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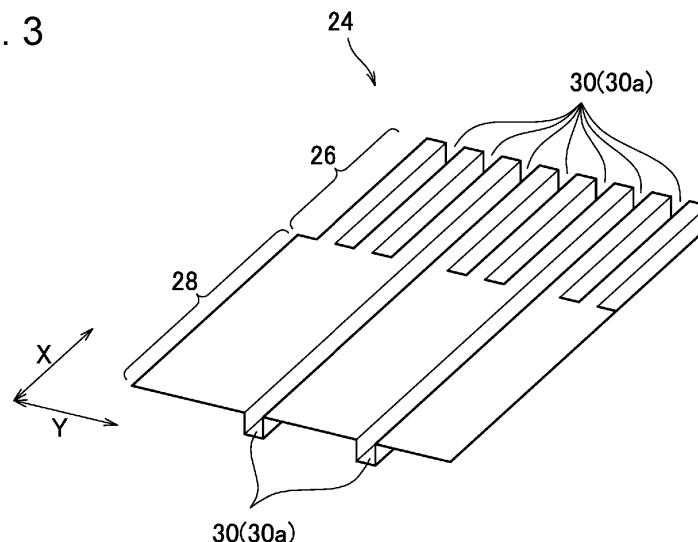
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(54) **FILTER, FLAVOR INHALATION ARTICLE COMPRISING SAID FILTER, AND DEVICE AND METHOD FOR PRODUCING SAID FILTER**

(57) A filter (6) used in a flavor inhalation article (1), wherein: the filter (6) comprises a sheet filling part (16) in which sheets (24) comprising a web material are gathered in a width direction Y intersecting the longitudinal direction X of the sheets (24) and are reduced in size to or below the diameter of the filter (6), and a rolled paper (18)

in which the sheet filling part (16) is wrapped; and the sheets (24) have first crimped regions (26) in which a prescribed number of crimped parts (30) are formed by implementing a crimping treatment on a partial region extending over the entire longitudinal direction X.

FIG. 3

Description

Technical Field

[0001] The present invention relates to a filter, a flavor inhalation article comprising the filter, device for producing the filter, and a method for producing the filter.

Background Art

[0002] A method for manufacturing a variable crimped web material is disclosed in PTL 1. This method includes the steps of feeding a continuous web material, crimping a first region of the web material at a first crimping value, and crimping a second region of the web material adjacent to the first region at a second crimping value. The web material is crimped using a set of two rollers. Each roller is corrugated across its width, that is, in the axial direction of the roller.

[0003] Furthermore, each roller is corrugated along its circumference, that is, in the circumferential direction of the roller. The corrugations in the axial direction of the rollers interleave with each other to crimp the web material. In detail, troughs of the corrugations formed along the outer circumferential surface of each roller crimp the web material at the first crimp value, and the peaks of the corrugations formed along the outer circumferential surface of each roller crimp the web material at the second crimp value.

[0004] Thus, crimped web material having regions of varied crimp values along the length of the web material is formed in a single operation. That is, according to PTL 1, as illustrated in Fig. 2 of PTL 1, the regions of varied crimp values are formed in the web material by varying an engagement depth of the corrugations of each roller.

[0005] The corrugations are linear protrusions and linear recesses formed throughout the circumference of the outer circumferential surface of each roller in the circumferential direction, and the linear protrusions and the linear recesses are formed with a predetermined pitch in the axial direction of each roller. Thus, the number of engagement parts where the linear protrusions and the linear recesses are engaged with each other is fixed. Accordingly, as illustrated in Fig. 3 of PTL 1, although the crimp value is varied by varying the depth of engagement between the linear protrusions and the linear recesses, many crimped parts shaped in a uniform wave shape of protrusions and recesses are formed throughout the web material in the longitudinal direction of the web material so as to be spaced apart from each other at predetermined intervals in an airflow directing element formed of the crimped web material, in other word, a filter.

Citation List

Patent Literature

[0006] PTL 1: Japanese Patent No. 6553038

Summary of Invention

Technical Problem

[0007] When the web material according to PTL 1 is used in a filter material of a flavor inhalation article (hereinafter, simply referred to as an article), the void ratio of the filter reduces and the draw resistance of the filter increases due to formation of many crimped parts having a uniform shape in the web material. Accordingly, an inhaling force required for a user to inhale the article increases. Thus, the amount of a flavor component that the user can take from the article 1 per puff may reduce, so-called an inhalation response from the article may be degraded, and smoke taste may be degraded.

[0008] Furthermore, it is unavoidable that the crimped parts have a uniform shape of the linear protrusions or the linear recesses. Thus, filter having variations cannot be formed. Furthermore, when many crimped parts having the uniform shape are formed in the web material, the stiffness of the filter reduces, and accordingly, the filter may bend. Furthermore, due to formation of many crimped parts having the uniform shape in the web material, a large amount of material powder (paper dust in the case of paper web) is generated when a crimping treatment is performed on the web material. Since a large amount of the material powder significantly contaminates facilities, the load of cleaning the facilities increases, and accordingly, productivity of the filter reduces.

[0009] The present invention is made in view of such problems, and an object of the present invention is to provide a filter, a flavor inhalation article including the filter, and a device and a method for producing the filter that improve the quality of the filter and the flavor inhalation article due to reduction of draw resistance and improvement of stiffness and that allow achievement of variations of the filter and the flavor inhalation article produced with improved productivity.

Solution to Problem

[0010] In order to achieve the above-described object, a filter according to an aspect is used in a flavor inhalation article. The filter includes a sheet filling part formed by performing gathering in a width direction intersecting a longitudinal direction of a sheet formed of a web material so as to reduce a diameter to a value smaller than or equal to a diameter of the filter and a rolled paper with which the sheet filling part is wrapped. When a crimping treatment is performed on a partial region of the sheet in the longitudinal direction, the sheet has a first crimped region in which a predetermined number of crimped parts are formed.

[0011] A flavor inhalation article according to an aspect includes the above-described filter.

[0012] A device for producing a filter according to an aspect produces a filter used in a flavor inhalation article. The device includes a sheet processing section config-

ured to process a sheet formed of a continuous web material while transporting the sheet through a transport path, a gathering section configured to perform gathering, in a width direction intersecting a longitudinal direction of the sheet, on the sheet having been processed in the sheet processing section, the gathering being performed, in a transport process of the sheet through the transport path, to form a sheet filling rod having a diameter reduced to a value smaller than or equal to a diameter of the filter, a wrapping section configured to wrap, with rolled paper, the sheet filling rod having been formed in the gathering section, the wrapping being performed so as to form a filter rod, and a cutting section configured to cut, into the filter, the filter rod having been formed in the wrapping section. The sheet processing section includes a roller set configured to pinch and transport the sheet with a first roller and a second roller through the transport path. Protruding parts are formed in the first roller, the protruding parts protruding in parts of an outer circumferential surface of the first roller in a circumferential direction. Recessed parts are formed in parts of an outer circumferential surface of the second roller in the circumferential direction in the second roller, the recessed parts to be engaged with the protruding parts. The roller set forms engagement parts where the protruding parts and the recessed parts are engaged with each other with the sheet interposed between the protruding parts and the recessed parts when the sheet is pinched and transported, the roller set having first engagement regions in partial regions of the outer circumferential surfaces in circumferential directions, a predetermined number of the engagement parts being formed in the first engagement regions. The first engagement regions form a first crimped region having a predetermined number of crimped parts corresponding to the engagement parts in number when a crimping treatment is performed on a partial region of the sheet in the longitudinal direction.

[0013] A method for producing a filter according to an aspect produces a filter used in a flavor inhalation article. The method includes the steps of processing a sheet formed of a continuous web material while transporting the sheet, in a transport process of the sheet, performing gathering, in a width direction intersecting a longitudinal direction of the sheet, on the sheet having been processed in the processing of the sheet, the gathering being performed to form a sheet filling rod having a diameter reduced to a value smaller than or equal to a diameter of the filter, wrapping the sheet filling rod having been formed in the performing of the gathering with rolled paper to form a filter rod, and cutting, into the filter, the filter rod having been formed in the wrapping. In the transport process of the sheet in the processing of the sheet, crimping processing is performed to form a first crimped region having a predetermined number of crimped parts by performing a crimping treatment on a partial region of the sheet in a longitudinal direction of the sheet.

Advantageous Effects of Invention

[0014] The filter, the flavor inhalation article including the filter, and the device and the method for producing the filter can be provided. With these, the quality of the filter can be improved due to reduction of the draw resistance of the filter and improvement of the stiffness of the filter, the productivity of the filter can be improved, and further, variations can be achieved. Brief Description of Drawings

[Fig. 1] Fig. 1 is a cross-sectional view of a flavor inhalation article.

[Fig. 2] Fig. 2 is a perspective view of a sheet before the sheet is processed.

[Fig. 3] Fig. 3 is a perspective view of the sheet on which a crimping treatment has been performed.

[Fig. 4] Fig. 4 is a longitudinal sectional view of a filter in a first filling part.

[Fig. 5] Fig. 5 is a longitudinal sectional view of the filter in a second filling part.

[Fig. 6] Fig. 6 is a general view of a device for producing a filter.

[Fig. 7] Fig. 7 is a flowchart explaining a method for producing the filter.

[Fig. 8] Fig. 8 is a perspective view of a roller set pinching the sheet.

[Fig. 9] Fig. 9 is a schematic view of an outer circumferential surfaces of a first and second rollers.

[Fig. 10] Fig. 10 is an enlarged sectional view of engagement parts of a first engagement region.

[Fig. 11] Fig. 11 is an enlarged sectional view of engagement parts of a second engagement region.

[Fig. 12] Fig. 12 is a perspective view of the roller set when the sheet is fed further from the state illustrated in Fig. 8.

[Fig. 13] Fig. 13 is a perspective view of the sheet having non-crimped region.

[Fig. 14] Fig. 14 is a schematic view of an outer circumferential surfaces of the first and second rollers that form the sheet illustrated in Fig. 13.

[Fig. 15] Fig. 15 is an enlarged sectional view of non-engagement regions formed in the roller set illustrated in Fig. 14.

[Fig. 16] Fig. 16 is a perspective view of the sheet when the crimped parts of the second crimped region are rectangular recessed parts.

