth and characterized in the independent claims. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0017] In accordance with the above purposes and to resolve the above technical problem in a new and original way, also achieving considerable advantages compared to the state of the prior art, an apparatus for feeding and forming organized groups of smoking articles according to the present invention comprises a containing compartment configured to contain a plurality of smoking articles, one or more conveying channels disposed below the containing compartment and communicating therewith, and a conveying device comprising a support structure on which there are mounted two or more conveying members with an elongated shape, parallel to each other and configured to facilitate the descent of the smoking articles from the containing compartment toward the conveying channels.

[0018] In accordance with one aspect of the present invention, the conveying members each comprise both a first element rotatably mounted on the support structure so that it can rotate around its own longitudinal axis, and also a second element coupled to the first element so that it can rotate together with the latter.

[0019] By doing so, the first element, which is in fact mounted in the support structure, that is, the fixed part of the

apparatus, is mounted rotatable around its longitudinal axis, and the second element, which is configured to interact with the conveying channel, can in turn be coupled to the first element so that it is, in turn, rotatable around the same longitudinal axis, without being directly constrained to the support structure in any way whatsoever.

**[0020]** The coupling between the first and the second element is produced in such a way that it constrains the integral rotation of the first and of the second element around the longitudinal axis, in such a way that a rotational motion imparted to one of the two elements is also transferred to the other element.

**[0021]** In accordance with another aspect of the present invention, the first element comprises a first coupling end and the second element comprises a second coupling end, the first and second coupling ends being configured to produce a stable, mechanical type coupling between them, without the aid of auxiliary attachment means.

**[0022]** In this way, the coupling is both stable, in the sense that the two elements do not detach in an undesirable way, as well as rigid, in the sense that the rotation of one of the elements determines the rotation of the other element.

**[0023]** In this sense, the apparatus according to the present invention advantageously does not require any type of auxiliary attachment means whatsoever, where with this expression we mean additional suitable attachment means that differ from the first and second element.

**[0024]** Advantageously, in this way the stable coupling between the first and the second element is formed only by the respective first and second coupling ends, and it does not require additional auxiliary attachment means that differ from such ends.

**[0025]** In accordance with one aspect of the present invention, the first coupling end is provided with a seating and the second coupling end is configured to be inserted in the seating of the first element. Preferably, the seating comprises a blind hole and the second coupling end of the second element preferably has a member which can be inserted in the seating, thus configuring a male-female mechanical coupling.

**[0026]** The opposite can obviously be provided, that is, that the seating is provided on the second element and that the insertable member is provided in the first element.

**[0027]** In accordance with another aspect of the present invention, the coupling is of the morse cone type.

**[0028]** In accordance with another aspect of the present invention, the second coupling end has a length greater than, or equal to, the length of the seating of the first element.

**[0029]** In accordance with another aspect of the present invention, the first and second coupling ends are configured to produce a magnetic coupling between them. This allows to produce, in a simple way, a stable coupling in which the extractable element can be easily disassembled. The first coupling end comprises a magnetic member, which is preferably inserted in the seating. This magnetic member can be, for example, a magnet. The second coupling end preferably comprises an appendix configured to be inserted in the seating, and it is advantageously made of magnetic or ferromagnetic material so as to produce the magnetic coupling with the magnet.

**[0030]** Preferably, even if the magnetic coupling is provided, the first and second coupling ends are configured to

also produce a same-shape coupling. This ensures that the two coupled elements rotate together.

**[0031]** For example, it can be provided that the seating comprises a mouth for entry into the seating that has a section with a different shape from that of the seating itself. Conveniently, this inlet mouth is configured to produce the same-shape coupling with the second element. In particular, the inlet mouth can have a cross-section with at least one rectilinear segment, and the extractable element can also have a cross-section with at least one rectilinear segment. Advantageously, the inlet mouth has a section such as to engage with the cross-section of the second element, which is usually hexagonal.

**[0032]** According to some embodiments, both the first element and also the first coupling end substantially have a cylindrical shape, and the first coupling end has an external diameter larger than the remaining part of the first element. In particular, the first coupling end is configured as a cylinder coaxial to the longitudinal axis of the first element, in which the seating is created. Advantageously, the latter has an internal diameter substantially equal to, or slightly smaller than, the external diameter of the first element.

**[0033]** Such a configuration of the first coupling end allows to create a seating with sizes that guarantee a stable and safe coupling between the first and the second element. In addition, between the first coupling end and the remaining part of the first element there is an abutment surface which is transverse to the longitudinal axis. The abutment surface is preferably provided in correspondence with the variation in diameter between the first coupling end and the remaining part of the first element.

