



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
23.12.2020 Bulletin 2020/52

(51) Int Cl.:
B65D 85/10 (2006.01) B65B 19/10 (2006.01)

(21) Application number: **19181691.7**

(22) Date of filing: **21.06.2019**

(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:
KH MA MD TN

(72) Inventor: **FRANZEN, Jens**
54314 Hentern (DE)

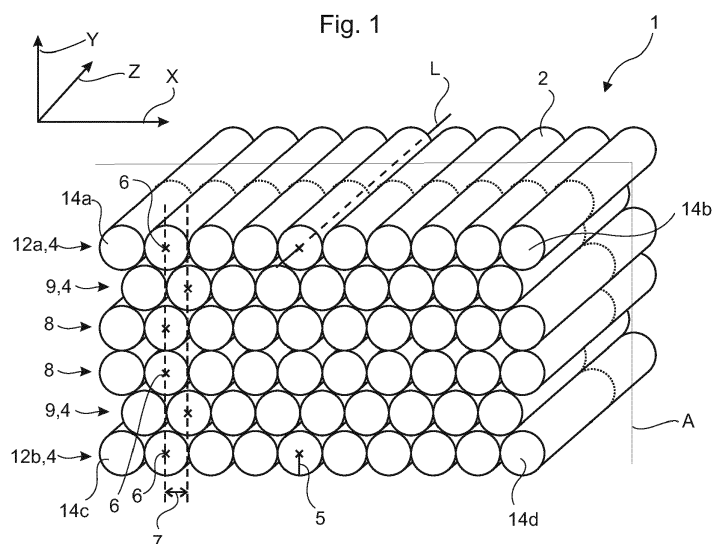
(74) Representative: **Hannke, Christian**
Hannke Bittner & Partner
Patent- und Rechtsanwälte mbB
Firmungstraße 4-6
56068 Koblenz (DE)

(71) Applicant: **JT International S.A.**
1202 Geneva (CH)

(54) **COLLATION OF CIGARETTES AND METHOD FOR PRODUCING A COLLATION OF CIGARETTES**

(57) The invention relates to a collation (1) of cigarettes (2) extending in a first, second and third spatial direction (X, Y, Z), which are all perpendicular to each other, wherein the collation (1) comprises a plurality of parallel cigarettes (2) all arranged with their longitudinal axis (L) parallel to the third spatial direction (Z), wherein the cigarettes (2) are arranged in at least six rows (4) each comprising a defined number m of cigarettes and the rows (4) extend in the first spatial direction (X) and are arranged above each other in the second spatial direction (Y) forming the collation (1) with a rectangular cross section (1a) in a sectional plane (A) spanned by

the first and second spatial direction (X, Y), wherein the centers (6) of the cigarettes (2) of each row (4) with regard to the sectional plane (A) are displaced in the first spatial direction (X) with respect to the centers (6) of the cigarettes (2) of the directly adjacent rows (4) in the second spatial direction (Y). The invention is characterized in that at least two adjacent rows (8) each comprising n cigarettes (2) are arranged with the centers (6) of their cigarettes (2) directly above the centers (6) of the cigarettes (2) of the other of the two adjacent rows (8) and in the second spatial direction (Y) the adjacent rows (8) are arranged between at least two other cigarette rows (4).



Description

[0001] The present invention relates to a collation of cigarettes extending in a first, second and third spatial direction, which are all perpendicular to each other, wherein the collation comprises a plurality of parallel cigarettes all arranged with their longitudinal axis parallel to the third spatial direction, wherein the cigarettes are arranged in at least six rows each comprising a defined number m of cigarettes and the rows extend in the first spatial direction and are arranged above each other in the second spatial direction forming the collation with a rectangular cross section in a sectional plane spanned by the first and second spatial direction, wherein the centers of the cigarettes of each row with regard to the sectional plane are displaced in the first spatial direction with respect to the centers of the cigarettes of the directly adjacent rows in the second spatial direction.

[0002] Cigarettes are mostly sold in packs. Often the pack comprises a cuboid shape having a rectangular cross-section perpendicular to its longest axis. This rectangular cross-section requires to arrange the cigarettes, which have a round cross-section in this plane, in a cigarette collation with a high packing efficiency, which has a rectangular cross-section matching the rectangular cross-section of the pack to securely store the cigarettes in the pack. To achieve this, the cigarettes are arranged in rows, which comprise an off-set in the direction of the extension of the row that essentially equals the radius of the cigarette in comparison to the preceding row. This arranges the cigarettes in a staggered manner (or in nested positions), which results in a very high packing efficiency and stable positioning of the cigarettes in the pack. However, for certain numbers of cigarettes it is difficult to arrange them in the previously described manner, as the cigarettes cannot be evenly divided into the rows.

[0003] Furthermore, the stability of such a cigarette collation is often dramatically reduced, when certain cigarettes are removed from the collation. This could either be the case when a reduced number of cigarettes have to be arranged in the pack during the packaging process, or when the consumer removes one cigarette after the other from the originally complete collation. With the reduced stability the cigarettes might skid in the pack and can get bended, damaged or even broken.

[0004] It is therefore the objective of the invention to provide a cigarette collation which overcomes the previously described disadvantages and is in particular stable, even when certain cigarettes are removed from the collation, and adjustable to various numbers of cigarettes. Furthermore, the collation should be easy to manufacture and the adjustment to various numbers of cigarettes should be possible in a fast, easy and cost-effective manner.

[0005] This is achieved by a collation of cigarettes extending in a first, second and third spatial direction, which are all perpendicular to each other, wherein the collation comprises a plurality of parallel cigarettes all arranged

with their longitudinal axis parallel to the third spatial direction, wherein the cigarettes are arranged in at least six rows each comprising a defined number m of cigarettes and the rows extend in the first spatial direction and are arranged above each other in the second spatial direction forming the collation with a rectangular cross section in a sectional plane spanned by the first and second spatial direction, wherein the centers of the cigarettes of each row with regard to the sectional plane are displaced in the first spatial direction with respect to the centers of the cigarettes of the directly adjacent rows in the second spatial direction. The invention is characterized in that at least two adjacent rows each comprising n cigarettes are arranged with the centers of their cigarettes directly above the centers of the cigarettes of the other of the two adjacent rows and in the second spatial direction the adjacent rows are arranged between at least two other cigarette rows.

[0006] This enables an especially stable cigarette collation. The two adjacent rows, which have no off-set to each other in the first spatial direction allow for a different number of cigarettes. The two adjacent rows are stabilized by at least one other cigarette row above and below the two adjacent rows. Also, this collation is symmetric with regard to the first and also second spatial direction while comprising an even number of rows. This enables a much better fit of the collation in the cuboid shape of the pack. The two adjacent rows also prohibit a glide of cigarettes along planes parallel to the third spatial direction, which have an angle of $\pm 30^\circ$ to the first or second spatial direction. This contributes to the superior stability of this cigarette collation.

[0007] This specific collation also has the advantage that it is stable even with less or removed cigarettes in the outmost rows. The collation retains the same height and/or width even when certain cigarettes are removed from the collation. If the two adjacent rows are not arranged between other rows, one of the two adjacent rows is the topmost or lowest row. If one cigarette is removed from this row, the other cigarettes of this row will move in the first spatial direction and subsequently in the second spatial direction into the nested or off-set position in comparison to the other of the two adjacent rows. This will slightly reduce the extent of the collation in the second spatial direction (the height of the collation) and make the collation looser in the pack, which is designed for a collation with two adjacent rows without any off-set in the first spatial direction. This problem is prevented by the collation according to the invention. This is highly advantageous, as with the stable collation, the cigarettes will not skid in the pack and any kind of damage to the cigarettes can be prevented. The collation according to the invention is especially suitable for larger than normal cigarette packs, in which more cigarettes are collated.

[0008] Preferably, the collation comprises 58 cigarettes. Preferably, the 58 cigarettes are distributed into six rows. Two of the six rows preferably comprise 9 cigarettes, while the other four rows preferably comprise 10

cigarettes. Preferably, the two adjacent rows each comprise 10 cigarettes.

