Apparatus and Method for Forming of Collations of Rod shaped articles

The invention relates to an apparatus for the forming of collations of rod shaped articles, in particular smoking articles. The invention further relates to a method of forming a collation of rod shaped articles and to a container comprising rod shaped articles, which have been formed into a collation by the inventive method.

Units for forming groups of rod shaped articles are known. For example, US-A-5,775,054 discloses an apparatus wherein three layers of cigarettes are fed subsequently from a hopper into pockets on a conveyor belt. EP 2 008 935 A1 discloses a packing machine for cigarettes, wherein only one type of smoking article can be packaged in one container.

It is known in the art that different types of rod shaped articles can be arranged in a predetermined arrangement of rod shaped articles, the so called "collation" of rod shaped articles. However, the arrangement of rod shaped articles is restricted to the provision of a whole different layer or column of rod shaped articles in the respective pockets, and the arrangement is in particular limited in that different smoking articles cannot be provided in the center of the collation of the smoking articles. EP 0 141 629 A1 discloses a packing machine, which enables to separately wrap two smoking article groups, which can then be packed together in one container. JP 2003-205909 A discloses a cigarette package encasing different kinds of cigarettes, wherein each of the columns in the package comprises only one kind of smoking articles, respectively.

~~It is an object~~ Embodiments of the invention ~~to~~ provide an apparatus and a method for the forming of collations of rod shaped articles, which provides an improved flexibility in building a collation of rod shaped articles comprising different types of rod shaped articles. A further object of the invention is to provide a machine produced container for housing rod shaped articles in a collation, wherein rod shaped articles of a first type are nested within rod shaped articles from a second, different type.

~~According to the invention, an apparatus for forming a predetermined collation of rod shaped articles, in particular smoking articles, is provided, comprising a feeder arrangement, a pocket, the pocket being adapted to house a predetermined number of rod shaped articles in the predetermined collation, wherein in the predetermined collation each rod shaped article has a predetermined position within the pocket. The apparatus further comprises a hopper with a plurality of hopper vanes, wherein each hopper vane is associated to one or a~~

~~plurality of predetermined positions in the pocket. The feeder arrangement comprises a first feeder being adapted to provide a first subgroup of rod shaped articles of a first type to a first subset of hopper vanes, the first subgroup of the rod shaped articles being a first part of the predetermined collation, a second feeder being adapted to provide a second subgroup of rod shaped articles of a second type to a second subset of hopper vanes, the second subgroup of the rod shaped articles being a second part of the predetermined collation, and a third feeder being adapted to provide a third subgroup of rod shaped articles of a third type to a third subset of hopper vanes, the third subgroup of the rod shaped articles being a third part of the predetermined collation. According to the invention, the second feeder is arranged in between the first feeder and the third feeder, and at least the first type and the third type of rod shaped articles is different from the second type of rod shaped articles.~~

According to a first aspect of the present invention, there is provided an apparatus for forming a predetermined collation of rod shaped articles, in particular smoking articles, comprising a feeder arrangement, a pocket, the pocket being adapted to house a predetermined number of rod shaped articles in the predetermined collation, wherein in the predetermined collation each rod shaped article has a predetermined position within the pocket, a hopper with a plurality of hopper vanes, wherein each hopper vane is at least associated to one predetermined position in the pocket, wherein the feeder arrangement comprises: - a first feeder being adapted to provide a first subgroup of rod shaped articles of a first type to a first subset of hopper vanes, the first subgroup of the rod shaped articles being a first part of the predetermined collation, a second feeder being adapted to provide a second subgroup of rod shaped articles of a second type to a second subset of hopper vanes, the second subgroup of the rod shaped articles being a second part of the predetermined collation, a third feeder being adapted to provide a third subgroup of rod shaped articles of a third type to a third subset of hopper vanes, the third subgroup of the rod shaped articles being a third part of the predetermined collation, wherein the second feeder is arranged in between the first feeder and the third feeder, and wherein at least the first type of rod shaped articles is different from the second type of rod shaped articles and wherein at least the second type of rod shaped articles is different from the third type of rod shaped articles.