[Fig. 17] Fig. 17 is a schematic view of the outer circumferential surfaces of the first and second rollers that form the sheet illustrated in Fig. 16.

[Fig. 18] Fig. 18 is an enlarged sectional view of the engagement parts of the second engagement regions formed in the roller set illustrated in Fig. 17.

[Fig. 19] Fig. 19 is a perspective view of the sheet when the crimped parts of the second crimped region are triangular protruding parts.

[Fig. 20] Fig. 20 is a schematic view of the outer circumferential surfaces of the first and second rollers that form the sheet illustrated in Fig. 19.

[Fig. 21] Fig. 21 is an enlarged sectional view of the engagement parts of the second engagement regions formed in the roller set illustrated in Fig. 20.

[Fig. 22] Fig. 22 is a perspective view of the sheet when the crimped parts of the second crimped region are lateral linear recesses.

[Fig. 23] Fig. 23 is a schematic view of the outer circumferential surfaces of the first and second rollers that form the sheet illustrated in Fig. 22.

[Fig. 24] Fig. 24 is an enlarged sectional view of the engagement parts of the second engagement regions formed in the roller set illustrated in Fig. 23.

[Fig. 25] Fig. 25 is a schematic view illustrating an example of a non-burning heating-type flavor inhalation article.

[Fig. 26] Fig. 26 is a schematic view illustrating another example of the non-burning heating-type flavor inhalation article.

[Fig. 27] Fig. 27 is a schematic view illustrating another example of the non-burning heating-type flavor inhalation article.

[Fig. 28] Fig. 28 is a schematic view illustrating another example of the non-burning heating-type flavor inhalation article.

[Fig. 29] Fig. 29 is a schematic view illustrating another example of the non-burning heating-type flavor inhalation article.

[Fig. 30] Fig. 30 is a schematic view illustrating another example of the non-burning heating-type flavor inhalation article.

[Fig. 31] Fig. 31 is a schematic view illustrating another example of the non-burning heating-type flavor inhalation article.

[Fig. 32] Fig. 32 is a schematic view illustrating an example of a burning heating-type flavor inhalation article.

[Fig. 33] Fig. 33 is a schematic view illustrating another example of the burning heating-type flavor inhalation article.

[Fig. 34] Fig. 34 is a schematic view illustrating another example of the burning heating-type flavor inhalation article.

[Fig. 35] Fig. 35 is a schematic view illustrating another example of the burning heating-type flavor inhalation article. Description of Embodiments

[0015] Fig. 1 illustrates a cross-sectional view of a non-burning heating-type flavor inhalation article 1 (hereinafter, also referred to as an article). The article 1 includes, for example, a flavor element 2, a tubular element 4, and a filter 6. When the flavor element 2, the tubular element 4, and the filter 6 are arranged side by side so as to butt against each other in this order in an axial direction X and wrapped with tipping paper 8, the article 1 is formed. The flavor element 2 is formed by wrapping a flavor material 10 with rolled paper 12.

[0016] When the flavor element 2 is heated with a heater of a device (flavor inhaler, not illustrated) during

use of the article 1, a flavor component of the flavor material 10 is volatilized and dispersed. A conductive member such as a metal plate or a metal particle may be mixed in the flavor material 10. In this case, the device generates a magnetic field due to the existence of the conductive member, and the flavor element 2 is heated by an induced current of the magnetic field.

[0017] The flavor material 10 is, for example, shredded tobacco, a cut cigarette sheet, or folded cigarette sheet into a gathered shape. The flavor material 10 may be a sheet which is formed from pulp not containing tobacco and to which a flavor is added, a sheet formed of a non-tobacco plant and cut, or one of these sheets folded into a wavy shape.

[0018] The tubular element 4 is, for example, a paper tube having a cylindrical shape formed of a single or double paper web and defines an airflow channel in the article 1. A plurality of air holes 14 are formed in a circumferential surface of the tubular element 4 to bring air into the article 1 while inhaling with the article 1. The flavor component volatilized from the flavor element 2 becomes an aerosol when cooled by the air taken from the outside into the article 1 via each of the air holes 14. The user of the article 1 inhales this aerosol.

[0019] The filter 6 is a filtering body formed by wrapping a sheet filling part 16 with the rolled paper 18. The sheet filling part 16 is integrally formed from a first filling part 20 and a second filling part 22. The first filling part 20 is positioned on the downstream side of the airflow channel in the filter 6 and has an inhalation port end 6a of the filter 6. The second filling part 22 is positioned on the upstream side of the airflow channel in the filter 6 and adjacent to the first filling part 20 in the axial direction X of the filter 6.

[0020] Fig. 2 illustrates a perspective view of a sheet 24 serving as a filter material before the sheet is processed. The filter material of the filter 6 is a single sheet 24 formed of a paper web (web material). The sheet 24 has, for example, a rectangular shape in plan view. A transport direction of the sheet 24 in a manufacturing process, which will be described later, is defined as a longitudinal direction X of the sheet 24 (the same direction as the axial direction X of the filter 6), and a direction intersecting the longitudinal direction X is defined as a width direction Y of the sheet 24.

[0021] The sheet 24 has a first crimped region 26 in a partial region in the longitudinal direction X and a second crimped region 28 in a region adjacent to the first crimped region 26 of the sheet 24 in the longitudinal direction X. An area A1 of the first crimped region 26 is smaller than or equal to an area A2 of the second crimped region 28. The sheet filling part 16 illustrated in Fig. 1 is formed by performing a crimped treatment on the sheet 24 and, in addition, by performing gathering in the width direction Y, in other words, by pulling and binding so as to reduce the diameter to a value smaller than or equal to the diameter of the filter 6. Accordingly, the length of the first filling part 20 is smaller than or equal to the length of the second filling part 22 in the axial direction X.

[0022] Fig. 3 illustrates a perspective view of the sheet 24 on which the crimped treatment has been performed. A predetermined number of crimped parts 30 are formed in the first crimped region 26 by performing the crimping treatment. The crimping treatment is creping processing in which the sheet 24 is shaped so that the sheet 24 has recesses and protrusions while the recesses are spaced apart from each other and the protrusions are spaced apart from each other. The crimped parts 30 are protruding or recessed fine wrinkles formed in the sheet 24. When the crimped parts 30 are formed in the sheet 24, elastic crepe paper is formed. The crimped parts 30 are defined as recessed parts recessed in various shapes relative to a flat surface of the sheet 24 or protruding parts protruding in various shapes relative to the flat surface of the sheet 24.

[0023] In the case illustrated in Fig. 3, the crimped parts 30 of the first crimped region 26 are longitudinal linear recesses 30a extending in the longitudinal direction X of the sheet 24. For example, seven longitudinal linear recesses 30a are formed so as to be spaced apart from each other in the width direction Y of the sheet 24 in the first crimped region 26. A smaller number of crimped parts 30 than the number of the crimped parts 30 in the case of the first crimped region 26 are formed in the second crimped region 28 by performing the crimping treatment. In the case illustrated in Fig. 3, the crimped parts 30 of the second crimped region 28 are longitudinal linear recesses 30a having the same shape as those in the case of the first crimped region 26. For example, two longitudinal linear recesses 30a are formed so as to be spaced apart from each other in the width direction Y of the sheet 24 in the second crimped region 28.

[0024] Fig. 4 illustrates a longitudinal sectional view of the filter 6 in the first filling part 20. Fig. 5 illustrates a longitudinal sectional view of the filter 6 in the second filling part 22. The first filling part 20 is formed by performing the gathering in the width direction Y on the first crimped region 26 having each of the crimped parts 30 illustrated in Fig. 3. The second filling part 22 is formed by performing the gathering in the width direction Y on the second crimped region 28 having each of the crimped parts 30 illustrated in Fig. 3.

[0025] The first filling part 20 is formed by performing the gathering on the first crimped region 26 having a large number of the crimped parts 30 compared to that of the second filling part 22. Thus, compared to the second filling part 22, the first filling part 20 has a reduced void ratio and an increased draw resistance. Meanwhile, the second filling part 22 is formed by performing the gathering on the second crimped region 28 having a small number of the crimped parts 30 compared to that of the first filling part 20. Thus, compared to the first filling part 20, the second filling part 22 has an increased void ratio and a reduced draw resistance.

[0026] Specifically, the draw resistance of the sheet filling part 16 per unit length in the axial direction X is preferably set such that the draw resistance of the first

filling part 20 is higher than or equal to 1.5 times the draw resistance of the second filling part 22. Here, the draw resistance of the filter 6 used in the non-burning heating-type article 1 tends to be set to a comparatively small value. Accordingly, when both the first and second filling parts 20 and 22 have comparatively small draw resistances, measurement of the draw resistance becomes difficult.

[0027] In this case, a plurality of first filling parts 20 cut out from sheet filling parts 16 are prepared, a continuous body is formed by connecting the first filling parts 20 in the axial direction X, and the draw resistance of this continuous body is measured. Then, the draw resistance of the first filling part 20 per unit length is calculated from the measured value. A similar continuous body is formed for the second filling part 22, and the draw resistance of the second filling part 22 per unit length is calculated from the draw resistance of this continuous body. In this way, even when the comparison in the draw resistance between the first and second filling parts 20 and 22 is difficult due to excessively small measured values of the draw resistance, it can be confirmed that the draw resistance of the first filling part 20 is higher than or equal to 1.5 times the draw resistance of the second filling part 22.

[0028] Fig. 6 generally illustrates a device for producing 40 the filter 6. Fig. 7 illustrates a flowchart explaining a method for producing the filter 6. The device for producing 40 includes a sheet supplying section 42, a sheet processing section 44, a gathering section 46, a wrapping section 48, a cutting section 50, an inspecting section 52, and the like.

[0029] When production of the filter 6 is started, the sheet supplying section 42 supplies the continuous sheet 24 formed of a paper web to a transport path 54 (S1: sheet supplying step). Next, the sheet processing section 44 processes the sheet 24 while transporting the sheet 24 through the transport path 54 (S2: sheet processing step). The sheet processing section 44 includes a roller set 56 and a control unit 58.