[0009] According to another embodiment, four corner cigarettes of topmost and lowest row of the rows are arranged above and below the first and last cigarette of the two adjacent rows in the second spatial direction, wherein the topmost and lowest row are arranged with the centers of their cigarettes above the centers of the cigarettes of the two adjacent rows.

[0010] The four corner cigarettes are arranged in the corners of the rectangular cross section of the pack. These corner cigarettes are therefore enclosed by the pack from two sides of the inner side surface, wherein the inner side surface of the pack is the part of the inner surface, which is parallel to the third spatial direction. This stabilizes the position of the corner cigarettes. In other words, the corner cigarettes rest against the inner side surface of the pack in the first and second spatial direction. With the four corner cigarettes, each arranged in one of the four corners of the rectangular cross section of the pack, the whole cigarette collation is retained in the pack although not all outer cigarettes of the collation are necessarily in contact with inner side surface of the pack.

[0011] Also the corner cigarettes define the rectangular shape of the collation in the first and second spatial direction. When any kind of packaging material is folded around the collation, the corner cigarettes contribute to an easy folding process with a better and more reproducible outcome and better quality of the inner liner folding, as they define the folding corners. The corner cigarettes define the rectangular shape of the collation. Additionally, the corner cigarettes support the packaging material at the corners.

[0012] According to another embodiment, in the second spatial direction an equal number of rows comprising m cigarettes, wherein preferably $2 \leq m \leq n$ or $m = n-1$, is arranged above and below the adjacent rows each comprising n cigarettes.

[0013] This arrangement of rows stabilizes the two adjacent rows in the center of the collation with regard to the second spatial direction. This arrangement makes the cigarette collation more stable during the packaging process. For example, if the two adjacent rows were the two first or two last rows of the collation, one removed cigarette of the outer row of the two would lead to a destabilization of the other adjacent row. By stabilizing the two adjacent rows in the center of the collation, cigarettes may be removed from the topmost or lowest row without destabilization of any adjacent cigarettes or whole rows. This advantage also applies for the case, when a consumer removes one cigarette after another from the collation. As the consumer generally tends to remove the cigarettes on the outside of the collation first, an arrangement of the two adjacent rows in the center of the collation will prolong the stability during the subsequent removal of cigarettes by the consumer.

[0014] Preferably, the collation of cigarettes further

comprises at least one liner being wrapped in at least one circumferential direction around the plurality of cigarettes.

[0015] Preferably, the liner is wrapped around the collation in a way that at least the surface of the collation extending in the planes spanned by the first and third or second and third spatial direction is covered by the liner. Preferably, the liner is wrapped around the collation a way that also the surface of the collation extending in the plane spanned by the first and second spatial direction is at least in part covered by the liner. Especially preferably, the liner is wrapped around the collation a way that the whole surface of the collation is covered by the liner. Preferably, the liner consists of paper or coated paper. Preferably, the coating is a metal coating.

[0016] The liner enables the collation to be stable outside of any rigid enclosure. This is especially advantageous during the packaging process. During this process, the collation can be handled much easier, when wrapped in a liner. Without the need for any rigid enclosure, the collation can be moved much more freely in the packaging machinery. It also can be transferred much easier into a rigid or semi-rigid cigarette pack, in which the collation is finally packed. Also, the liner seals the cigarettes. Moisture loss of the cigarette tobacco may in this way be prevented.

[0017] According to another embodiment, with regard to the second spatial direction, the topmost and lowest rows of the collation comprise $2 < m < n$ cigarettes. Preferably, two cigarettes of the topmost row and two cigarettes of the lowest row are corner cigarettes.

[0018] With this variable choice of the number of cigarettes in the topmost and lowest row, the number of cigarettes in the collation can be varied without the need to alter the general functioning and stability of the collation. Also the same packaging material can be used. In this way, a very easy and cost effective way of adapting the cigarette number to specific preferences is provided.

[0019] According to another embodiment, the topmost and lowest row comprise the same number m of cigarettes. In this way an even number of cigarettes can be realized in the collation. Preferably, $m = n$. In this way the highest number of cigarettes can be arranged in the collation.

[0020] According to another embodiment, the topmost or lowest row comprise $m-1$ cigarettes, wherein the other of the two rows comprises m cigarettes. In this way an uneven number of cigarettes can be realized in the collation. In view of the previously described embodiment, which allows for an even number of cigarettes in the collation, the collation is very versatile regarding the number of cigarettes contained therein. Even and uneven numbers of cigarettes can be arranged in the collation without any drawbacks regarding the stability of the collation. Also the collation still retains its outer rectangular shape. Therefore, it still fits in the very same cuboid packaging even if certain cigarettes are omitted or removed.

[0021] According to another embodiment, the rows

each comprise n or $n-2$ cigarettes, wherein n is an even number and the cigarettes of the rows comprising $n-2$ cigarettes are positioned mirror inverted in the collation with regard to a mirror plane spanned by the second and third spatial direction, which extends through the center of the collation.

[0022] The collation according to this embodiment can be divided into two sub-collations along the mirror plane. The two sub-collations also comprise four corner cigarettes, which retain the smaller rectangular shape of the cross section along the first and second spatial direction. The two sub-collations can be individually wrapped each by an individual liner. The liner and/or an additional sealing layer may seal the sub-collations independently from each other from moisture loss. The individually sealed sub-collations are then arranged in a joint pack.

[0023] The moisture loss generally occurs after the sealing has been opened and a moisture exchange of the contained cigarettes with the outer surrounding is possible. This drying is unwanted because it deteriorates the quality of the cigarettes. This is especially a problem with larger cigarette packages. With the individually sealed sub-collations, the second sub-collation may be unsealed after the first sub-collation is emptied by the consumer. In this way, the freshness of the cigarettes in the second sub-collation is prolonged.

[0024] Parallel to the first spatial direction and between the two adjacent rows, the collation comprises a second mirror plane. In alternative to the previously described partitioning of the collation, the collation may also be divided into two sub-collations along this mirror plane. Preferably, the in this way generated sub-collations each comprise four corner cigarettes. Preferably, the collation can even be divided along both mirror planes. This creates four sub-collations. The four sub-collations preferably each comprise four corner cigarettes. Preferably, the four sub-collations are individually sealed. The four sub-collations are preferably arranged in a joint pack. In this way, the freshness of the cigarettes can be prolonged further. With the creation of sub-collations it is also possible to arrange every sub-collation in an individual pack. In this way two packaging sizes (e.g. large and small) can be manufactured without the need to modify the collation machine.

[0025] According to another embodiment, the total number of rows is lower than the number n of cigarettes in any of the adjacent rows. This ensures the desired rectangular cross-section of the collation in the first and second spatial direction, wherein the rows are arranged parallel to a front side of the cigarette pack.

[0026] Preferably, the collation comprises 52 to 58 cigarettes with $n = 10$ and $7 \leq m \leq n$. These numbers ensure especially good stability of the collation.

[0027] The problem is also solved by a pack of cigarettes comprising an outer rigid or semi-rigid packaging, which is characterized in that the pack further comprises the collation of cigarettes according to the preceding description. The collation remains stable in the pack even

after the consumer subsequently removed individual cigarettes. This prevents the cigarettes from skidding in the pack and prohibits any kind of bending or breakage of the cigarettes in the pack.

[0028] The objective is also reached by a method for producing a collation of cigarettes, which extends in a first, second and third spatial direction, which are all perpendicular to each other, wherein the collation comprises a plurality of parallel cigarettes which are arranged in a receiving pocket with their longitudinal axis parallel to the third spatial direction, wherein the cigarettes are arranged in multiple rows each comprising a predefined number of cigarettes and the rows extend in the first spatial direction and are arranged subsequently above each other in the second spatial direction forming the collation with a rectangular cross section in a sectional plane spanned by the first and second spatial direction, wherein the centers of the cigarettes of each row with regard to the sectional plane are displaced in the first spatial direction with respect to the centers of the cigarettes of the preceding rows in the second spatial direction. The method is characterized in that at least two adjacent rows are arranged directly above each other in the second spatial direction, wherein the centers of the cigarettes of the first adjacent row are arranged directly above the centers of the cigarettes of the second adjacent row and the adjacent rows are arranged between at least two other cigarette rows in the second spatial direction.