It will be appreciated that through an appropriate choice of the dimensions of the pocket, the pocket may house different total numbers of rod shaped articles or different arrangements of rod shaped articles, referenced hereafter with the term “collation”. For example, the pocket may house a total of between ten and thirty rod shaped articles. The rod

shaped articles may be arranged in different collations, depending on the total number of rod shaped articles. For example, the rod shaped articles may be arranged in a single layer of six, seven, eight, nine or ten. Alternatively, the rod shaped articles may be arranged in two or more layers. The two or more layers may contain the same number of rod shaped articles. For example, the rod shaped articles may be arranged in two layers of five, six, seven, eight, nine or ten, three layers of five or seven, or four layers of four, five or six. Alternatively, the two or more layers may include at least two layers containing different numbers of rod shaped articles to each other. For example, the rod shaped articles may be arranged in a layer of five and a layer of six (5-6); a layer of six and a layer of seven (6-7); a layer of seven and a layer of eight (7-8); a middle layer of five and two outer layers of six (6-5-6); a middle layer of five and two outer layers of seven (7-5-7); a middle layer of six and two outer layers of five (5-6-5); a middle layer of six and two outer layers of seven (7-6-7); a middle layer of seven and two outer layers of six (6-7-6); a middle layer of nine and two outer layers of eight (8-9-8); or a middle layer of six with one outer layer of five and one outer layer of seven (5-6-7).

The rod shaped articles may be smoking articles. However, other rod-shaped articles with similar size and dimensions are for example smoking accessories, such as flavor-reservoirs or elongate ash-trays that are arranged in substitution of one or several smoking articles in the collation. In particular, a smoking accessory may be arranged such that it occupies the space which would be usually allocated to one or several smoking articles in the collation.

In one embodiment of the invention, each hopper vane may be associated to one predetermined position in the pocket. Thus, any collation can be formed, as the type of each rod shaped article in the pocket can be determined individually.

In some embodiments ~~according to~~ of the invention, the apparatus allows providing three or more different types of rod shaped articles for a collation. However, in a preferred embodiment, the first type of rod shaped articles may be the same as the third type of rod shaped articles. In this case the first and third subset of vanes are preferably arranged in a distance to each other, in particular not adjacent to each other. This allows providing the second type of rod shaped articles in a position in the pocket which is between rod shaped articles of the first and third type. This allows to fill a collation with a first type of rod shaped articles, add a number of different rod shaped articles and then fill up the collation with the first type of rod shaped articles. This can have the effect that, by an adequate choice of the positions of the second type of rod shaped articles, to appear as if the second type of rod shaped articles are placed into the center of the collation. For example, it is thus possible in a collation of three layers, with a middle layer of six and two outer layers of seven (7-6-7), to fill the central two rod shaped articles with a second type of rod shaped articles, such that the collation becomes 7-(2-2-2)-7. Prior to the present invention, such a collation could only be manufactured by hand, but not on high speed machinery.

In some embodiments, a fourth feeder is provided, wherein the fourth feeder is adapted to provide a fourth subgroup of rod shaped articles of a fourth type to a further subset of hopper vanes. Also in this case, some types of the rod shaped articles may be equal, for example the first and the fourth type are equal, or the first and the third type are equal and the second and the fourth type are equal. This allows for additional flexibility in building different collations with different types of rod shaped articles.

In particular, the hopper vanes are hopper channels for guiding the rod shaped articles, which are preferably arranged in a single column and parallel to each other in the respective hopper vane. The hopper vanes of the first subset are different from the vanes of the second subset, and each subset comprises at least one hopper vane. Thus, by means of embodiments of the inventive apparatus different types of rod shaped articles can be provided in different layers of the pocket. The different types of rod shaped articles may relate to rod shaped smoking articles of different length, diameter, filter construction, brands and combinations thereof.

In particular, the predetermined collation comprises a predetermined number of collation layers and collation columns. The collation comprises at least three different parts, which are formed by the first, second and third subgroups of rod-shaped articles, respectively. Usually, the pocket has a substantially rectangular form with the different layers extending along the longer side of the rectangle, while the columns of rod shaped articles extend substantially along the shorter side of the rectangle. Usually, the longer side of the pocket extends substantially horizontal, while the shorter side of the pocket extends substantially vertical. When forming

groups for standard cigarette containers, usually the layers comprise 5 to 7 rod shaped articles in the form of cigarettes, while the columns comprise 3 rod shaped articles. Thus, the pockets allow in particular the provision of rod shaped articles to containers comprising 17 to 21 rod shaped articles.

In particular, it is possible that individual rod shaped articles are omitted from the respective columns or layers in the pocket, to determine the number of rod shaped articles which is formed as a collation in the pocket. Protrusions or place holders may be provided for this purpose. Furthermore, in particular the columns of rod shaped articles may not always be straight, but the rod shaped articles in each of the layers may be shifted in the extension direction of the layer with respect to the adjacent layer, which allows a tighter packing of the rod shaped articles. The rod shaped articles in one layer may be laterally offset to the position of the rod shaped article in an adjacent layer by the radius of a rod shaped article. Thus, the individual smoking articles forming a column are slightly offset with respect to each other in the lateral direction.

It is also possible to construct collations for non-rectangular pockets, like for example parallelepiped, trapezoid or triangular pockets.