[0030] The roller set 56 includes a first roller 60 and a second roller 62. In the transport path 54, the first and second rollers 60 and 62 transport the sheet 24 while pinching the sheet 24. A rotation shaft of at least one of the first and second rollers 60 and 62 is connected to a drive shaft of a motor (not illustrated) and rotated by the motor. The motor is electrically connected to the control unit 58. The rotation speed of the first and second rollers 60 and 62 is controlled by using the motor based on a signal from the control unit 58.

[0031] Fig. 8 illustrates a perspective view of the roller set 56 pinching the sheet 24. In the first roller 60, linear protrusions (protruding parts) 64 that protrude in parts of an outer circumferential surface in a circumferential direction Z are formed. In the second roller 62, linear recesses (recessed parts) 66 to be engaged with the linear protrusions 64 are formed in parts of an outer circumferential surface in the circumferential direction Z. When the roller set 56 pinches and transports the

sheet 24, the first and second rollers 60 and 62 rotate in arrow directions indicated in Fig. 8, the linear protrusions 64 and the linear recesses 66 are engaged with each other with the sheet 24 interposed therebetween, and engagement parts 68 are formed in the roller set 56.

[0032] Fig. 9 illustrates a schematic view of the outer circumferential surfaces of the first and second rollers 60 and 62. The roller set 56 has first engagement regions 70 in which predetermined numbers of engagement parts 68 are formed in partial regions of the outer circumferential surfaces of the first and second rollers 60 and 62 in the circumferential direction Z. In the first engagement regions 70, the crimping treatment is performed on partial regions of the sheet 24 in the longitudinal direction X by using the engagement parts 68. The roller set 56 also has second engagement regions 72 in regions adjacent to the first engagement regions 70 of the respective outer circumferential surfaces of the first and second rollers 60 and 62 in the circumferential direction Z of the outer circumferential surfaces.

[0033] Fig. 10 illustrates an enlarged sectional view of the engagement parts 68 of the first engagement region 70. Fig. 11 illustrates an enlarged sectional view of the engagement parts 68 of the second engagement region 72. The number of the engagement parts 68 is smaller in the second engagement region 72 than in the first engagement region 70. As illustrated in Fig. 8, the second engagement regions 72 perform the crimping treatment on a region of the sheet 24 adjacent to the first crimped region 26 in the longitudinal direction X, that is, the second crimped region 28. For example, two engagement parts 68 are formed in the second engagement region 72. As illustrated in Fig. 3, as the crimped parts 30 corresponding to the engagement parts 68 in number, two longitudinal linear recesses 30a are formed in the second crimped region 28 of the sheet 24.

[0034] Fig. 12 illustrates a perspective view of the roller set 56 when the sheet 24 is fed further from the state illustrated in Fig. 8. For example, seven engagement parts 68 are formed in the first engagement region 70. As illustrated in Fig. 3, as the crimped parts 30 corresponding to the engagement parts 68 in number, seven longitudinal linear recesses 30a are formed in the first crimped region 26 of the sheet 24. Thus, in sheet processing step S2, the first crimped region 26 having the predetermined number of crimped parts 30 corresponding to the engagement parts 68 in number is formed in the sheet 24 (P1: crimping processing).

[0035] In crimping processing P1, in addition, the second crimped region 28 having a smaller number of the crimped parts 30 than in the case of the first crimped region 26 is formed in the sheet 24. An area A3 (see Fig. 9) of the first engagement region 70 in each of the first and second rollers 60 and 62 is smaller than or equal to an area A4 (see Fig. 9) of the second engagement region 72 in each of the first and second rollers 60 and 62. Thus, as described above, the area A1 of the first crimped region 26 is smaller than or equal to the area A2 of the second

crimped region 28. In other words, the length of the first filling part 20 is smaller than or equal to the length of the second filling part 22 in the axial direction X.

[0036] Next, referring to Figs. 6 and 7, in a transport process of the sheet 24 through the transport path 54, the gathering section 46 performs gathering, in the width direction Y, on the continuous sheet 24 having been processed in the sheet processing section 44. The gathering is performed to form a sheet filling rod 74 having a diameter reduced to a value smaller than or equal to the diameter of the filter 6 (S3: gathering step). The sheet filling rod 74 forms the sheet filling part 16 in which the first filling part 20 and the second filling part 22 are integral, when, in a later step, the sheet filling rod 74 is formed in a filter rod 76 and, after that, cut into the filter 6.

[0037] In detail, the gathering section 46 includes a liquid adding booth 78, a granule adding unit 80, a trumpet guide 82, a tongue 84, and the like in order from the upstream side in the transport direction through the transport path 54. In the liquid adding booth 78, a liquid additive is sprayed to the sheet 24 before the gathering (P2: liquid adding processing). The additive is a liquid that contains, for example, a plasticizer and a flavor. The granule adding unit 80 includes a hopper 80a and a dispersing roller 80b.

[0038] The hopper 80a stores granules, and the dispersing roller 80b disperses the granules supplied from the hopper 80a onto the sheet 24 before the gathering. The granules are granular additives and contain, for example, granules of activated carbon and the flavor. Both the trumpet guide 82 and the tongue 84 have respective cylindrical shapes. The diameter of the inner circumferential surface of the trumpet guide 82 gradually reduces from the upstream side of the transport path 54.

[0039] The trumpet guide 82 randomly performs the gathering on the sheet 24 transported through the transport path 54 while reducing the diameter of the sheet 24 such that the sheet 24 has a rod shape, and releases the sheet 24 toward the tongue 84. When the rod-shaped sheet 24 on which the gathering has been performed passes through the tongue 84, the diameter of the rod-shaped sheet 24 further reduces to a value smaller than or equal to the diameter of the filter 6, and formed into the sheet filling rod 74.

[0040] Next, the wrapping section 48 wraps the sheet filling rod 74 with the supplied rolled paper 18 to form the filter rod 76 (S4: wrapping step). Next, the cutting section 50 cuts the filter rod 76 into the filter 6 having a predetermined length to form the filter 6 (S5: cutting step). Next, the inspecting section 52 inspects a ratio R between the lengths, in the axial direction X, of the first filling part 20 and the second filling part 22 in the sheet filling part 16 of the filter 6 (S6: inspecting step).

[0041] As a result of cutting the filter rod 76 in cutting step S5, many filters 6 having the same length in the axial direction X are formed. Since each of the filters 6 has the same length, the ratio R between the lengths of the first and second filling parts 20 and 22 included in the filter 6 is

inspected in inspecting step S6. This inspection is performed by, for example, radiating inspection light such as transmission infrared light to a circumferential surface of the filter 6 and performing image recognition on an image having been captured. The lengths of the first and second filling parts 20 and 22 may be directly inspected instead of the ratio R.

[0042] Next, in the inspecting section 52, whether the inspected ratio R is a predetermined first threshold T1 is determined (S7: determining step). The first threshold T1 is set to be a predetermined value in accordance with specifications of the filter 6 or a predetermined allowable range. When a determination result is true (Yes) and $R = T1$ holds, it is determined that the lengths of the first filling part 20 and the second filling part 22 in the axial direction X are desired correct values.

[0043] In other words, it is determined that the lengths, in the longitudinal direction X, of the first crimped region 26 and the second crimped region 28 of the sheet 24 included in the sheet filling part 16 are desired correct values, and the inspection and production of the filter 6 end. In contrast, when the determination result is false (No) and $R = T1$ does not hold, it is determined that the length of at least one of the first filling part 20 and the second filling part 22 in the axial direction X is excessively large or excessively small.

[0044] In other words, it is determined that the lengths, in the longitudinal direction X, of the first crimped region 26 and the second crimped region 28 of the sheet 24 included in the sheet filling part 16 are incorrect. In this case, since the quality of the filter 6 is not reliably obtained, correction of the crimping treatment in crimping processing P1 is required. The inspecting section 52 is electrically connected to the control unit 58 of the sheet processing section 44.

[0045] When it is determined that the ratio R is not the first threshold T1 in determining step S7, the inspecting section 52 transmits the difference between the ratio R and the first threshold T1 to the control unit 58. Based on the difference between the ratio R and the first threshold T1, the control unit 58 controls a rotation speed V_r of at least one of the first roller 60 and the second roller 62 (S8: control step). As a result, in order to correct the ratio R to the first threshold T1, crimping processing P1 is performed in the first and second crimped regions 26 and 28 of the sheet 24 in the sheet processing section 44.

[0046] As has been described, the filter 6 according to the embodiment includes the sheet filling part 16 and the rolled paper 18 wrapped around the sheet filling part 16. The sheet filling part 16 is formed by performing the gathering in the width direction Y on the sheet 24 formed of a paper web to reduce the diameter to a value smaller than or equal to the diameter of the filter 6. The sheet 24 included in the sheet filling part 16 has the first crimped region 26. In the first crimped region 26, the predetermined number of the crimped parts 30 are formed by performing the crimping treatment on the partial regions of the sheet 24 in the longitudinal direction X.

[0047] That is, the sheet filling part 16 obtained by performing the gathering on the first crimped region 26 having the crimped parts 30 is formed only in the partial regions in the longitudinal direction X of the sheet 24. In this way, in a region of the sheet 24 adjacent to the first crimped region 26, the crimped parts 30 can be formed such that the number of the crimped parts 30 in the adjacent region is different from the number of the crimped parts 30 in the first crimped region 26, the crimped parts 30 having a different shape from the shape of the crimped parts 30 in the first crimped region 26 can be formed, or it is allowed that no crimped part 30 is formed.

[0048] When the above-described flexibility is imparted to the crimping treatment of the sheet 24, the void ratio and the draw resistance of the filter 6 can be optimized, and accordingly, smoke taste of the article 1 can increase. Furthermore, when the number and the shape of the crimped parts 30 formed in the sheet 24 are changed, the filter 6 having variations can be formed in one operation and the stiffness of the filter 6 can be improved.

[0049] Furthermore, when the number of crimped parts 30 formed in the sheet 24 reduces, and the amount of paper dust generated in association with the formation of the crimped parts 30 reduces, the load of cleaning facilities can reduce. Thus, productivity of the filter 6 can be improved. Furthermore, since the sheet filling part 16 having different crimped forms can be formed in one operation from the continuous sheet 24, individual filter elements having different crimped forms are not necessarily combined to form the filter 6. Thus, the productivity of the filter 6 can be further improved.