[0029] This arrangement realizes a collation with a large number of cigarettes, which is especially stable. The two adjacent rows are stabilized by at least one other cigarette row above and below the two adjacent rows.

[0030] According to another embodiment of this method, four corner cigarettes of topmost and lowest row of the rows are arranged above and below the first and last cigarette of the two adjacent rows in the second spatial direction, wherein the topmost and lowest row are arranged with the centers of their cigarettes directly above the centers of the cigarettes of the two adjacent rows.

[0031] The corner cigarettes define the rectangular cross section in the first and second spatial direction. This makes a subsequent packaging of the collation especially easy.

[0032] According to another embodiment of this method, the rows of cigarettes are placed in the receiving pocket in the following order:

- Placing a first row comprising m cigarettes, wherein $2 \leq m \leq n$, in the receiving pocket;
- Placing a second row comprising $n-1$ cigarettes in the receiving pocket on top of the first row;
- Placing at least two adjacent rows each comprising n cigarettes in the receiving pocket on top of the second row;
- Placing a third row comprising $n-1$ cigarettes in the receiving pocket on top of the adjacent rows;
- Placing a fourth row comprising m cigarettes, wherein $2 \leq m \leq n$, in the receiving pocket on top of the

third row;

[0033] The receiving pocket is part of a collating machine. The cigarettes, which are arranged horizontally with their longest axis, are feeded via vertical vanes onto a base plate. The base plate may comprise recesses for the individual cigarettes to ensure the correct positioning. The cigarettes are then horizontally transferred from the base plate into the receiving pocket.

[0034] The number of cigarettes in the collation can be easily changed by either blocking certain vanes, so that no cigarette is delivered by that vanes into the respective row. Also it is possible to instead modify the transfer machinery, which transfers the cigarettes from the base plate into the receiving pocket, so that certain cigarettes are not transferred into the receiving pocket.

[0035] In the previously described embodiment, the rows are individually assembled on the base plate and then subsequently transferred into the receiving pocket. In alternative to that, it is also possible to assemble all rows of the collation above each other on the base plate instead of the receiving pocket. In this case, all rows are simultaneously transferred into the receiving pocket after the collation is fully arranged on the base plate.

[0036] According to another embodiment of this method, after the assembly of the collation of cigarettes one or more cigarettes are removed from the first, second, third and/or fourth row. In this way, the number of cigarettes in the collation can be changed without the change of any parts of the collation machine.

[0037] According to another embodiment of this method, the corner cigarettes of the first and fourth row are left at their positions, wherein the corner cigarettes are arranged above and below the first and last cigarette of the adjacent rows in the second spatial direction. This embodiment is advantageously combined with the previously described embodiment, in which one or more cigarettes are removed from the first, second, third and/or fourth row. By leaving the corner cigarettes at their positions, the overall shape and stability of the collation is retained.

[0038] Preferably, the previous method comprises a step in which the collation of cigarettes is wrapped by a liner after the assembly of the collation of cigarettes. The wrapping of the collation with a liner simplifies the subsequent handling of the collation. With the liner, the collation is now stable outside of the receiving pocket or any other rigid container.

[0039] According to another embodiment of this method, the centermost cigarettes of the second and third row are removed after the assembly of the collation of cigarettes and the collation of cigarettes is then splitted into two sub collations along a splitting plane passing through the center of the collation of cigarettes and being parallel to the second and third spatial directions. Preferably, the two sub-collations are afterwards individually sealed to improve and prolong the freshness of the cigarettes. Afterwards, the two sub-collations are preferably arranged

in a joint pack. This method provides an easy way to arrange two individually stable sub-collation in one joint packaging.

[0040] As previously described, it is also possible to divide the collation along a second mirror plane parallel to the first spatial direction. This can be carried out instead or additionally to the partitioning along the first mirror plane. In this way, two differently shaped sub-collations or even four sub-collation can be generated. It is also possible to first divide the collation along the first mirror plane into two sub-collations and then further divide only one sub-collation along the second mirror plane, so that three sub-collations are formed. All sub-collations are preferably sealed individually. Preferably, the sub-collations are arranged together in a joint pack or individually in smaller packs.

[0041] Further advantages, objectives and features of the present invention will be described, by way of example only, in the following description with reference to the appended figures. In the figures, like components in different embodiments can exhibit the same reference symbols. The figures show:

Fig. 1 a perspective view of the collation 1;

Fig. 2 a front view of the collation 1;

Fig. 3a-b a front view of the collation 1 with two cigarettes 2 less (a) and five cigarettes 2 less (b);

Fig. 4 a font view of the collation 1 divided in sub-collations 1a-f;

Fig. 5a-b a perspective (a) and top view (b) of a pack 16;

Fig. 6 a front view of the collation 1 in a receiving pocket 20.

[0042] Figure 1 shows a perspective view of the collation 1. The cigarettes 2 have a longitudinal axis L, which is parallel to their longest extent. This longitudinal axis L extends in the third spatial direction Z. The cigarettes 2 are arranged parallel to each other with their respective longitudinal axes L. The cigarettes 2 are arranged in rows 4, 8, 12a, 12b, which extend in the first spatial direction X. The rows are positioned above each other in the second spatial direction Y. The collation 2 comprises a rectangular cross section in the section plane A, which is spanned by the first and second spatial direction X, Y. The collation 1 comprises two adjacent rows 8, which are positioned between other rows 4. The other rows 4 are arranged next to the adjacent rows 8 in the second spatial direction Y. In other words, the rows 4 are arranged above or below the adjacent rows 8. This makes the two outmost of the rows 4 the topmost and the lowest row 12a, 12b. The collation comprises 6 rows. The topmost, lowest and the adjacent rows 12a, 12b, 8 each comprise 10 ciga-

rettes 2. The two rows 4, which are arranged between the topmost or lowest rows 12a, 12b and the adjacent rows 8, each comprise 9 cigarettes.

[0043] The adjacent rows 8 are arranged without any off-set to each other in the first spatial direction X. The topmost and lowest rows 12a, 12b and the adjacent rows 8 are arranged without any off-set in the first spatial direction X to each other. This means, that the centers 6 of the cigarettes 2 in these rows 12a, 12b, 8 have no off-set in the first spatial direction X compared to the centers 6 of the corresponding cigarettes 2 in the other of these rows 12a, 12b, 8. The corresponding cigarettes 2 are the cigarettes 2, which are arranged in different rows 12a, 12b, 8 but at the same position with regard to the first spatial direction X. The intermediate rows 9, which are arranged directly above and below the adjacent rows 8, exhibit an off-set 7 in the first spatial direction X compared to the adjacent rows 8. The off-set 7 is of the length of the radius 5 of the cigarettes 2. In other words, the centers 6 of the cigarettes 2 of the intermediate rows 9 are displaced in the first spatial direction X by the length of the radius 5 of the cigarettes 2 compared to the centers 6 of the cigarettes 2 in the adjacent rows 8. The topmost and lowest row 12a, 12b exhibit an off-set 7 in the first spatial direction X compared to the intermediate rows 9. The off-set 7 equals the radius 5 of the cigarettes 2. The direction of the off-set 7 between the intermediate rows 9 and the topmost and lowest row 12a, 12b is opposite to the direction of the off-set 7 between the intermediate rows 9 and adjacent rows 8. This results in the described arrangement of adjacent rows 8 and topmost and lowest rows 12a, 12b without any off-set to each other in the first spatial direction.

[0044] The collation 1 comprises four corner cigarettes 14a-d. The corner cigarettes 14a-d are the first and last cigarettes 2 of the topmost and lowest rows 12a, 12b. The corner cigarettes 14a-d are located at the corners of the rectangular cross-section of the collation 1 in section plane A. The corner cigarettes 14a-d define the outer dimension of the rectangular cross-section of the collation 1.

[0045] Figure 2 depicts the same collation 1 as figure 1 but as a front view. The topmost, adjacent and lowest rows 12a, 8, 12b are positioned without any off-set in the first spatial direction X directly or indirectly below each other in the second spatial direction Y. This means, that the centers 6 of the corresponding cigarettes 2 of each of these rows 12a, 8, 12b are positioned on a line 7a. The line 7a is parallel to the second spatial direction Y. The intermediate rows 9 exhibit an off-set 7 compared to the topmost, adjacent and lowest rows 12a, 8, 12b. This off-set 7 is aligned parallel to the first spatial direction X. The centers 6 of the corresponding cigarettes 2 of the intermediate rows are positioned on a line 7b. The line 7b is parallel to the second spatial direction Y. The lines 7a and 7b are parallel to each other and distanced from each other by the off-set 7.