In particular, the rod shaped articles are longitudinally extending smoking articles. The longitudinal extension of the smoking article is the main extension direction of the smoking article. In particular, the smoking article is cylindrical, with the longitudinal axis being its central axis. Where the rod shaped articles have a substantially cylindrical form, the nappe is preferably parallel to the longitudinal extension direction. In particular, the rod shaped articles are cigarettes, filter cigarettes, cigars, or components for smoking devices. Components for smoking devices may be longitudinally extending smoking material rods, which are inserted into a heating device, such as an electrical or carbonaceous heating device, and which are heated but not burned during consumption.

In the course of each transfer of rod shaped articles from the hopper vane to the pocket, each hopper vane provides preferably between one and three rod shaped articles to the pocket.

According to embodiments of the invention, separate transfer locations of hopper vanes provide the different layers of rod shaped articles in the collation. The transfer locations are preferably provided in different positions in the downstream direction of the movement of the pocket relative to the hopper vanes. The second layer is in particular on top of the first layer. The rod shaped articles provided in a transfer location of hopper vanes are in particular transferred at the same time to the pockets such that the different transfer locations of the hopper vanes provide the different layers of rod shaped articles in the pocket. According to a preferred embodiment the subsets of hopper vanes and the transfer locations of hopper vanes are different, such that

In particular, the hopper vanes extend substantially in the vertical direction, wherein each group of hopper vanes has outlets at their lower ends, which are arranged adjacent to each other at the same height. The hopper vanes may be slightly inclined with respect to each other, such that the distance in between the hopper vanes of each transfer location of hopper vanes is reduced toward their downstream end, such that the rod shaped articles which are transferred together from a transfer location to form a layer in the pocket are relatively close to each other. However, at the upstream end of the hopper vanes, all hopper vanes of each subset, or of all transfer locations are preferably substantially equidistant. This facilitates the feeding of the rod shaped articles from the feeder arrangement to the hopper vanes.

Preferably, the lower end of the hopper vanes of a transfer location is at the same level as the layer of rod shaped articles provided by this transfer location of hopper vanes into the pocket, wherein a pushing means is adapted to push the rod shaped articles into the pockets. The pushing movement is preferably substantially in the longitudinal direction of the rod shaped articles.

Preferably each hopper vane corresponds to a chute having a width slightly larger than the diameter of the respective type of rod shaped articles. Thus, in each hopper vane only one rod shaped article may be arranged at the same height, while several rod shaped articles are provided parallel and adjacent to each other in the extension direction of the hopper vane. Preferably, the depth of the hopper vane is slightly larger than the length of the rod shaped articles in the longitudinal direction. Thus, the rod shaped articles are provided in defined positions in the hopper vanes.

The maximum amount of hopper vanes preferably corresponds to the maximum amount of rod shaped articles provided in one pocket, as each hopper vane is preferably assigned to a specific position in the pocket.

The rod shaped articles may be transferred in one or several steps to the pocket.

~~According to the invention further a method for forming a collation of rod shaped articles, in particular smoking articles, in a pocket is provided, wherein in the predetermined collation each rod shaped article has a predetermined position in the pocket, comprising the following steps. A plurality of hopper vanes is provided, wherein each hopper vane is at least associated to one predetermined position in the pocket. A first subgroup of rod shaped articles of a first type is provided to a first subset of hopper vanes, a second subgroup of rod shaped articles of a second type is provided to a second subset of hopper vanes and a third subgroup of rod shaped articles of a third type is provided to a third subset of hopper vanes.~~

~~The rod-shaped articles are transferred from the first subset of hopper vanes, the second subset of hopper vanes and the third subset of hopper vanes into the pocket, such that each position in the predetermined collation is occupied by a rod-shaped article of a predetermined type. According to the invention, the second subset of hopper vanes is arranged in between the first subset of hopper vanes and the third subset of hopper vanes, and at least the first type of rod-shaped articles is different from the second type of rod-shaped articles and at least the second type of rod-shaped articles is different from the third type of rod-shaped articles.~~

According to a second aspect of the present invention, there is provide a method for forming a collation of rod shaped articles, in particular smoking articles, in a pocket, wherein in the predetermined collation each rod shaped article has a predetermined position in the pocket, comprising the steps of: Providing a plurality of hopper vanes, wherein each hopper vane is at least associated to one predetermined position in the pocket, providing a first subgroup of rod shaped articles of a first type to a first subset of hopper vanes, providing a second subgroup of rod shaped articles of a second type to a second subset of hopper vanes, providing a third subgroup of rod shaped articles of a third type to a third subset of hopper vanes, wherein the second subset of hopper vanes is arranged in between the first subset of hopper vanes and the third subset of hopper vanes, and transferring the rod shaped articles from the first subset of hopper vanes, the second subset of hopper vanes and the third subset of hopper vanes into the pocket, such that each position in the predetermined collation is occupied by a rod shaped article of a predetermined type, wherein at least the first type of rod shaped articles is different from the second type of rod shaped articles and wherein at least the second type of rod shaped articles is different from the third type of rod shaped articles.