**[0034]** The transverse abutment surface can, for example, act as an end-of-travel during the insertion of the first element in the corresponding seating of the conveying device.

**[0035]** In accordance with another aspect of the present invention, the containing compartment comprises a rear wall in which a plurality of through holes is present, each hole being coaxial to a corresponding longitudinal axis of a first element. Each first coupling end is rotatably inserted in a respective through hole, while each corresponding second element protrudes within the containing compartment. Preferably, the first coupling end has an external diameter equal to the internal diameter of the through holes, in order to further stabilize the conveying member and keep it parallel to the other conveying members. In addition or alternatively, the first coupling end has a length equal to the length of the through hole, corresponding to the thickness of the rear wall of the containing compartment. In this way, only the second element of the conveying member protrudes from the front surface of the rear wall of the containing compartment in order to interfere with the smoking articles.

**[0036]** According to another aspect of the present invention, there is also provided a method for feeding and forming organized groups of smoking articles, comprising a first step in which an apparatus is made available which has a containing compartment configured to contain a plurality of the smoking articles as above, one or more conveying channels disposed below the containing compartment and communicating therewith, and a conveying device comprising a support structure on which there are mounted two or more conveying members with an elongated shape, parallel

to each other and configured to facilitate the descent of the smoking articles from the containing compartment toward the conveying channels.

**[0037]** The method comprises a second step in which it is provided that the conveying members are manufactured in such a way that each of them comprises both a first element rotatably mounted on the support structure so that it can rotate around its own longitudinal axis, and also a second element able to be selectively and removably coupled to the first element so that it can rotate together with the latter around the longitudinal axis and configured to interact with the smoking articles in order to convey them toward the one or more conveying channels.

**[0038]** The method provides to produce a stable, mechanical type coupling, without the aid of auxiliary attachment means, between a first coupling end of the first element and a second coupling end of the second element.

**[0039]** Preferably, the apparatus is of the type indicated above.

**[0040]** Advantageously, the method also comprises a third step in which the second element is extracted from the first element while the latter remains rotatably mounted on the support structure.

**[0041]** Obviously, this method implies that the conveying members are already mounted in the conveying device. After the extraction of the second element, it is possible to insert, in the insertion seating left empty, another second element, which for example can have different sizes and/or shape from the second element just extracted.

**[0042]** According to another aspect, it is provided to use a conveying member in an apparatus for feeding and forming organized groups of smoking articles, wherein the conveying member comprises both a first element configured to be rotatably mounted on the apparatus so as to rotate around its own longitudinal axis, and also a second element able to be selectively and removably coupled to the first element in order to rotate together with the latter around the longitudinal axis, and configured to interact with the smoking articles so as to facilitate their flow toward at least one containing compartment of the apparatus. In particular, the apparatus can be of the type described above.

#### DESCRIPTION OF THE DRAWINGS

**[0043]** These and other aspects, characteristics and advantages 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:

**[0044]** FIG. 1 is a schematic front view of an apparatus for feeding and forming organized groups of smoking articles according to the present invention;

**[0045]** FIG. 2 is an enlarged detail of FIG. 1;

**[0046]** FIG. 3 is a plan view, partly in section, of the apparatus of FIG. 1, taken along the plane with outline III-III of FIG. 1;

**[0047]** FIGS. 4 and 5 are cross-section views of a conveying device of the apparatus of FIG. 1, taken according to the planes with outline IV-IV and V-V, respectively, of FIG. 3;

**[0048]** FIGS. 6 and 7 are three-dimensional views, on an enlarged scale, of a conveying member according to a first embodiment, in an assembled and disassembled configuration, respectively;

**[0049]** FIG. 8 is a longitudinal section view of the conveying member of FIG. 6;

**[0050]** FIGS. 9 and 10 are three-dimensional views, on an enlarged scale, of a conveying member according to a second embodiment, in an assembled and disassembled configuration, respectively;

**[0051]** FIG. 11 is an enlarged detail of a detail of the rod of FIG. 10; and

**[0052]** FIG. 12 is a longitudinal section view of the conveying rod of FIG. 9.

**[0053]** We must clarify that in the present description the phraseology and terminology used have the sole function of better illustrating the present invention with reference to the attached drawings and must not be in any way used to limit the scope of the invention itself, or the field of protection defined by the attached claims.

**[0054]** 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 be conveniently combined or incorporated into other embodiments without further clarifications.