[0046] The corner cigarettes 14a-d of the topmost and

lowest row 12a, 12b are arranged above or below the corresponding cigarettes 2 of the adjacent rows 8. This means, that the corner cigarette 14a, which is arranged at the first position of the topmost row 12a, is arranged above the first cigarettes 8a of the adjacent rows 8. In particular, this means that the center 6 of this corner cigarette 14a is arranged above the centers 6 of the first cigarettes 8a of the adjacent rows 8 without any off-set in the first spatial direction X. Furthermore, the corner cigarette 14c, which is arranged at the first position of the lowest row 12b, is arranged below the first cigarettes 8a of the adjacent rows 8. In particular, this means that the center 6 of this corner cigarette 14c is arranged below the centers 6 of the first cigarettes 8a of the adjacent rows 8 without any off-set in the first spatial direction X. The centers 6 of the first corner cigarettes 14a, 14c of the topmost and lowest row 12a, 12b and the centers 6 of the first cigarettes 8a of the adjacent rows 8 are arranged on a line 13a, which is parallel to the second spatial direction Y.

[0047] Furthermore, the corner cigarette 14b, which is arranged at the last position of the topmost row 12a, is arranged above the last cigarettes 8b of the adjacent rows 8. In particular, this means that the center 6 of this corner cigarette 14b is arranged above the centers 6 of the last cigarettes 8b of the adjacent rows 8 without any off-set in the first spatial direction X. Furthermore, the corner cigarette 14d, which is arranged at the last position of the lowest row 12b, is arranged below the last cigarettes 8b of the adjacent rows 8. In particular, this means that the center 6 of this corner cigarette 14d is arranged below the centers 6 of the last cigarettes 8b of the adjacent rows 8 without any off-set in the first spatial direction X. The centers 6 of the last corner cigarettes 14b, 14d of the topmost and lowest row 12a, 12b and the centers 6 of the last cigarettes 8b of the adjacent rows 8 are arranged on a line 13b, which is parallel to the second spatial direction Y.

[0048] Figures 3a and 3b depict a collation 1 of cigarettes 2, in which certain cigarettes are omitted. Figure 3a depicts a collation 1 of cigarettes 2, in which two cigarettes are omitted. In the topmost row 12a one cigarette is omitted. The omitted cigarette leaves a first void 15a in the topmost row 12a. This void 15a does not destabilize the collation 1, as the remaining cigarettes 2 in the topmost row 12a are held in place securely due to their respective off-set 7 to the row 4 arranged directly next to the topmost row 12a in the second spatial direction Y. This means, that all remaining cigarettes 2 of the topmost row 12a are in a nested position in comparison to the row 4 arranged directly next to the topmost row 12a in the second spatial direction Y.

[0049] In the lowest row 12b also one cigarette 2 is omitted. This created a second void 15b. This void 15b also does not destabilize the collation 1 due to the reasons discussed above. The term first and second void 15a, 15b does not necessarily determine the order in which the voids 15a, 15b are created. It is also possible

to omit just one cigarette and either create the first or second void 15a, 15b.

[0050] The corner cigarettes 14a-d are never omitted, as they contribute to the stability of the collation 1. Every other cigarette 2 in the topmost and/or lowest row 12a, 12b with exception of the corner cigarettes 14a-d may be omitted and a corresponding void 15a, 15b created.

[0051] Figure 3b shows a collation 1, in which five cigarettes are omitted. In the topmost row 12a three cigarettes are omitted creating three voids 15a, 15c, 15d. In the lowest row 12b two cigarettes are omitted creating two voids 15b, 15e. The voids 15a-d are not directly adjacent to each other. At least one cigarette 2 in the respective row 12a, 12b is still positioned between the individual voids 15a-e. This is a generally preferred rule for the omitting of cigarettes 2 in the collation 1, as the stability is improved compared to a collation 1 in which voids 15 are created directly adjacent to each other.

[0052] Figure 4 depicts a collation 1 dividable into sub-collations 1a-h. The topmost, lowest and adjacent rows 12a, 12b, 8 each comprise the same even number of cigarettes n. Fig. 4 shows a collation with n = 10. As the intermediate rows 9 comprise n-1 cigarettes, the intermediate rows 9 comprise an uneven number of cigarettes. The centermost cigarette of the intermediate rows 9 is omitted, creating a void 9a, 9b in each of the intermediate rows 9. With the two voids 9a, 9b, the collation comprises a mirror plane M1 parallel to the second spatial direction Y, which extends through the center 19 of the collation 1. Furthermore, the mirror plane M1 does not intersect any cigarettes of the collation 1. As a result, the collation 1 can be parted along the mirror plane M1 into two sub-collations 1a, 1b. Each sub-collation 1a, 1b comprises four corner cigarettes 11a-d, 14a-d. The corner cigarettes 14a-d of the collation 1 are also corner cigarettes 14a-d of the sub-collations 1a,b. The additional corner cigarettes 11a-d are the cigarettes of the topmost and lowest row 12a, 12b directly adjacent to the mirror plane M1. This means, that the first sub-collation 1a comprises four corner cigarettes 14a, 11a, 14c, 11c. The second sub-collation 1b also comprises four corner cigarettes 11b, 14b, 11d, 14d. In this way, the sub-collations 1a,b exhibit the same stability advantages as the whole collation 1.

[0053] Furthermore, the collation may in alternative to the previous description or additionally be divided along a second mirror plane M2 into either four. The second mirror plane M2 is parallel to the first spatial direction X and extends through the center 19 of the collation 1. This means, that the second mirror plane M2 is located between the two adjacent rows 8. If the collation 1 is divided only along the second mirror plane M2, the centermost cigarettes of the intermediate rows 9 do not have to be omitted, as the second mirror plane M2 does not intersect any of the cigarettes 2 in the collation 1. The two sub-collations 1c, 1d each comprise four corner cigarettes 14a-d, 8a, 8b. The sub-collation 1c comprising the topmost row 12a comprises two of the corner cigarettes 14a,

14b of the whole collation 1 and two additional corner cigarettes 8a, 8b, which are the first and last cigarettes 8a, 8b of one of the adjacent row 8, which is closest to the topmost row 12a. The sub-collation 1d comprising the lowest row 12b comprises two of the corner cigarettes 14c, 14d of the whole collation 1 and two additional corner cigarettes 8a, 8b, which are the first and last cigarettes 8a, 8b of one of the adjacent row 8, which is closest to the lowest row 12b.

[0054] If the collation 1 is divided along both mirror planes M1, M2, four sub-collations 1e-h are formed. Each of the sub-collation 1e-h comprises four corner cigarettes 14a-d, 11a-d, 8a, 8b, 17a-d. The additional corner cigarettes in comparison to the partitioning only along one of the mirror planes M1, M2 are the four cigarettes 17a-d of the collation 1, which are closest to the center 19 of the collation 1. With the corner cigarettes 14a-d, 11a-d, 8a, 8b, 17a-d all sub-collations 1a-h are highly stable and can be easily packed individually. Furthermore, it is also possible to divide the collation 1 along one of the mirror planes M1, M2 and afterwards divide only one of the sub-collations 1a, 1b, 1c, 1d along the other mirror plane M1, M2. In this way it is possible to achieve three sub-collations, of which one is larger than the other two.

[0055] Figure 5a shows a perspective view and figure 5b a top view of a pack 16. The pack 16 comprises an outer rigid or semi-rigid packaging 18 and the collation 1 of cigarettes 2. The packaging 18 comprises a cuboid shape. The packaging 18 encloses the collation 1 of cigarettes 2. The packaging 18 comprises a top opening 18a, which is closable with a hingedly connected lid 18b. The collations 1 and its cigarettes 2 are accessible through the top opening 18a of the packaging 18.