[0050] Furthermore, in the case where the above-described combining is performed, when the lengths of the filter elements in the axial direction X are small, the filter elements may be rolled while the filter elements are transported. When the rolled filter elements are combined, a defective filter 6 may be produced. However, since the sheet filling part 16 having different crimped forms can be formed in one operation from the continuous sheet 24, the combining itself becomes unnecessary. Thus, the productivity of the filter 6 can be further improved and the quality of the filter 6 can be reliably obtained.

[0051] More specifically, the sheet 24 has the second crimped region 28 in a region of the sheet 24 adjacent to the first crimped region 26 in the longitudinal direction X. The number of the crimped parts 30 formed in the second crimped region 28 is smaller than the crimped parts 30 formed in the first crimped region 26. In this way, compared to the case where the same number of the crimped parts 30 as the number of the crimped parts 30 in the first crimped region 26 are formed in an entire region of the sheet 24, the draw resistance of the filter 6 can reduce, the stiffness of the filter 6 can be improved, and improvement of the productivity of the filter 6 can be achieved.

[0052] In detail, when the draw resistance of the filter 6

reduces, an inhaling force required for the user to inhale the article 1 reduces. Thus, the amount of the flavor component that the user can take per puff increases, an inhalation response from the article 1 is improved, and further, smoke taste of the article 1 is improved. Furthermore, when the void ratio of the filter 6 increases, the flavor material 10 of the flavor element 2 may pass through the void of the filter 6 so as to be put into the mouth of the user during the inhalation of the article 1.

[0053] However, with the filter 6, in association with the formation of the first filling part 20 having many crimped parts 30, the risk of putting the flavor material 10 into the mouth reduces, and the quality of the article 1 is improved. Furthermore, in association with the formation of the second filling part 22 having a comparatively small number of the crimped parts 30, the stiffness of the filter 6 is improved, in particular, the stiffness in the radial direction of the filter 6 is improved. This leads to reduction of the risk of bending, for example, the middle of the filter 6 is bent when the article 1 is inserted into the device. Accordingly, the quality of the article 1 is improved.

[0054] Furthermore, the article 1 gives the impression to the user that the stiffness of the filter 6 is high, in other words, the filter 6 is hard. This can present to the user a feel of the article 1, and further, a high-quality feel of the article 1. Furthermore, the area A1 of the first crimped region 26 is smaller than or equal to the area A2 of the region of the sheet 24 adjacent to the first crimped region 26 in the longitudinal direction X, that is, the second crimped region 28 according to the embodiment. Thus, the length of the first filling part 20 formed from the first crimped region 26 is smaller than or equal to the length of the second filling part 22 formed from the second crimped region 28.

[0055] Here, when the length of the first filling part 20 with a larger number of the crimped parts 30 is smaller than or equal to the length of the second filling part 22 with a smaller number of the crimped parts 30, the amount of filtering of the flavor component can be reduced in the filter 6. In particular, the non-burning heating-type article 1 volatilizes small amount of the flavor component in the flavor element 2 compared to the burning heating-type article 1. Accordingly, the amount of filtering of the flavor component in the filter 6 is preferably reduced as much as possible.

[0056] Accordingly, in the case where the filter 6 is used in the non-burning heating-type article 1, when the length of the first filling part 20 is smaller than or equal to the length of the second filling part 22, in other words, the area A1 of the first crimped region 26 is smaller than or equal to the area A2 of the second crimped region 28, the amount of the flavor component that the user can take from the article 1 increases, the inhalation response from the article 1 is improved, and further, smoke taste of the article 1 is improved.

[0057] Furthermore, the draw resistance, per unit length, of the sheet filling part 16 of the first filling part 20 in the axial direction X is higher than or equal to 1.5

times the draw resistance of the second filling part 22. Thus, there can be a certain degree of difference in draw resistance between the first filling part 20 and the second filling part 22. Accordingly, the draw resistance of the entirety of the filter 6 can be easily optimized by changing the lengths of the first filling part 20 and the second filling part 22.

[0058] Furthermore, the first filling part 20 is positioned on the downstream side of the second filling part 22 in the airflow channel and has the inhalation port end 6a of the filter 6. Thus, in the article 1, a neat end surface of the first filling part 20 which has many crimped parts 30, on which the crimping treatment has been performed in a tight manner, and which has small and uniform voids is exposed as the inhalation port end 6a. Accordingly, compared to the case where an end surface of the second filling part 22 having coarse and large voids is exposed, the appearance of the article 1 is improved.

[0059] Furthermore, the first filling part 20 is positioned on the downstream side of the second filling part 22 in the airflow channel. Thus, the first filling part 20 is disposed at a position spaced apart from the flavor element 2 with the second filling part 22 interposed therebetween. That is, the first filling part 20 having a higher filtering performance than that of the second filling part 22 is not adjacent to the flavor element 2. This prevents the flavor component that has just been volatilized in the flavor element 2 and has not been cooled and aerosolized from passing through the first filling part 20 having the high filtering performance and being excessively filtered.

[0060] As has been described, in particular with the non-burning heating-type article 1, the amount of the flavor component volatilized in the flavor element 2 is comparatively small. Accordingly, when the first filling part 20 is positioned on the downstream side of the second filling part 22 in the airflow channel, the amount of the flavor component that the user can take from the article 1 increases, the inhalation response from the article 1 is improved, and further, smoke taste of the article 1 is improved.

[0061] Furthermore, the sheet processing section 44 of the device for producing 40 includes the roller set 56 that includes the first and second rollers 60 and 62. When the roller set 56 pinches and transports the sheet 24, the linear protrusions 64 of the first roller 60 and the linear recesses 66 of the second roller 62 are engaged with each other with the sheet 24 interposed therebetween. Thus, the engagement parts 68 are formed in the roller set 56. The roller set 56 has the first engagement regions 70 in which the predetermined numbers of engagement parts 68 are formed in the partial regions of the outer circumferential surfaces in the circumferential direction Z.

[0062] The first engagement regions 70 form the first crimped region 26 in the sheet 24 in crimping processing P1 of sheet processing step S2. Furthermore, the roller set 56 has the second engagement regions 72 in regions of the outer circumferential surfaces adjacent to the first

engagement regions 70 in the circumferential direction Z. The second engagement regions 72 have a smaller number of the engagement parts 68 than the number of the engagement parts 68 in the first engagement regions 70. The second engagement regions 72 form the second crimped region 28 in the sheet 24 in crimping processing P1 of sheet processing step S2.

[0063] Thus, in the transport process of the sheet 24, the first and second crimped regions 26 and 28 can be easily formed in the sheet 24, and further, the first and second filling parts 20 and 22 can be easily formed in the sheet filling part 16 of the filter 6. Furthermore, the area A3 of the first engagement regions 70 is smaller than or equal to the area A4 of the region of the outer circumferential surfaces of the roller set 56 adjacent to the first engagement regions 70, that is, the second engagement regions 72 according to the embodiment. Thus, the area A1 of the first crimped region 26 can be smaller than or equal to the area A2 of the second crimped region 28.

[0064] Furthermore, the inspecting section 52 of the device for producing 40 inspects, in inspecting step S6, the ratio R between the lengths, in the axial direction X, of the first filling part 20 and the second filling part 22 of the sheet filling part 16 of the filter 6 and determines, in determining step S7, whether the ratio R is the first threshold T1. When it is determined that, in determining step S7, the ratio R is not the first threshold T1, a rotation speed Vr of at least one of the first roller 60 and the second roller 62 is controlled in control step S8 based on the difference between the ratio R and the first threshold T1.

[0065] Although it is in a very small amount, the sheet 24 may extend in crimping processing P1. The amounts of extension may accumulate after the elapse of long time and lead to a defect of the article 1 in that at least one of the lengths of the first filling part 20 and the second filling part 22 in the axial direction X is excessively large or excessively small. The defect caused by the extension of the sheet 24 can be corrected when steps S6 to S8 described above are performed, and the quality of the article 1 can be improved.

[0066] Although the description of the embodiment is completed with the above description, the above-described embodiment is not limiting and can be changed in a various manner without departing from the gist. For example, a crinkling pattern in the first or second crimped region 26 or 28, the shape of the crimped parts 30, or the area A1 or A2 of the first or second crimped region 26 or 28 is not limited to the above-described embodiment. The crinkling patterns in the first and second crimped regions 26 and 28, the shape of the crimped parts 30, and the areas A1 and A2 of the first and second crimped regions 26 and 28 are allowed to be changed in a various manner. In this way, the flexibility of the crimping treatment on the sheet 24 is further improved, and accordingly, optimization of the draw resistance of the filter 6, diversification of the filter 6, improvement of the stiffness of the filter 6, and improvement of the productivity of the filter 6 can be more

effectively achieved.

[0067] Specifically, as illustrated in Fig. 13, the sheet 24 may have a non-crimped region 86 having no crimped parts 30 in a region of the sheet 24 adjacent to the first crimped region 26 in the longitudinal direction X. In this case, as illustrated in Figs. 14 and 15, the roller set 56 has non-engagement regions 88 without an engagement part 68 in regions adjacent to the first engagement regions 70 of the outer circumferential surfaces in the circumferential direction Z. The non-engagement region 88 forms the non-crimped region 86 in the sheet 24 in sheet processing step S2.

[0068] The sheet 24 may have the second crimped region 28 in a region of the sheet 24 adjacent to the first crimped region 26 in the longitudinal direction X. In the second crimped region 28, the crimping treatment is performed so as to form the crimped parts 30 having a smaller recessed area than that in the first crimped region 26. For example, in the case illustrated in Fig. 16, the crimped parts 30 formed in the second crimped region 28 are recessed parts in a dot shape in plan view of the sheet 24, and specifically, the crimped parts 30 are rectangular recessed parts 30b having a rectangular shape in section.

[0069] In this case, as illustrated in Fig. 17, a plurality of rectangular protruding parts 90 are formed in the second engagement region 72 of the first roller 60. A plurality of rectangular recessed parts 92 to be engaged with the protruding parts 90 are formed in the second engagement region 72 of the second roller 62. When the roller set 56 pinches and transports the sheet 24, the first and second rollers 60 and 62 rotate, the protruding parts 90 and the recessed parts 92 are engaged with each other with the sheet 24 interposed therebetween, and the engagement parts 68 are formed in the roller set 56.