#### DESCRIPTION OF SOME EMBODIMENTS OF THE PRESENT INVENTION

**[0055]** With reference to FIG. 1, an apparatus 10 according to the present invention, for feeding and forming organized groups of smoking articles 20, such as cigarettes, cigars, cigarillos or similar products, for example, comprises a containing compartment, or feed hopper, 11 of a known type in which it is provided to accumulate, during use, a plurality of smoking articles 20 so that they are fed in an organized and orderly manner through a series of conveying channels 30 disposed in three compartments 31, 32, 33 located below the hopper 11 (FIG. 1). The three compartments 31, 32, 33 comprise a central compartment 32 and two lateral compartments 31 and 33.

**[0056]** The hopper 11 comprises a front wall 12, a rear wall 13, parallel to the front wall 12 and connected to it by means of two lateral walls 14, 15 (FIGS. 1 and 3). The front 12, rear 13 and lateral 14, 15 walls delimit a lower aperture 16 at their lower end, through which the smoking articles 20 can pass to be conveyed toward the channels 30 (FIGS. 1 and 2).

**[0057]** The rear wall defines a substantially vertical plane having a front surface 17, along which the smoking articles 20 are accumulated, and a rear surface 18 (4 and 5) external to the hopper 11.

**[0058]** The conveying channels 30 have a vertical, or substantially vertical, development and can be slightly inclined. Each conveying channel 30 comprises a respective inlet aperture 34 in the upper part, placed in communication with the hopper 11, in particular in proximity to its lower aperture 16, so that the smoking articles 20 can access the channels 30 immediately after having exited from the hopper 11. Alternatively, the inlet apertures 34 of the channels 30 can be disposed directly inside the hopper 11.

**[0059]** In any case, the disposition of the inlet apertures 34 is such that each channel 30 is put in communication with the hopper 11. Please note that all the inlet apertures 34 are aligned with each other along a horizontal axis parallel to a transverse direction Y, where the smoking articles 20 accumulate thanks to the force of gravity, creating a mass, or accumulation, 21 (FIG. 1).

[0060] The apparatus 10 also comprises a conveying device 40 comprising a rectilinear support 41 and a plurality of conveying members 42 (FIGS. 1 and 2) configured as rods, each having their own longitudinal axis X and inserted in as many seatings 43 created in the support 41, the seatings 43 being configured as through holes (FIGS. 3, 4 and 5). In each seating 43 there is housed rotatable a sleeve 44 integral with a corresponding conveying member 42. The seatings 43, and consequently also the longitudinal axes X, are uniformly distributed along the support 41 and are distanced from each other by a constant center distance  $\varnothing$  (FIG. 2).

[0061] The support 41 is disposed in correspondence with the rear surface 18 of the rear wall 13 of the hopper 11, and the conveying members 42 protrude from the front surface 17 of the hopper 11 (FIGS. 4 and 5), passing through corresponding through holes 19 created in the rear wall 13 of the hopper 11. The through holes 19 are disposed just above the inlet apertures 34 of the channels 30, so as to be aligned therewith, that is, oriented horizontally in the transverse direction Y. The number of conveying members 42 and the center distance  $\varnothing$  that separates them are such that each inlet aperture 34 is disposed between two adjacent conveying members 42 (FIG. 2).

[0062] In the example shown, the three compartments 31, 32 and 33 comprise a total of twenty-one channels 30 and twenty-four conveying members 42 are provided, each located in proximity to a respective side of an inlet aperture 34 (FIGS. 1 and 2). In particular, two conveying members 42 are disposed on the sides of each inlet aperture 34. Between two adjacent inlet apertures 34 there is a single conveying member 42, which can convey smoking articles 20 alternatively in both the channels 30 adjacent to it. In the example given here, the support 41 comprises a total of thirty-four seatings 43, ten of which are left empty.

[0063] In the example shown, the conveying members 42 are placed outside the hopper 11, immediately below the lower aperture 16 thereof (FIG. 2). However, it is possible to provide that the conveying members 42 are placed inside the hopper 11, that is, above the lower aperture 16. In this case, it is advantageous for the front wall 12 of the hopper 11 to be openable, or removable, in order to facilitate the disassembly of the conveying members 42, as will be explained in detail below.