[0056] Figure 5b shows the top view of the pack 16. The collation 1 is visible through the top opening 18a. The collation 1 is surrounded by a liner 10. The liner 10 is wrapped around the collation in the first and second spatial directions X, Y. For better visibility, the liner 10 is depicted with a slight distance to the packaging 18. Nevertheless, the packaging 18 may lie against the liner 10. This means that the outer surface 10a of the liner 10 is at least in part in contact with the inner surface of the packaging 18. The outer surface 10a is the surface of the liner 10, which is averted from the collation 1. In contrast to that, the inner surface 10b of the liner 10 is directed towards the collation 1 and is in contact with the cigarettes 2. This means, that the liner 10 and the packaging 18 enclose the collation 1 and the cigarettes 2 therein and maintain the cuboid shape of the collation 1.

[0057] Figure 6 shows a front view of the collation 1 in a receiving pocket 20. The receiving pocket 20 is part of the collating machine. The collating machine collated the collation 1 in the receiving pocket 20. The receiving pocket 20 is adapted to the outer dimension of the collation 1 in its extent in the first and second spatial direction X, Y. The receiving pocket 20 comprises an inner cavity 21 in which the collation 1 can be fitted. This means, that the inner dimensions of the inner cavity 21 correspond to the

outer dimensions of the collation 1. In particular are dimensions of the inner cavity 21 adapted to the number of rows 4, 8 and the maximum number n of cigarettes 2 per row 8, 4.

[0058] The receiving pocket 20 may comprise protrusions 22. The protrusions 22 are arranged at the inner surface 20a of the receiving pocket 20. The protrusions 22 are arranged at the inner surface 20a, which is parallel to the second spatial direction Y, at the beginning and end position of rows 4 comprising n-1 cigarettes 2. The protrusions 22 have an elongated shape running parallel to the third spatial direction Z. In the first spatial direction X the protrusions have an extent 23 corresponding to the off-set 7. Therefore, the protrusions 22 ensure the nested positioning of the rows 4 at which they are positioned.

[0059] The applicant reserves his right to claim all features disclosed in the application document as being an essential feature of the invention, as long as they are new, individually or in combination, in view of the prior art. Furthermore, it is noted that in the figures features are described, which can be advantageous individually. Someone skilled in the art will directly recognize that a specific feature being disclosed in a figure can be advantageous also without the adoption of further features from this figure. Furthermore, someone skilled in the art will recognize that advantages can evolve from a combination of diverse features being disclosed in one or various figures.

List of reference symbols

[0060]

1	collation
1a-h	sub-collations
2	cigarettes
4	rows
5	radius of a cigarette
6	center of a cigarette
7	off-set
7a	vertical line
7b	vertical line
8	adjacent rows
8a	first cigarettes
8b	last cigarettes
9	intermediate rows
9a,b	center void
10	liner
10a	outer surface
10b	inner surface
11a-d	corner cigarettes
12a	topmost row
12b	lowest row
13a	vertical line
13b	vertical line
14a-d	corner cigarettes
15a-e	void
16	pack

17a-d	corner cigarettes
18	packaging
18a	top opening
18b	lid
5 19	center
20	receiving pocket
21	inner cavity
22	protrusion
23	extent of the protrusion
10 X	first spatial direction
Y	second spatial direction
Z	third spatial direction
A	cross section
L	longitudinal axis
15 M1	mirror plane
M2	second mirror plane

Claims

- 20 1. A collation (1) of cigarettes (2) extending in a first, second and third spatial direction (X, Y, Z), which are all perpendicular to each other, wherein the collation (1) comprises a plurality of parallel cigarettes (2) all arranged with their longitudinal axis (L) parallel to the third spatial direction (Z), wherein the cigarettes (2) are arranged in at least six rows (4) each comprising a defined number m of cigarettes and the rows (4) extend in the first spatial direction (X) and are arranged above each other in the second spatial direction (Y) forming the collation (1) with a rectangular cross section (1a) in a sectional plane (A) spanned by the first and second spatial direction (X, Y), wherein the centers (6) of the cigarettes (2) of each row (4) with regard to the sectional plane (A) are displaced in the first spatial direction (X) with respect to the centers (6) of the cigarettes (2) of the directly adjacent rows (4) in the second spatial direction (Y),
- 25 30 35 40 **characterized in that** at least two adjacent rows (8) each comprising n cigarettes (2) are arranged with the centers (6) of their cigarettes (2) directly above the centers (6) of the cigarettes (2) of the other of the two adjacent rows (8) and in the second spatial direction (Y) the adjacent rows (8) are arranged between at least two other cigarette rows (4).
- 45 50 55 2. A collation (1) of cigarettes (2) according to claim 1, **characterized in that**, four corner cigarettes (14a-d) of topmost and lowest row (12a, 12b) of the rows (4) are arranged above and below the first and last cigarette (8a, 8b) of the two adjacent rows (8) in the second spatial direction (Y), wherein the topmost and lowest row (12a, 12b) are arranged with the centers (6) of their cigarettes (2) above the centers (6) of the cigarettes (2) of the two adjacent rows (8).

3. Collation (1) of cigarettes (2) according to claim 1 or 2,
characterized in that
 in the second spatial direction (Y) an equal number of rows (4, 12a, 12b) comprising m cigarettes (2), wherein $2 \leq m \leq n$ or $m = n-1$, is arranged above and below the adjacent rows (8) each comprising n cigarettes (2). 5
4. Collation (1) of cigarettes (2) according to at least one of the preceding claims,
characterized in that
 with regard to the second spatial direction (Y) the topmost and lowest rows (12a, 12b) of the collation (1) comprise $2 < m < n$ cigarettes (2). 10 15
5. Collation (1) of cigarettes (2) according to at least one of the preceding claims,
characterized in that
 the topmost and lowest row (12a, 12b) comprise the same number m of cigarettes (2). 20
6. Collation (1) of cigarettes (2) according to at least one of the preceding claims,
characterized in that
 the topmost or lowest row (12a, 12b) comprise m-1 cigarettes (2), wherein the other of the two rows (12a, 12b) comprises m cigarettes. 25
7. Collation (1) of cigarettes (2) according to at least one of the preceding claims,
characterized in that
 the rows (4, 8, 12a, 12b) each comprise n or n-2 cigarettes (2), wherein n is an even number and the cigarettes (2) of the rows (4, 12a, 12b) comprising n-2 cigarettes (2) are positioned mirror inverted in the collation (1) with regard to a mirror plane (M1) spanned by the second and third spatial direction (Y, Z), which extends through the center (19) of the collation (1). 30 35 40
8. Collation (1) of cigarettes (2) according to at least one of the preceding claims,
characterized in that
 the total number of rows (4, 8, 12a, 12b) is lower than the number n of cigarettes (2) in any of the adjacent rows (8). 45
9. A pack (16) of cigarettes comprising an outer rigid or semi-rigid packaging (18),
characterized in that
 the pack (16) further comprises the collation (1) of cigarettes (2) according to at least one of the claims 1-8. 50 55
10. Method for producing a collation (1) of cigarettes (2), which extends in a first, second and third spatial direction (X, Y, Z), which are all perpendicular to each

other, wherein the collation (1) comprises a plurality of parallel cigarettes (2) which are arranged in a receiving pocket (20) with their longitudinal axis (L) parallel to the third spatial direction (Z), wherein the cigarettes (2) are arranged in multiple rows (4) each comprising a predefined number of cigarettes (2) and the rows (4) extend in the first spatial direction (X) and are arranged subsequently above each other in the second spatial direction (Y) forming the collation (1) with a rectangular cross section (1a) in a sectional plane (A) spanned by the first and second spatial direction (X, Y), wherein the centers (6) of the cigarettes (2) of each row (4) with regard to the sectional plane (A) are displaced in the first spatial direction (X) with respect to the centers (6) of the cigarettes (2) of the preceding rows (4) in the second spatial direction (Y),

characterized in that

at least two adjacent rows (8) are arranged directly above each other in the second spatial direction (Y), wherein the centers (6) of the cigarettes (2) of the first adjacent row (8) are arranged directly above the centers (6) of the cigarettes (2) of the second adjacent row (8) and the adjacent rows (8) are arranged between at least two other cigarette rows (4) in the second spatial direction (Y).