~~The~~Embodiments of the invention further relates to a method for forming collations of longitudinally extending rod shaped articles, wherein initially at least two different types of rod shaped articles are fed through a hopper, wherein a first type of rod shaped articles is fed through a first subset of hopper vanes, and a second type of rod shaped articles is fed through a second subset of hopper vanes. At least a first and a second layer of rod shaped articles are subsequently transferred from the hopper vanes to a pocket, such that at least one layer in the pocket comprises the first type of rod shaped articles and the second type of rod shaped articles. Preferably, each hopper vane is at least associated to one predetermined position in the pocket.

A subset of rod shaped articles may comprise only one smoking article. In particular, each layer is provided by a different transfer location of hopper vanes. At least one transfer location of hopper vanes is not corresponding to a subset of hopper vanes.

In particular, the step of transferring the rod shaped articles comprises moving the pocket between transfer locations, wherein each transfer location is associated with a layer or column of rod shaped articles in the predetermined collation. Preferably, the method further comprises the step of conveying the pocket with respect to the hopper vanes, wherein the rod shaped articles from the hopper vanes are received in the pocket for each of the layers of rod shaped articles at different conveying positions of the pocket.

Preferably, the step of transferring the rod shaped articles comprises transferring rod shaped article of a first type into the pocket from the first and third subset of hopper vanes and transferring rod shaped article of a second type into the pocket from the second subset of hopper vanes, such that the rod shaped articles of a second type are arranged within at least one layer of the predetermined collation, such that rod shaped articles of the first type are arranged on both sides of the rod shaped articles from a second type within the layer. In this context being arranged on both sides in particular refers to a collation, wherein at least one rod shaped article of the second type is arranged in a column in the pocket, wherein rod shaped articles of the first type are arranged in the same layer but in other columns on both sides of the at least one rod shaped article of a second type.

In one embodiment, the method further comprises the step of providing the rod shaped articles comprised in the pocket to a container while maintaining their relative positions with respect to each other. Thus, the rod shaped articles are transferred from the pocket to a

container. The rod shaped articles may be wrapped in an inner liner before being transferred to the container or may be transferred into an inner liner forming an inner container.

Preferably, the method comprises a step of conveying the rod shaped articles in the vertical direction in the hopper vanes with their longitudinal axes being arranged substantially in the horizontal direction, and further conveying the rod shaped articles in their longitudinal direction from the hopper vanes to the pockets. Due to the conveying in the vertical direction in the hopper vanes, the rod shaped articles are conveyed by means of gravity or at least their conveying is supported by gravity.

Embodiments ~~The~~ of the invention further provide~~s~~ a container comprising rod shaped articles, which have been formed to a collation by the method or apparatus according to the above aspects of the invention, such that he container comprises at least two different types of rod shaped articles. The container comprises columns and rows with different types of rod shaped articles.

Each layer in the pocket preferably corresponds to one row of rod shaped articles in the container, wherein the row extends in the width direction of the container. In particular, three rows of rod shaped articles are provided in a container, each comprising preferably six or seven rod shaped articles. According to the teaching of the invention, individual rod shaped articles or groups of rod shaped articles of a different type may be provided in predefined locations in the individual rows. In particular, only one smoking article of a different type may be provided in the container, the container being otherwise filled with another type of rod shaped articles.

~~The~~ Embodiments of the present invention is~~are~~ also directed to the use of a feeding apparatus with three hoppers to fill a first type of rod-shaped articles and a second type of rod-shaped articles into a container, wherein, within the collation, the second type of articles are nested within the first type of rod shaped articles. A rod shaped article can be considered as "nested" in a collation, if rod shaped articles of one or several types are arranged on both sides of the at least one nested rod shaped article from another type within a layer in the collation. Further "nested" may refer to a configuration, wherein in a collation at least one nested rod shaped article is encompassed on both sides in the layer and column direction by rod shaped articles of another type.

The invention will now be further described with reference to exemplary embodiments as shown in the figures.

Figure 1 shows an embodiment of an apparatus according to the invention in a frontal cross section.

Figure 2 shows the embodiment of an apparatus according to the invention in a side cross section.

Figure 3 shows a feeder arrangement for an apparatus according to the invention in a frontal cross section.