[0064] The conveying device 40 also comprises three motors 45, 46, 47 located on the sides of the hopper 11, behind it, substantially at the height of the conveying members 42, and mounted on the support 41 (FIGS. 1 and 3). The shaft of each motor 45, 46 and 47 is connected, by means of a respective eccentric mechanism, or a connecting rod-crank mechanism, 48, 49 and 50, to a respective rack 51, 52 and 53. The conveying members 42 are divided into three groups 54, 55 and 56 (FIG. 3), each engaged with a respective rack 51, 52 and 53 by means of toothed wheels 57, 58 and 59, each integral with a respective sleeve 44 and coaxial with a corresponding longitudinal axis X. Each of the three groups 54, 55 and 56 comprises eight consecutive conveying members 42, disposed above a respective compartment 31, 32 and 33.

[0065] In accordance with the embodiment shown in figs. from 1 to 5, in the apparatus 10, a first motor 45 and a second motor 46 are disposed side by side on a first side of the hopper 11 (FIGS. 1 and 3) and drive a first rack 51 and a second rack 52, respectively. The two racks 51 and 52 are

parallel to the transverse direction Y (FIGS. 1, 4 and 5) and are meshed with the toothed wheels 57 and 58, respectively (FIGS. 3, 4 and 5).

[0066] The third motor 47 is instead disposed on the other side of the hopper 11 and drives, by means of the third connecting rod-crank mechanism 50, the third rack 53, which is meshed with the toothed wheels 59 (FIGS. 1 and 3) and is disposed in such a way as not to interfere with the second rack 52, which drives the second group 55 of conveying members 42.

[0067] In accordance with one aspect of the present invention, each conveying member 42 is made in two pieces, which can be reciprocally coupled. In particular, each conveying member 42 comprises a support rod 60 provided at one end thereof with a seating 61, and a shaped rod 62 equipped with a coupling end 63, configured to engage in the seating 61 in a stable but removable manner (figs. from 6 to 12). During use, that is, when a support rod 60 and a shaped rod 62 are coupled, they are coaxial and aligned along the longitudinal axis X (FIGS. 8 and 12). Each seating 61 is made in correspondence with a respective widened end 64, the external diameter of which is larger than the external diameter of the remaining portion of the support rod 60. The seating 61 is configured as a blind hole made in the widened end 64.

[0068] Each support rod 60, at the opposite end of the widened end 64, is provided with a thread 65 configured to be screwed into a respective nut 66, so as to prevent it from being displaced axially with respect to the support 41, while allowing it to rotate with respect to the latter (FIGS. 4 and 5).

[0069] Each shaped rod 62 has a substantially hexagonal cross-section; however, it is possible to provide other shapes for the cross-section of the shaped rod 62, for example circular or square, provided that they allow it to facilitate, by rotating alternately in opposite directions around its own longitudinal axis X, the individual flow of smoking articles 20 from the hopper 11 toward the channels 30. The hexagonal shape is advantageous because, during the rotation of the shaped rod 62, the edges that separate two adjacent faces accompany the smoking articles, facilitating their entry, one after the other, into the channels 30.

[0070] Each widened end 64, thanks to its external diameter being larger than the external diameter of the rest of the support rod 60, forms an abutment surface 67 perpendicular to the longitudinal axis X, which abuts against a corresponding end of the sleeve 44 in which the support rod 60 is inserted. This allows to keep the support rod 60 stably inserted and axially positioned in the support 41. In fact, any displacement in the longitudinal direction, that is, along the longitudinal axis X, is prevented by the abutment surface 67, which abuts against the sleeve 44 on one side and against the nut 66 on the other side.

[0071] Each widened end 64 is housed in a corresponding through hole 19 of the rear wall 13 of the hopper 11, and for this purpose it has a length equal to the thickness of the rear wall 13 itself, so as to be completely inserted therein (FIGS. 4 and 5).

[0072] From FIGS. 3, 4 and 5 it can be seen that, during use, only the shaped rods 62 are in contact with the smoking articles 20, therefore it is necessary for them to be able to rotate in such a way as to facilitate the descent of the smoking articles 20 from the hopper 11 to the channels 30, while the support rods 60 are completely outside the hopper



11. The shaped rods 62 and the support rods 60 are therefore rigidly coupled to each other, so that the rotary motion imparted to the support rods 60 by the racks 51, 52 and 53, driven by the motors 45, 46 and 47, is also transferred to the shaped rods 62.

[0073] figs. from 6 to 8 show a first embodiment of a conveying member 42, in which the coupling between the support rod 60 and the shaped rod 62 is a mechanical coupling with interference. In particular, the coupling end 63 of the shaped rod 62 and the widened end 64 of the support rod 60 are configured as a morse cone, with a reciprocally mating shape. The coupling end 63 of the shaped rod 62 is the male element of the morse cone; however, it is possible to provide that it is the widened end 64 of the support rod 60 to be such male element.