11. Method according to claim 10

characterized in that

four corner cigarettes (14a-d) of topmost and lowest row (12a, 12b) of the rows (4) are arranged above and below the first and last cigarette (8a, 8b) of the two adjacent rows (8) in the second spatial direction (Y), wherein the topmost and lowest row (12a, 12b) are arranged with the centers (6) of their cigarettes (2) directly above the centers (6) of the cigarettes (2) of the two adjacent rows (8).

12. Method according to claim 10 or 11,

characterized in that

the rows of cigarettes (4, 8) are placed in the receiving pocket (20) in the following order:

- Placing a first row (4a) comprising m cigarettes (2), wherein $2 \leq m \leq n$, in the receiving pocket (20);
- Placing a second row (4b) comprising n-1 cigarettes (2) in the receiving pocket (20) on top of the first row (4a);
- Placing at least two adjacent rows (8) each comprising n cigarettes (2) in the receiving pocket (20) on top of the second row (4b);
- Placing a third row (4c) comprising n-1 cigarettes (2) in the receiving pocket (20) on top of the adjacent rows (8);
- Placing a fourth row (4d) comprising m cigarettes (2), wherein $2 \leq m \leq n$, in the receiving pocket (20) on top of the third row (4c);

13. Method according to at least one of the claims 10-12,
characterized in that
after the assembly of the collation (1) of cigarettes
(2) one or more cigarettes (2) are removed from the
first, second, third and/or fourth row (4a-d). 5
14. Method according to at least one of the claims 10-13,
characterized in that
the corner cigarettes (14a-d) of the first and fourth
row (4a, 4d) are left at their positions, wherein the 10
corner cigarettes (14a-d) are arranged above and
below the first and last cigarette (8a, 8b) of the ad-
jacent rows (8) in the second spatial direction (Y).
15. Method according to at least one of the claims 10-14, 15
characterized in that
the centermost cigarettes (5) of the second and third
row (4b, 4c) are removed after the assembly of the
collation (1) of cigarettes (2) and the collation (1) of
cigarettes (2) is then splitted into two sub collations 20
(1a, 1b) along a splitting plane (B) passing through
the center of the collation (1) of cigarettes (2) and
being parallel to the second and third spatial direc-
tions (Y, Z). 25
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Fig. 1