[0070] As illustrated in Fig. 18, an engagement area of the engagement parts 68 formed in the second engagement regions 72 of the roller set 56 is smaller than that of the engagement parts 68 in the first engagement regions 70 (see Fig. 10). The second engagement regions 72 form the second crimped region 28 in the sheet 24 in crimping processing P1 of sheet processing step S2 such that the second crimped region 28 has a plurality of rectangular recessed parts 30b having a smaller recessed area than that of the first crimped region 26. When the gathering is performed on this second crimped region 28, the second filling part 22 is formed.

[0071] In the case illustrated in Fig. 19, the crimped parts 30 formed in the second crimped region 28 are protruding parts in a dot shape in plan view of the sheet 24, and specifically, the crimped parts 30 are triangular protruding parts 30c having a triangular shape in section. As illustrated in Fig. 20, a plurality of triangular recessed parts 94 are formed in the second engagement region 72 of the first roller 60. A plurality of triangular protruding parts 96 to be engaged with the recessed parts 94 are formed in the second engagement region 72 of the second roller 62. When the roller set 56 pinches and trans-

ports the sheet 24, the first and second rollers 60 and 62 rotate, the recessed parts 94 and the protruding parts 96 are engaged with each other with the sheet 24 interposed therebetween, and the engagement parts 68 are formed in the roller set 56.

[0072] As illustrated in Fig. 21, an engagement area of the engagement parts 68 formed in the second engagement regions 72 of the roller set 56 is smaller than that of the engagement parts 68 in the first engagement regions 70 (see Fig. 10). The second engagement regions 72 form the second crimped region 28 in the sheet 24 in crimping processing P1 of sheet processing step S2 such that the second crimped region 28 has a plurality of triangular protruding parts 30c having a smaller protruding area than that of the first crimped region 26. When the gathering is performed on this second crimped region 28, the second filling part 22 is formed. When the recessed parts 94 are changed to protruding parts and the protruding parts 96 are changed to recessed parts, the triangular protruding parts 30c can be changed to triangular recessed parts.

[0073] In the case illustrated in Fig. 22, the crimped parts 30 formed in the second crimped region 28 of the sheet 24 are lateral linear recesses 30d extending in the width direction Y of the sheet 24. As illustrated in Fig. 23, for example, two linear protrusions 98 extending in the width direction Y are formed in the first engagement region 70 of the first roller 60. For example, two linear recesses 100 to be engaged with the linear protrusions 98 are formed in the second engagement region 72 of the second roller 62. When the roller set 56 pinches and transports the sheet 24, the first and second rollers 60 and 62 rotate, the linear recesses 98 and the linear protrusions 100 are engaged with each other with the sheet 24 interposed therebetween, and the engagement parts 68 are formed in the roller set 56.

[0074] As illustrated in Fig. 24, an engagement area of the engagement parts 68 formed in the second engagement regions 72 of the roller set 56 is smaller than that of the engagement parts 68 in the first engagement regions 70 (see Fig. 10). The second engagement regions 72 form the second crimped region 28 in the sheet 24 in crimping processing P1 of sheet processing step S2 such that the second crimped region 28 has, for example, two lateral linear recesses 30d having a smaller recessed area than that of the first crimped region 26. When the gathering is performed on this second crimped region 28, the second filling part 22 is formed.

[0075] Furthermore, the type or the configuration of the article 1 including the filter 6 or the number, the position, or the length, in the axial direction X, of the first or second filling part 20 or 22 in the filter 6 is not limited to the embodiment having been described. Figs. 25 to 31 schematically illustrate examples of the non-burning heating-type article 1 different from that illustrated Fig. 1. These articles 1 include the flavor element 2 that is non-burning and to be heated. In the case illustrated in Fig. 25, the length of the second filling part 22 included in the filter 6 is

about twice to three times the length of the first filling part 20.

[0076] In the case illustrated in Fig. 26, the article 1 does not include the tubular element 4, and the length of the second filling part 22 is about seven times the length of the first filling part 20. In the case illustrated in Fig. 27, the article 1 further includes a second filter 104 that is disposed between the tubular element 4 and the filter 6 and contains activated carbon 102. The granules of the activated carbon 102 are wrapped with a filter material such as acetate tow in the second filter 104. In the case illustrated in Fig. 28, the article 1 further includes a third filter 108 which is disposed on the downstream side of the filter 6 in the airflow channel. A capsule 106 is disposed in the third filter 108. Additives such as a flavor liquid are included in the capsule 106, and the capsule 106 is wrapped with a filter material such as acetate tow in the third filter 108.

[0077] In the case illustrated in Fig. 29, the sheet filling part 16 is formed by disposing, in the axial direction X, a plurality of combinations, for example, two combinations of the second filling part 22 and the first filling part 20 alternately in this order from the upstream side of the airflow channel. In the case illustrated in Fig. 30, the article 1 does not include the tubular element 4, and the sheet filling part 16 includes the second filling part 22 between two first filling parts 20. The length of the second filling part 22 is about four times the length of the first filling part 20.

[0078] In the case illustrated in Fig. 31, the article 1 includes two filters 6. The second filling parts 22 are positioned outside the tubular element 4 on the left and right in the axial direction X with the tubular element 4 interposed therebetween. Furthermore, the first filling parts 20 are positioned outside the second filling parts 22 on the left and right in the axial direction X. The second filling parts 22 having a small number of the crimped parts 30 or having a small recessed area improve the strength of the filter 6 in the radial direction. In contrast, the first filling parts 20 having a large number of the crimped parts 30 or having a large recessed area improve buckling strength of the filter 6 in the axial direction X. Accordingly, the first filling part 20 may be positioned on the upstream side of the second filling part 22 in the airflow channel depending on the configuration of the article 1.

[0079] Meanwhile, the filter 6 according to the embodiment can be applied to a burning heating-type article 1. Figs. 32 to 35 schematically illustrate examples of the burning heating-type article 1. These articles 1 include the flavor element 2 to be heated when burning as a result of ignition but do not include the tubular element 4. In the case illustrated in Fig. 32, the length of the second filling part 22 is about four times the length of the first filling part 20.

[0080] In the case illustrated in Fig. 33, the length of the first filling part 20 is greater than the length of the second filling part 22. In the case illustrated in Fig. 34, the article 1 further includes the second filter 104 that is disposed

between the flavor element 2 and the filter 6 and contains the granules of the activated carbon 102. Furthermore, the length of the first filling part 20 is about twice the length of the second filling part 22. In the case illustrated in Fig. 35, the article 1 further includes the third filter 108 disposed on the downstream side of the filter 6. The capsule 106 is disposed in the third filter 108. Furthermore, the length of the first filling part 20 is greater than the length of the second filling part 22.

[0081] The burning heating-type article 1 volatilizes a greater amount of the flavor component in the flavor element 2 compared to that of the non-burning heating-type article 1. Accordingly, the necessity to reduce the amount of filtering the flavor component with the filter 6 is reduced. Accordingly, when, in particular, the filter 6 is used in the burning heating-type article 1, depending on the filtering performance of the filter 6 required for the article 1, as illustrated in Figs. 33 to 35, the length of the first filling part 20 may be set to be greater than the length of the second filling part 22, in other words, the area A1 of the first crimped region 26 may be set to be greater than the area A2 of the second crimped region 28.

[0082] A plurality of roller sets 56 may be provided in the sheet processing section 44, and three or more crimped regions may be formed in the sheet 24 so as to form three or more filling parts for the sheet 24 in the sheet filling part 16. The sheet 24 may be formed of a web material other than the paper web.

Reference Signs List

[0083]

1 flavor inhalation article
2 flavor element
4 tubular element
6 filter
16 sheet filling part
18 rolled paper
20 first filling part
22 second filling part
24 sheet
26 first crimped region
28 second crimped region
30 crimped part
30a longitudinal linear recess (crimped part)
30b rectangular recessed part (dot-shaped recessed part, crimped part)
30c triangular protruding part (dot-shaped protruding part, crimped part)
30d lateral linear recess (crimped part)
40 device for producing
44 sheet processing section
46 gathering section
48 wrapping section
50 cutting section
54 transport path
56 roller set

60 first roller
62 second roller
64 linear protrusion of first roller (protruding part)
66 linear recess of second roller (recessed part)
74 sheet filling rod
76 filter rod
86 non-crimped region
90 protruding part of first roller
92 recessed part of second roller
94 recessed part of first roller
96 protruding part of second roller
98 linear protrusion of first roller (protruding part)
100 linear recess of second roller (recessed part)
102 activated carbon
104 second filter
106 capsule
108 third filter
A1 area of first crimped region
A2 area of region of sheet adjacent to first crimped region (second crimped region or non-crimped region)
A3 area of first engagement region
A4 area of regions adjacent to first engagement regions of outer circumferential surfaces of first roller and second roller (second engagement regions or non-engagement regions)
P1 crimping processing
R ratio
S2 sheet processing step
S3 gathering step
S4 wrapping step
S5 cutting step
S6 inspecting step
S7 determining step
S8 control step
T1 first threshold
X longitudinal direction of sheet, axial direction of filter, transport direction of sheet, sheet filling rod, and filter
Y width direction of sheet
Z circumferential direction of outer circumferential surfaces of first roller and second roller

45 Claims

1. A filter used in a flavor inhalation article, the filter comprising:

a sheet filling part formed by performing gathering in a width direction intersecting a longitudinal direction of a sheet formed of a web material so as to reduce a diameter to a value smaller than or equal to a diameter of the filter; and
a rolled paper with which the sheet filling part is wrapped,
wherein, when a crimping treatment is performed on a partial region of the sheet in the