[0074] The male type coupling end 63 of each shaped rod 62 has a length greater than, or equal to, the blind hole 61. Furthermore, each shaped rod 62 comprises an intermediate part 68 for gradual connection between the coupling end 63 and the shaped section, which, during use, is positioned outside the blind hole 61 of the support rod 60 (FIGS. 4, 5, 6 and 8).

[0075] In this embodiment, the morse cone allows a coupling between each support rod 60 and the corresponding shaped rod 62 that is firm and stable in the axial direction, so that the support rods 60 and the shaped rods 62 do not detach, during use, due to the motion imparted by the motors 45, 46 and 47. At the same time, this also guarantees a rigid coupling in the rotational direction, that is, such that the rotation imparted to the support rods 60 is transmitted to the shaped rods 62.

[0076] In a second embodiment, shown in figs. from 9 to 12, the coupling between each support rod 60 and the corresponding shaped rod 62 is produced by means of magnetic means, configured as a magnet 69 for example, housed in the bottom of the blind hole 61 that defines the seating of the support rod 60. The coupling end 63 of each shaped rod 62 is therefore made of ferromagnetic material, so as to produce the coupling with the magnet 69.

[0077] The coupling by means of the magnet 69 is stable, because it allows to hold the corresponding shaped rod 62. However, to guarantee that each shaped rod 62 rotates together with the corresponding support rod 60, a same-shape coupling is also provided between each support rod 60 and the corresponding shaped rod 62.

[0078] In particular, in the example shown, the same-shape coupling is produced between the seating 60, which has a mouth 70 with an elongated shape, with two rectilinear walls 71 parallel to each other, and a corresponding shaped part of the shaped rod 62 (FIGS. 9, 10 and 11). More precisely, the distance between the two rectilinear surfaces 71 is equal to the distance that separates two opposite faces of the hexagonal shaped rod 62. In this way, the two rectilinear surfaces 71 can engage with two opposite faces of the shaped rod 62 in order to produce the same-shape coupling (FIG. 12).

[0079] Please note that, in this case, the coupling end 63 of the shaped rod 62 has a shorter length than that of the blind hole 61, so that the mouth 70 interferes directly with the shaped rod 62 itself.

[0080] In this case, the coupling end 63 has a smaller diameter than that of the shaped rod 62, which allows to

form an abutment 72 that abuts against the mouth 70, which in turn has a lateral extension larger than the blind hole 61 (FIG. 11).

[0081] The operation of the feeding apparatus 10 is completely similar to that of the apparatuses on which known conveying members, each consisting of a single piece, are mounted. It provides to start the motors 45, 46 and 47 which drive the racks 51, 52 and 53 in an alternating rectilinear motion, which causes the sleeves 44 to rotate in opposite directions, thanks to the toothed wheels 57, 58 and 59. This determines an alternating rotation of the conveying members 42 that interact with the smoking articles 20 with which they are in contact, allowing to regulate their flow through the inlet apertures 34 of the channels 30 (FIG. 2).

[0082] Unlike the apparatuses of the state of the art, with the apparatus 10 according to the present invention, if it is necessary to change the part of the conveying members 42, for example in order to change their diameter, the transverse size, or the format, or simply in order to remove them completely, it is sufficient to extract the relative shaped rod 62 from the corresponding support rod 60, and possibly insert a new shaped rod 62 in the seating 61 of the latter.

[0083] The change in number and/or format of the conveying members 42 is usually necessary when changing the diameter and/or the length of the smoking articles 20 to be fed, or their number in each packet to be packaged downstream of the apparatus 10. In fact, if the diameter of the shaped rods 62 is changed, only the reciprocal distance between two adjacent shaped rods 62 changes for the passage of the smoking articles 20, while the center distance  $\varnothing$  between two adjacent conveying members 42 remains unchanged.

[0084] It is evident that the operations to disassemble the conveying members are considerably facilitated, because it is not necessary to disassemble the support rod 60 from the support 41, which prevents having to access the inside of the apparatus 10 in order to disassemble the corresponding nut 66. It is in fact sufficient to extract the shaped rod 62 from its support rod 60, in a way that is simple and accessible to anyone.

[0085] In the example shown, since the conveying members 42 are located outside the hopper 11, they are not covered by the front wall 12 and the shaped rods 62 can be easily removed. If the conveying members 42 are instead covered by the front wall 12 of the hopper 11, it is necessary to open or remove the front wall 12 before being able to extract the shaped rods 62.