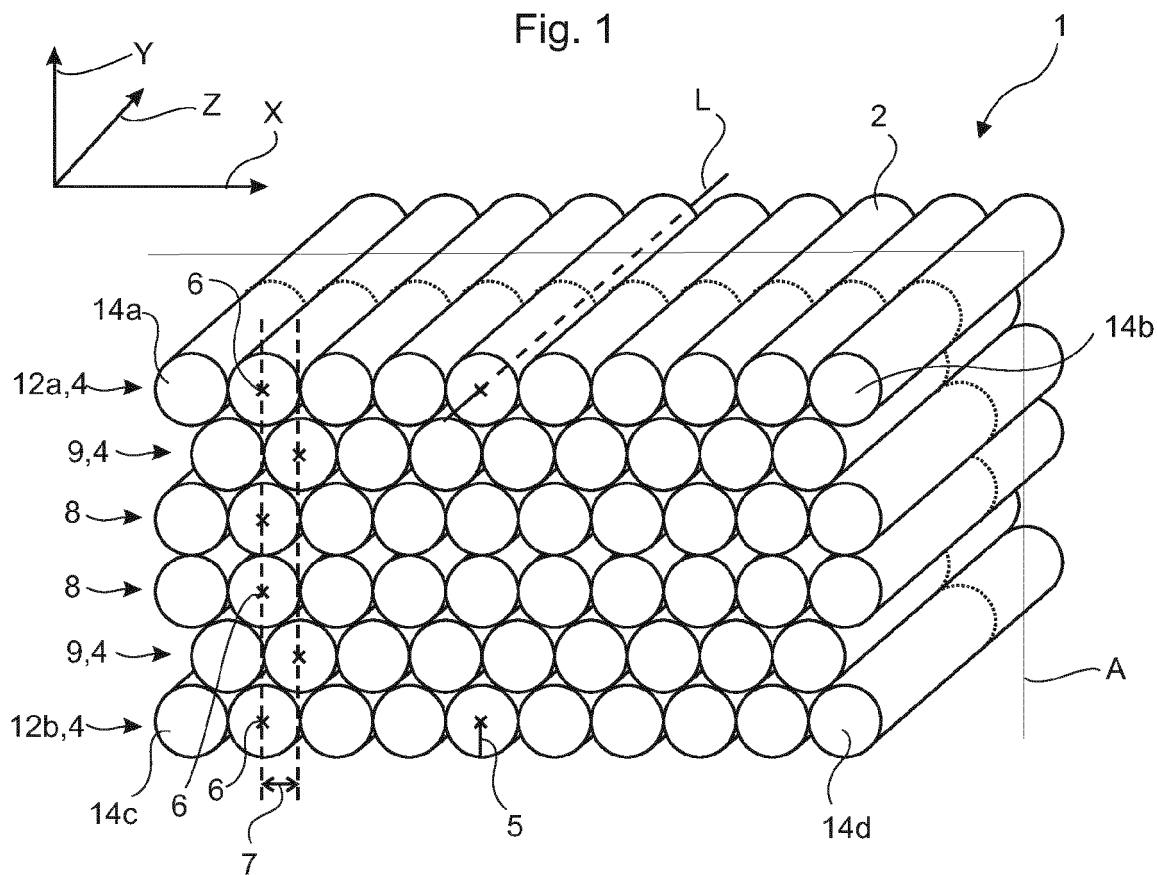


Fig. 2

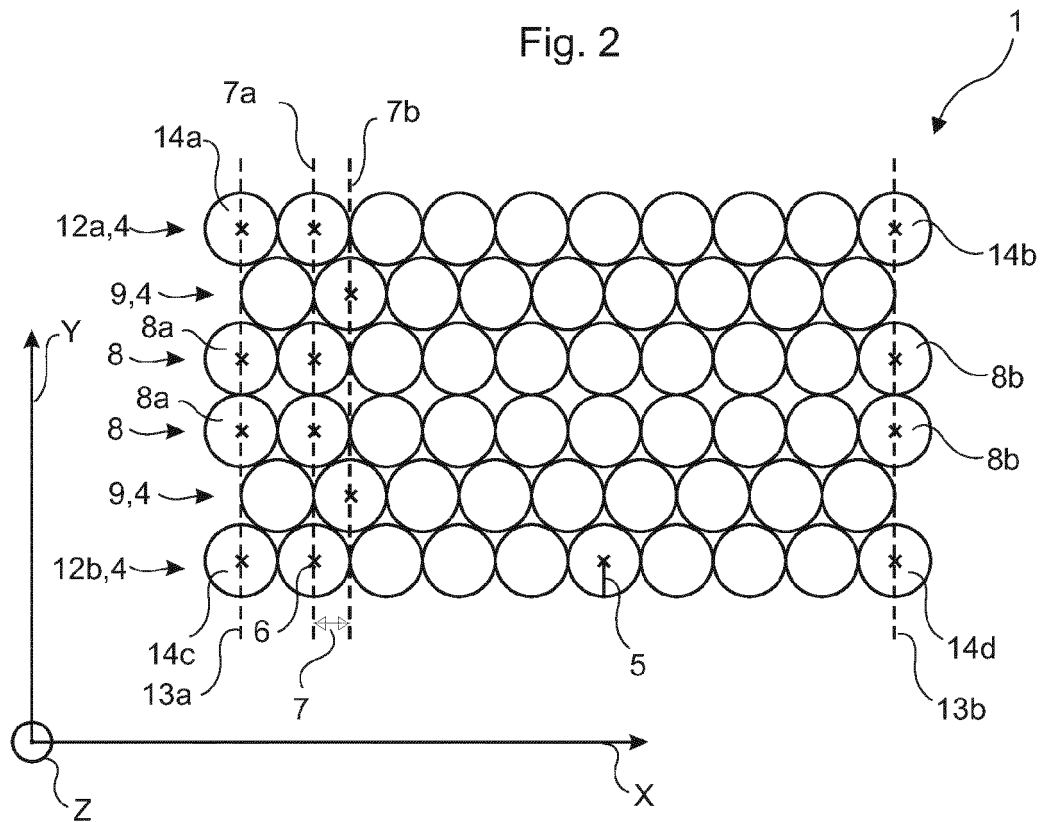


Fig. 3a

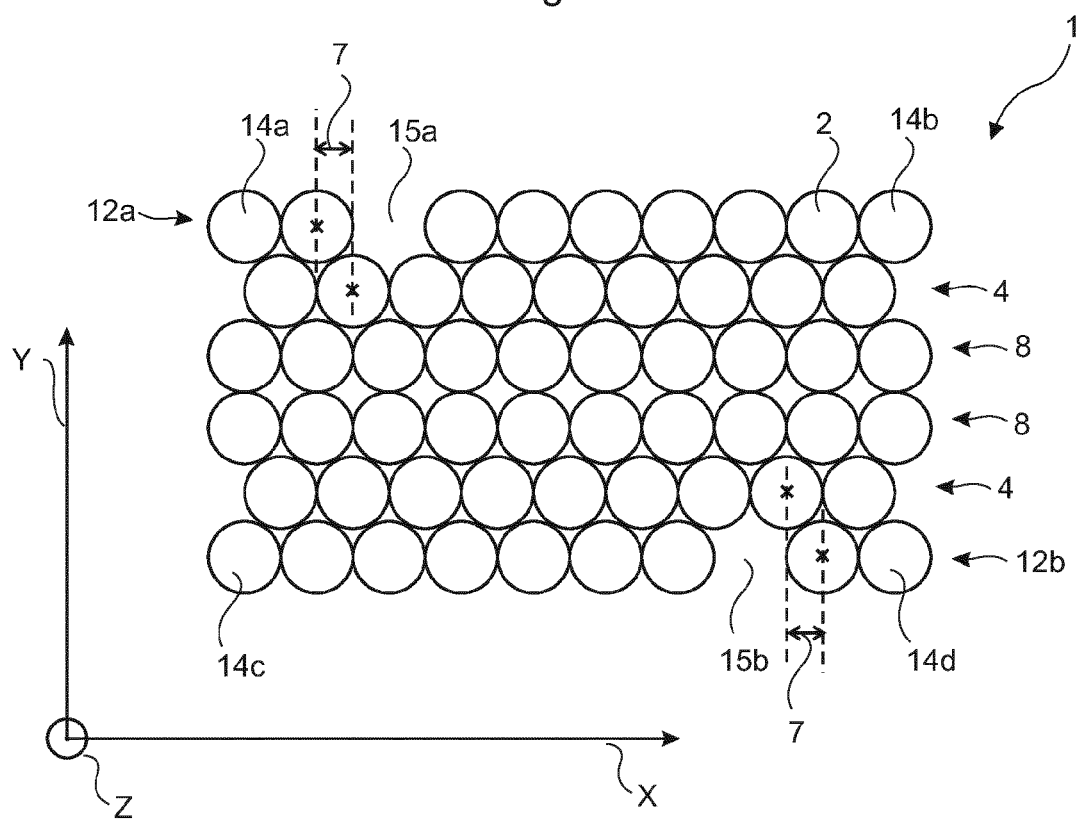


Fig. 3b

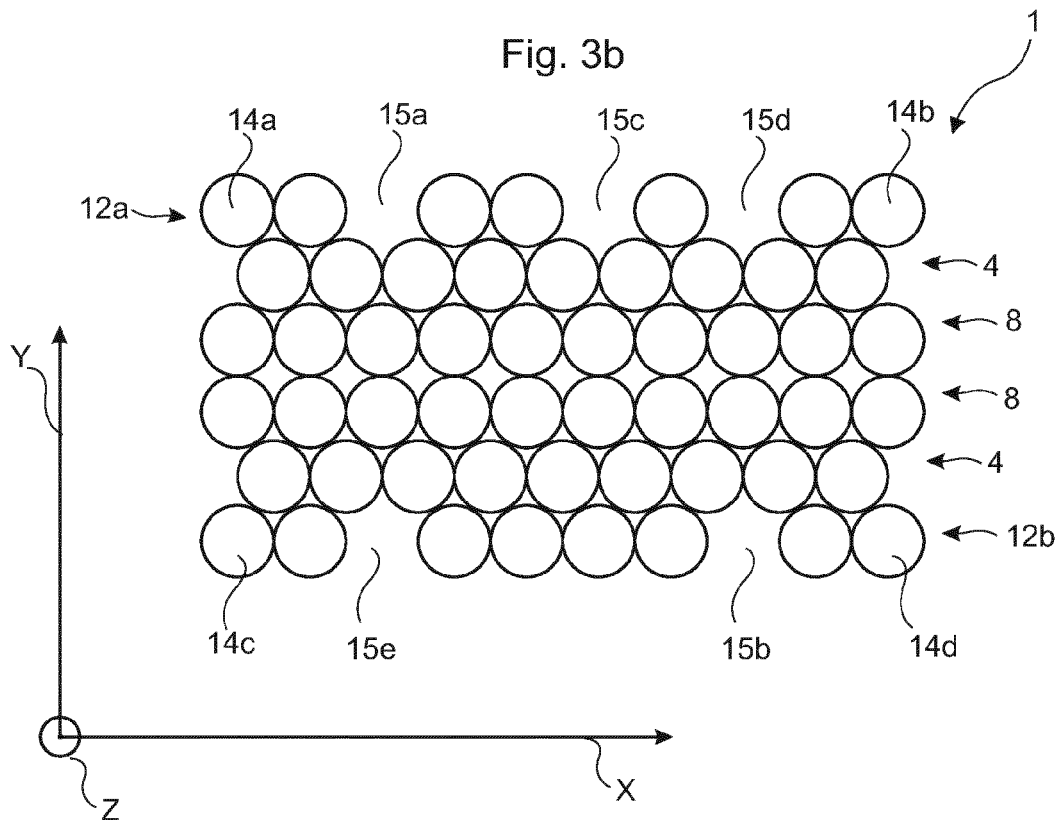


Fig. 4

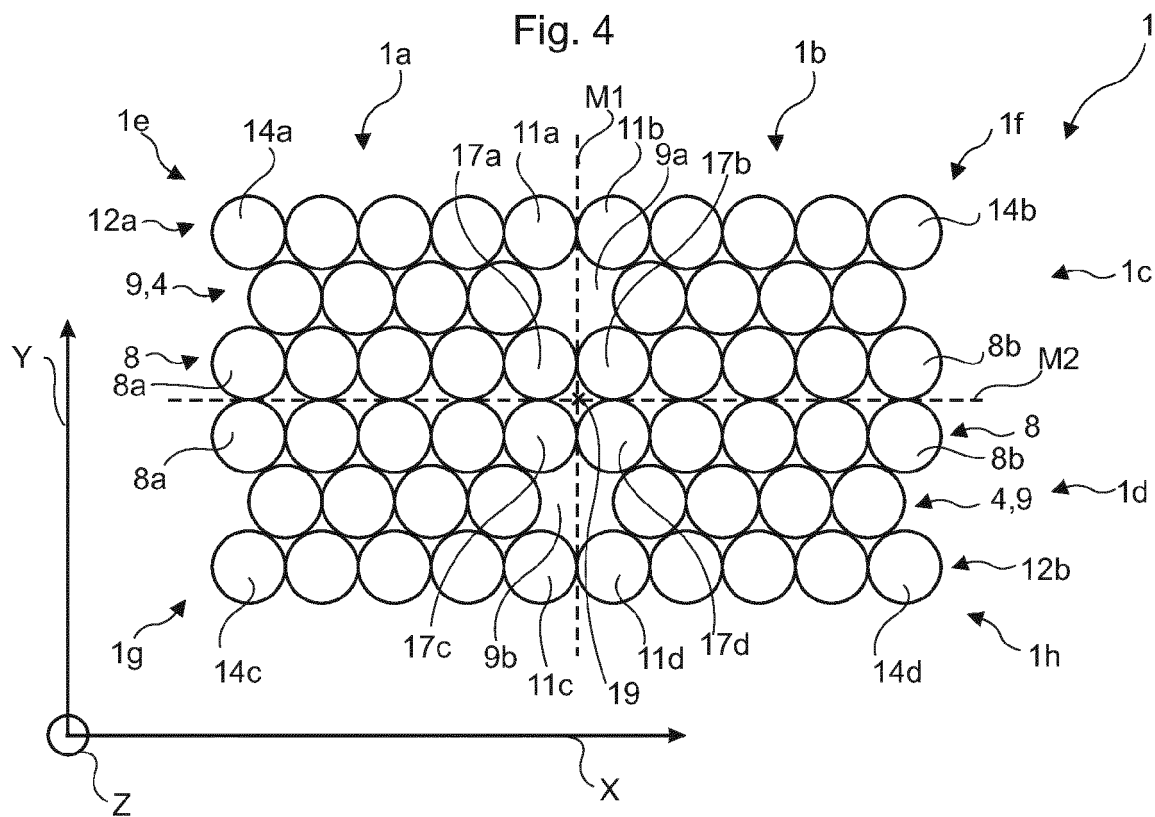