- longitudinal direction, the sheet has a first crimped region in which a predetermined number of crimped parts are formed.
2. The filter according to claim 1,
wherein the sheet has a second crimped region in a region of the sheet adjacent to the first crimped region in the longitudinal direction, the second crimped region being formed by performing the crimping treatment to have a smaller number of the crimped parts than a number of the crimped parts in a case of the first crimped region.
 3. The filter according to claim 1,
wherein the sheet has a non-crimped region in a region of the sheet adjacent to the first crimped region in the longitudinal direction, the non-crimped region having no crimped parts.
 4. The filter according to claim 1,
wherein the sheet has a second crimped region in a region of the sheet adjacent to the first crimped region in the longitudinal direction, the second crimped region being formed by performing the crimping treatment to have the crimped parts having a smaller recessed area than a recessed area in a case of the first crimped region.
 5. The filter according to any one of claims 1 to 4,
wherein an area of the first crimped region is smaller than or equal to an area of a region of the sheet adjacent to the first crimped region in the longitudinal direction.
 6. The filter according to any one of claims 1 to 5,

wherein the first crimped region forms a first filling part in the sheet filling part,
a region of the sheet adjacent to the first crimped region in the longitudinal direction forms a second filling part adjacent to the first filling part in the sheet filling part, and
a length of the first filling part in an axial direction is smaller than or equal to a length of the second filling part in the axial direction.
 7. The filter according to any one of claims 1 to 6,

wherein the first crimped region forms a first filling part in the sheet filling part,
a region of the sheet adjacent to the first crimped region in the longitudinal direction forms a second filling part adjacent to the first filling part in the sheet filling part, and
draw resistance of the sheet filling part per unit length in an axial direction in the first filling part is higher than or equal to 1.5 times draw resistance in the second filling part.
 8. The filter according to any one of claims 1 to 7,

wherein the first crimped region forms a first filling part in the sheet filling part,
a region of the sheet adjacent to the first crimped region in the longitudinal direction forms a second filling part adjacent to the first filling part in the sheet filling part, and
the sheet filling part has a plurality of combinations of the first filling part and the second filling part in an axial direction thereof.
 9. The filter according to any one of claims 1 to 8,
wherein at least a subset of the crimped parts is a longitudinal linear recess extending in the longitudinal direction of the sheet.
 10. The filter according to any one of claims 1 to 9,
wherein at least a subset of the crimped parts is a recessed part or a protruding part having a dot shape in plan view of the sheet.
 11. The filter according to any one of claims 1 to 10,
wherein at least a subset of the crimped parts is a lateral linear recess extending in the width direction of the sheet.
 12. The filter according to any one of claims 1 to 11,
wherein the web material is a paper web.
 13. A flavor inhalation article comprising:
the filter according to any one of claims 1 to 12.
 14. The flavor inhalation article according to claim 13,
further comprising: a tubular element.
 15. The flavor inhalation article according to claim 13 or 14, further comprising:
a second filter containing active carbon.
 16. The flavor inhalation article according to any one of claims 13 to 15, further comprising:
a third filter in which a capsule including an additive is disposed.
 17. The flavor inhalation article according to any one of claims 13 to 16, the flavor inhalation article comprising:
a flavor element heated in a non-burning manner.
 18. The flavor inhalation article according to any one of claims 13 to 17, the flavor inhalation article comprising:
a flavor element heated by being burned.
 19. A device for producing a filter used in a flavor inhalation article, the device comprising:

a sheet processing section configured to process a sheet formed of a continuous web material while transporting the sheet through a transport path;

a gathering section configured to perform gathering, in a width direction intersecting a longitudinal direction of the sheet, on the sheet having been processed in the sheet processing section, the gathering being performed, in a transport process of the sheet through the transport path, to form a sheet filling rod having a diameter reduced to a value smaller than or equal to a diameter of the filter;

a wrapping section configured to wrap, with rolled paper, the sheet filling rod having been formed in the gathering section, the wrapping being performed so as to form a filter rod; and a cutting section configured to cut, into the filter, the filter rod having been formed in the wrapping section,

wherein the sheet processing section includes a roller set configured to pinch and transport the sheet with a first roller and a second roller through the transport path,

protruding parts are formed in the first roller, the protruding parts protruding in parts of an outer circumferential surface of the first roller in a circumferential direction,

recessed parts are formed in parts of an outer circumferential surface of the second roller in the circumferential direction in the second roller, the recessed parts to be engaged with the protruding parts,

the roller set forms engagement parts where the protruding parts and the recessed parts are engaged with each other with the sheet interposed between the protruding parts and the recessed parts when the sheet is pinched and transported, the roller set having first engagement regions in partial regions of the outer circumferential surfaces in circumferential directions, a predetermined number of the engagement parts being formed in the first engagement regions, and

the first engagement regions form a first crimped region having a predetermined number of crimped parts corresponding to the engagement parts in number when a crimping treatment is performed on a partial region of the sheet in the longitudinal direction.

- 20.** The device for producing a filter according to claim 19,

wherein the roller set has second engagement regions in regions of the outer circumferential surfaces adjacent to the first engagement regions in the circumferential directions of the out-

er circumferential surfaces, the second engagement regions having a smaller number of engagement parts than a number of engagement parts in a case of the first engagement regions, and

the second engagement regions form a second crimped region having a smaller number of the crimped parts than a number of the crimped parts in a case of the first crimped region when the crimping treatment is performed on a region of the sheet adjacent to the first crimped region in the longitudinal direction.

- 21.** The device for producing a filter according to claim 19,

wherein the roller set has non-engagement regions having no engagement parts in regions of the outer circumferential surfaces adjacent to the first engagement regions in the circumferential directions of the outer circumferential surfaces, and

the non-engagement regions form a non-crimped region in a region of the sheet adjacent to the first crimped region in the longitudinal direction, the non-crimped region having no crimped parts.

- 22.** The device for producing a filter according to claim 19,

wherein the roller set has second engagement regions in regions of the outer circumferential surfaces adjacent to the first engagement regions in the circumferential directions of the outer circumferential surfaces, the second engagement regions having a smaller engagement area in the engagement parts than an engagement area in a case of the first engagement regions, and

the second engagement regions form a second crimped region having crimped parts having a smaller recessed area than a recessed area in a case of the first crimped region when the crimping treatment is performed on a region of the sheet adjacent to the first crimped region in the longitudinal direction.

- 23.** The device for producing a filter according to any one of claims 19 to 22,

wherein an area of the first engagement regions is smaller than or equal to an area of regions of the outer circumferential surfaces adjacent to the first engagement regions.

- 24.** A method for producing a filter used in a flavor inhalation article, the method comprising the steps of:

processing a sheet formed of a continuous web material while transporting the sheet;
 in a transport process of the sheet, performing gathering, in a width direction intersecting a longitudinal direction of the sheet, on the sheet having been processed in the processing of the sheet, the gathering being performed to form a sheet filling rod having a diameter reduced to a value smaller than or equal to a diameter of the filter;
 wrapping the sheet filling rod having been formed in the performing of the gathering with rolled paper to form a filter rod; and
 cutting, into the filter, the filter rod having been formed in the wrapping,
 wherein, in the transport process of the sheet in the processing of the sheet, crimping processing is performed to form a first crimped region having a predetermined number of crimped parts by performing a crimping treatment on a partial region of the sheet in a longitudinal direction of the sheet.

25. The method for producing a filter according to claim 24,
 wherein, in the crimping processing, a second crimped region having a smaller number of the crimped parts than a number of the crimped parts in a case of the first crimped region is formed by performing the crimping treatment on a region of the sheet adjacent to the first crimped region in the longitudinal direction.
26. The method for producing a filter according to claim 24,
 wherein, in the crimping processing, a second crimped region having the crimped parts having a smaller recessed area than a recessed area of the crimped parts in a case of the first crimped region is formed by performing the crimping treatment on a region of the sheet adjacent to the first crimped region in the longitudinal direction.
27. The method for producing a filter according to any one of claims 24 to 26,

wherein, in the processing of the sheet, a roller set configured to pinch and transport the sheet with a first roller and a second roller through the transport path is used to perform the crimping processing,
 wherein the filter having been formed in the cutting has a sheet filling part formed by cutting the sheet filling rod,
 the first crimped region forms a first filling part in the sheet filling part, and
 a region of the sheet adjacent to the first crimped region in the longitudinal direction forms a sec-

ond filling part adjacent to the first filling part in the sheet filling part, and
 wherein the method further includes the steps of inspecting a ratio between lengths of the first filling part and the second filling part in an axial direction,
 determining whether the ratio having been inspected in the inspecting is a predetermined first threshold, and
 controlling, when it is determined that the ratio is not the first threshold in the determining, a rotation speed of at least one of the first roller and the second roller in the crimping processing based on a difference between the ratio and the first threshold.