[0086] It follows that the operations to disassemble and/or replace a part of the conveying members 42 no longer require the intervention of a specialized technician, which allows to facilitate and streamline the management of operations and personnel assigned to the apparatus 10, nor do they require the use of special tools, but only tools commonly available in the spaces where such apparatuses 10 are installed.

[0087] It is clear that modifications and/or additions of parts and/or steps may be made to the apparatus 10 and to the corresponding method for feeding and forming organized groups of smoking articles as described heretofore, without departing from the field and scope of the present invention, as defined by the claims.

[0088] 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 apparatuses and methods for feeding and forming organized groups of smoking articles, having the characteristics as set forth in the claims and hence all coming within the field of protection defined thereby.

**[0089]** In the following claims, the sole purpose of the references in brackets is to facilitate reading and they must not be considered as restrictive factors with regard to the field of protection defined by the same claims.

1. Apparatus for feeding and forming organized groups of smoking articles comprising a containing compartment configured to contain a plurality of said smoking articles, one or more conveying channels disposed below said containing compartment and communicating therewith, and a conveying device comprising a support structure on which there are mounted two or more conveying members with an elongated shape, parallel to each other and configured to facilitate the descent of said smoking articles from said containing compartment toward said conveying channels, wherein said conveying members each comprise both a first element rotatably mounted on said support structure to be rotatable around its own longitudinal axis, and also a second element coupled to said first element to be rotatable together with the latter, wherein said first element comprises a first coupling end and said second element comprises a second coupling end, said first and second coupling ends being configured to produce a stable, mechanical type coupling between them, without the aid of auxiliary attachment means.

2. Apparatus as in claim 1, wherein said mechanical coupling is produced in such a way that it constrains the integral rotation of the first and of the second element around the longitudinal axis.

3. Apparatus as in claim 1, wherein said mechanical coupling is of the morse cone type.

4. Apparatus as in claim 1, that wherein said first and second coupling ends are configured to produce a magnetic coupling between them.

5. Apparatus as in claim 1, wherein said first coupling end comprises a magnetic member and said second coupling end is made of magnetic or ferromagnetic material.

6. Apparatus as in claim 1, wherein said first coupling end comprises a seating and said second coupling end comprises an appendix configured to be inserted into said seating.

7. Apparatus as in claim 6, wherein said first coupling end comprises an inlet mouth for entry into the seating, with a cross-section different from that of said seating and configured to produce a same-shape coupling with said second element.

8. Apparatus as in claim 1, wherein both said first element and also said first coupling end substantially have a cylin-

dric shape, and in that said first coupling end has an external diameter greater than the remaining part of said first element, and in that between said first coupling end and the remaining part of said first element there is an abutment surface which is transverse with respect to said longitudinal axis.

9. Apparatus as in claim 1, wherein said containing compartment comprises a rear wall in which there is a plurality of through holes, each one coaxial to a corresponding longitudinal axis of a first element, and in that the coupling end of each first element of a conveying member is rotatably inserted in a respective one of said through holes, while each corresponding second element protrudes within said containing compartment.

10. Method for feeding and forming organized groups of smoking articles, comprising a first step in which an apparatus is made available, which has a containing compartment configured to contain a plurality of said smoking articles, one or more conveying channels disposed below said containing compartment and communicating therewith, and a conveying device comprising a support structure on which there are mounted two or more conveying members with an elongated shape, parallel to each other and configured to facilitate the descent of said smoking articles from said containing compartment toward said conveying channels, and a second step in which it is provided to manufacture said conveying members so that each of them comprises both a first element rotatably mounted on said support structure to be rotatable around its own longitudinal axis, and also a second element coupled to said first element to be rotatable together with the latter, said method being characterized in that it provides to produce a stable, mechanical type coupling, without the aid of auxiliary attachment means, between a first coupling end of said first element and a second coupling end of said second element.

11. Method as in claim 10, that wherein it also comprises a third step in which said second element is extracted from said first element while the latter remains rotatably mounted on said support structure.

12. Use of a conveying member in an apparatus for feeding and forming organized groups of smoking articles as in claim 1, wherein said conveying member comprises both a first element configured to be rotatably mounted on a support structure of said apparatus so as to rotate around its own longitudinal axis, and also a second element coupled to said first element in order to rotate together with the latter around the longitudinal axis, and configured to interact with the smoking articles, so as to facilitate their flow toward at least one containing compartment of said apparatus.

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