Fig. 5a

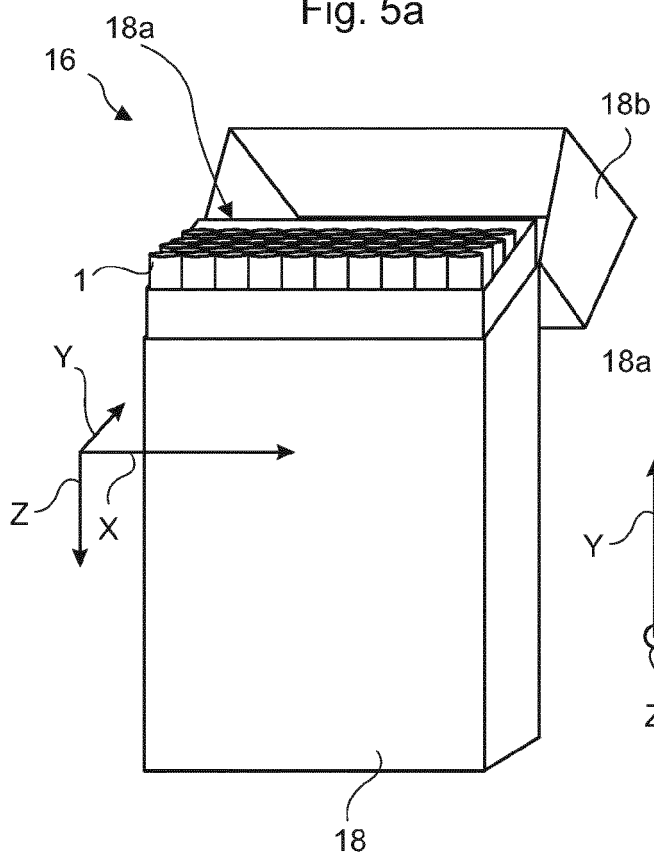


Fig. 5b

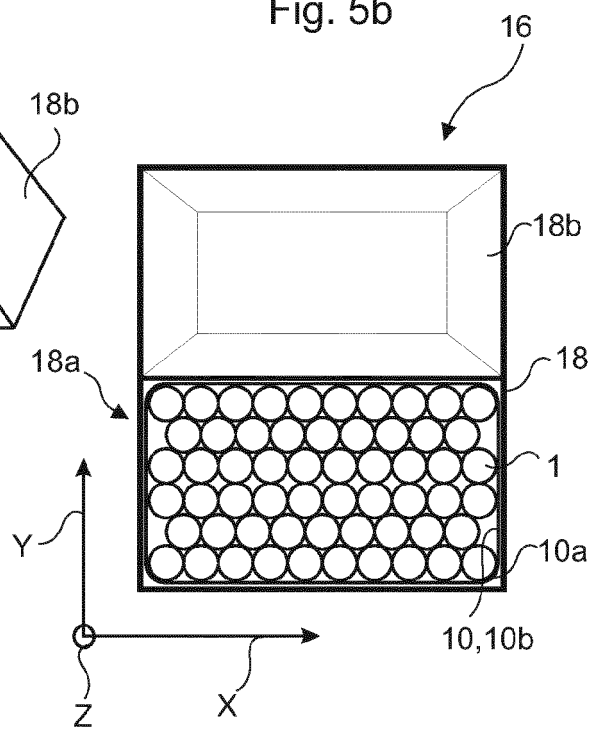
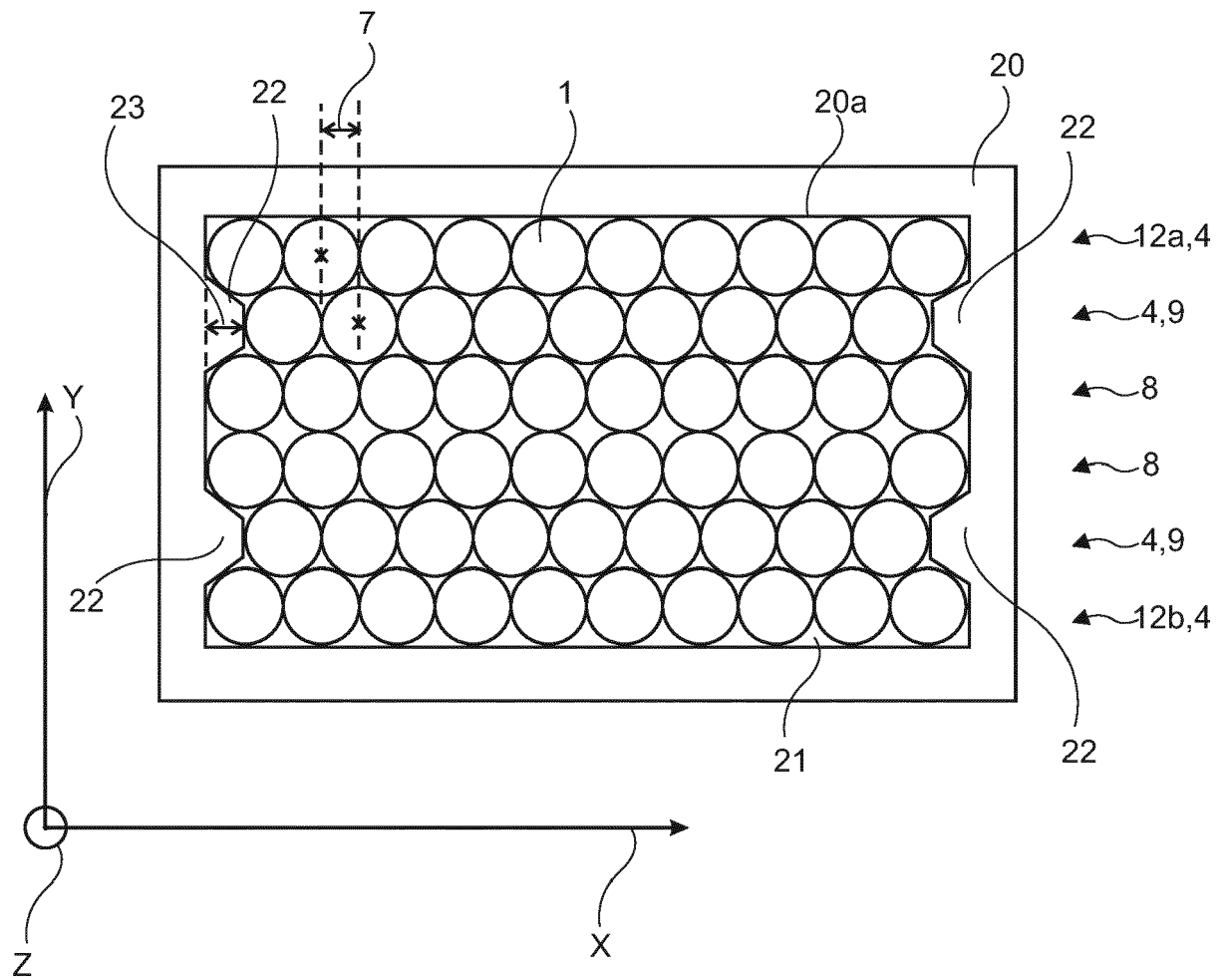


Fig. 6





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