FIG. 1

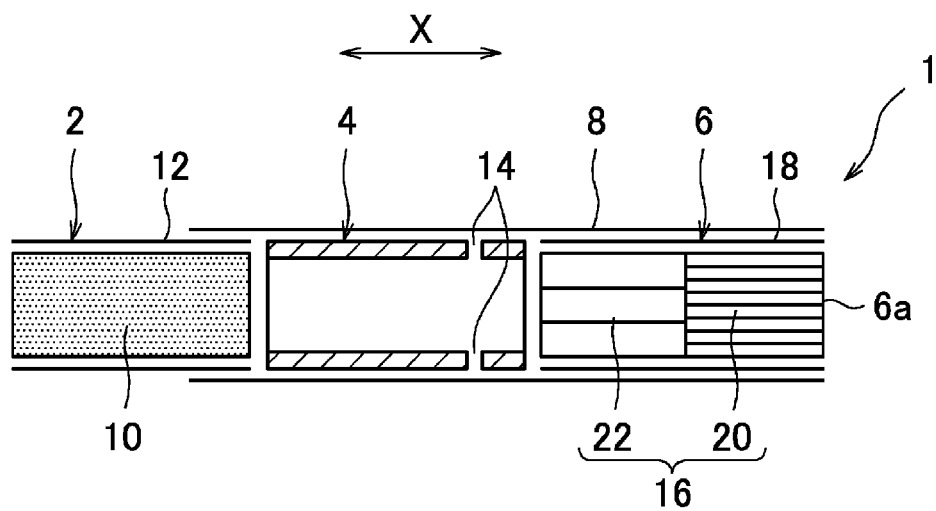


FIG. 2

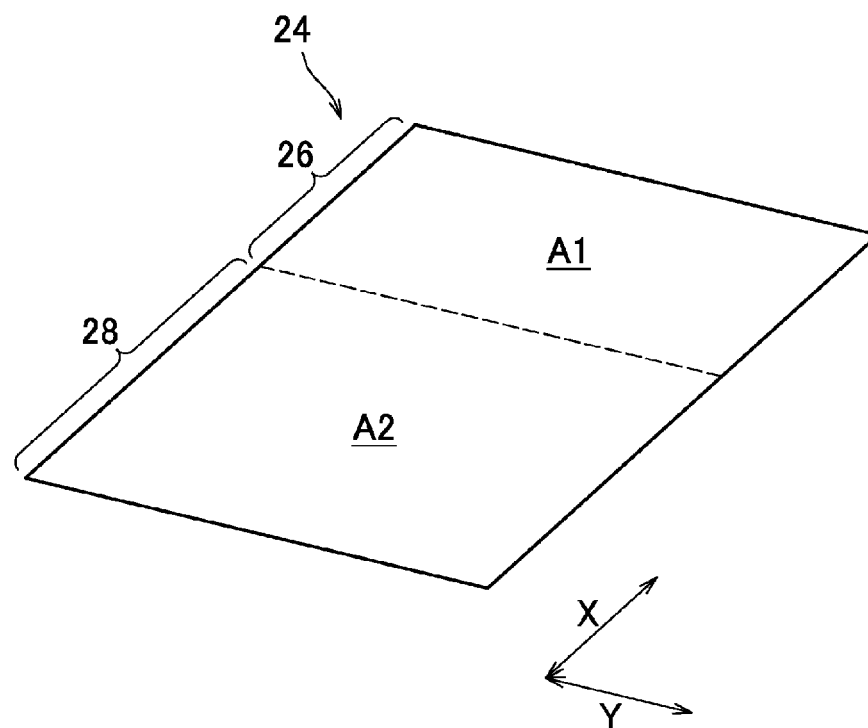


FIG. 3

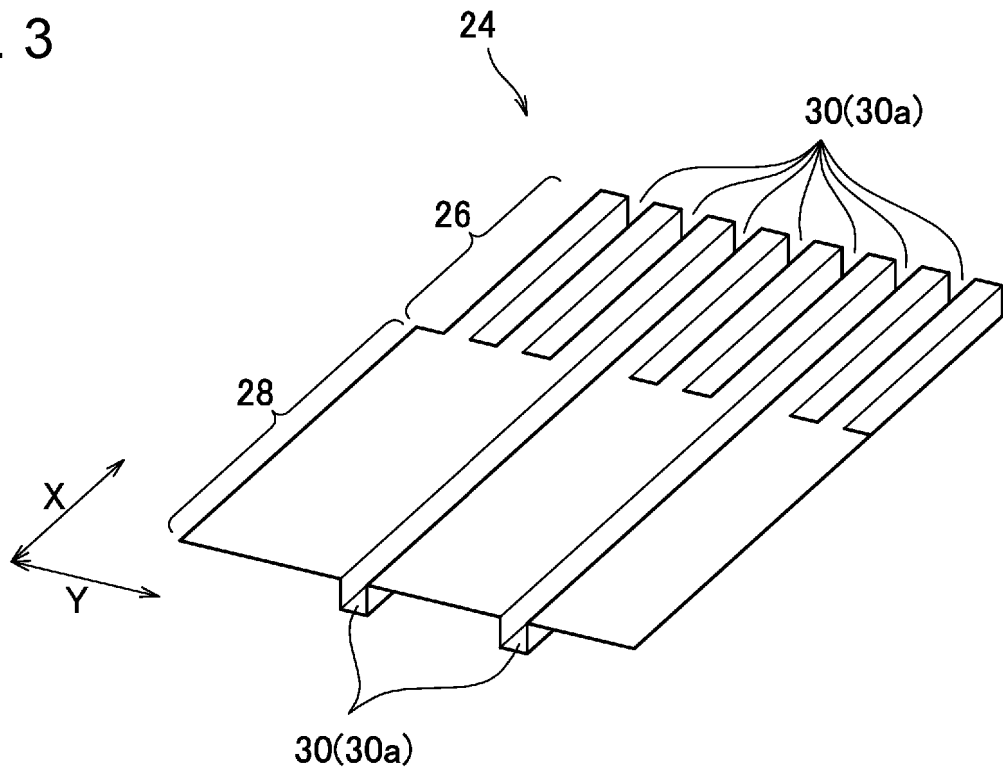


FIG. 4

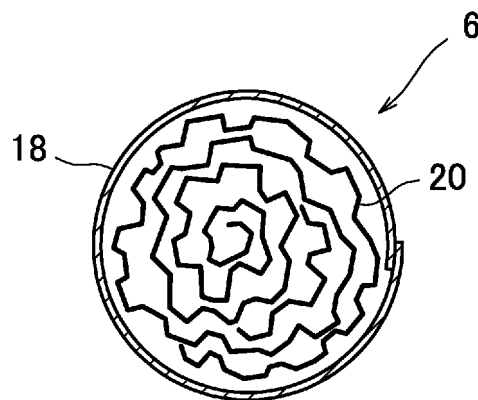


FIG. 5

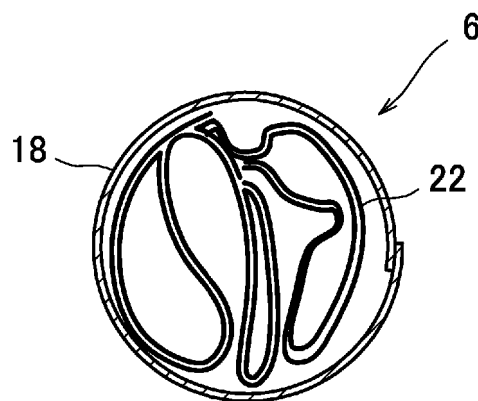


FIG. 6

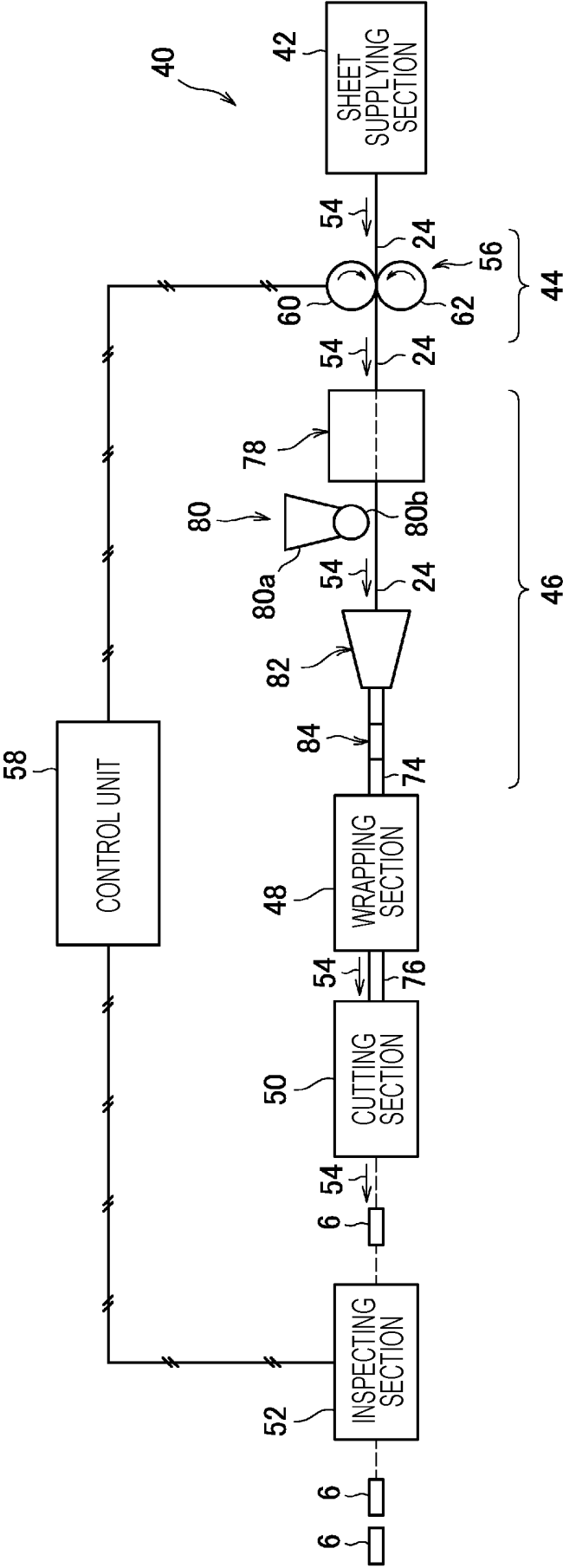


FIG. 7

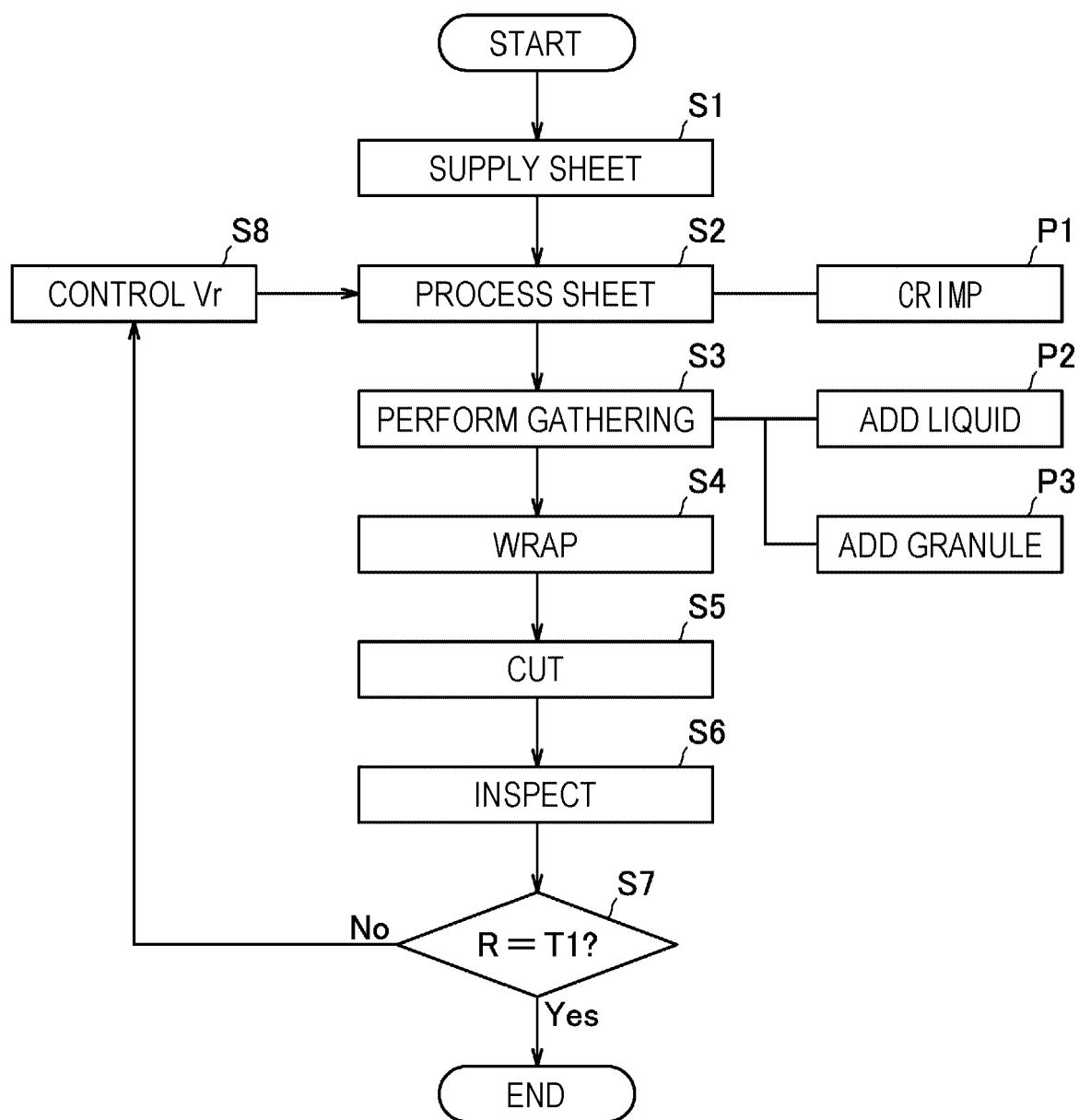


FIG. 8

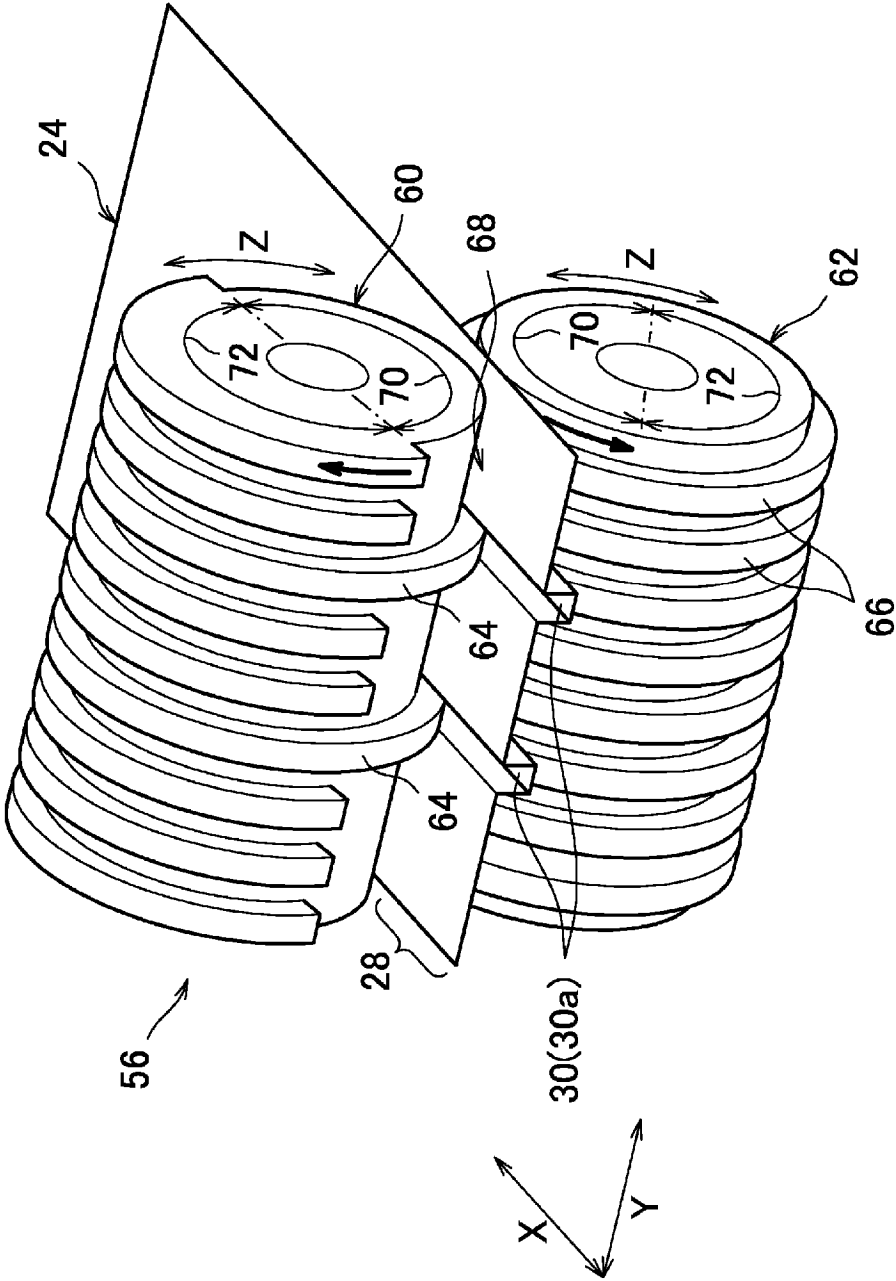


FIG. 9

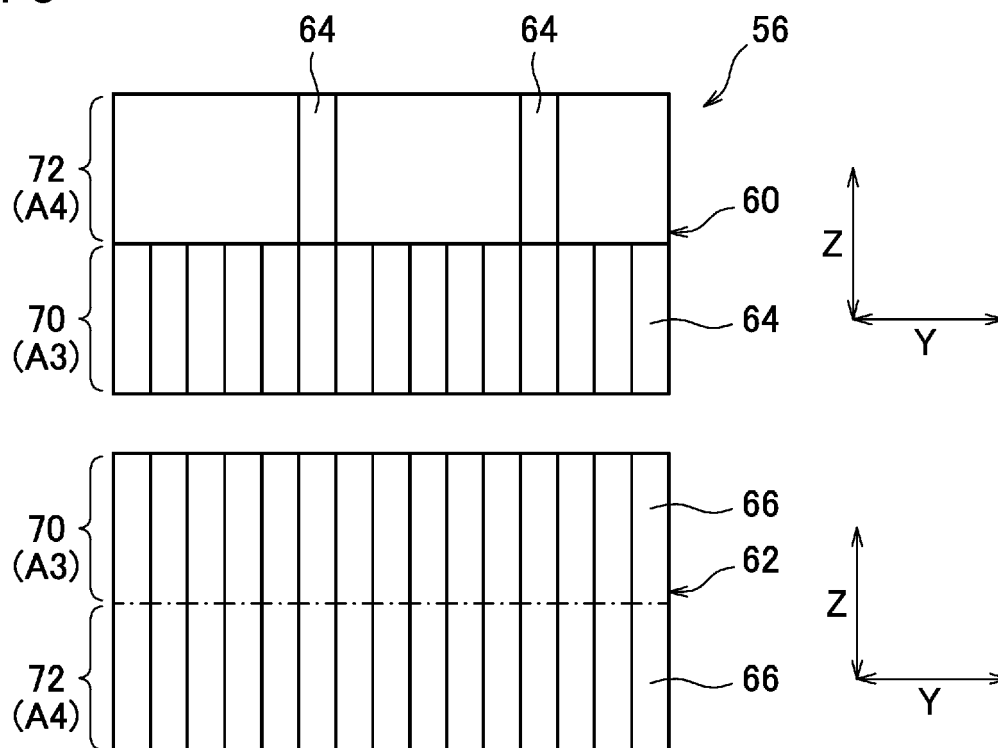


FIG. 10

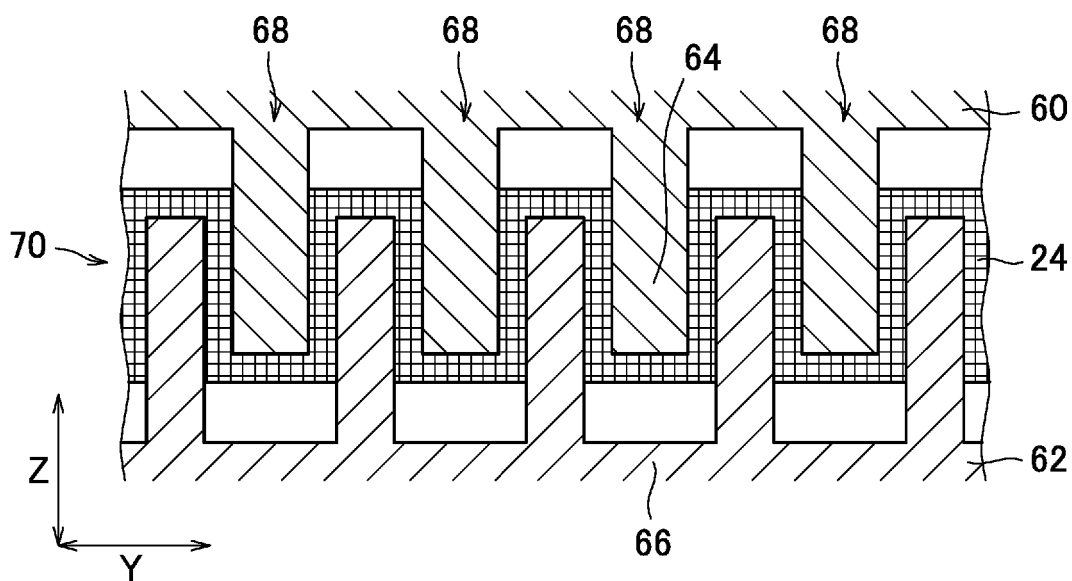


FIG. 11

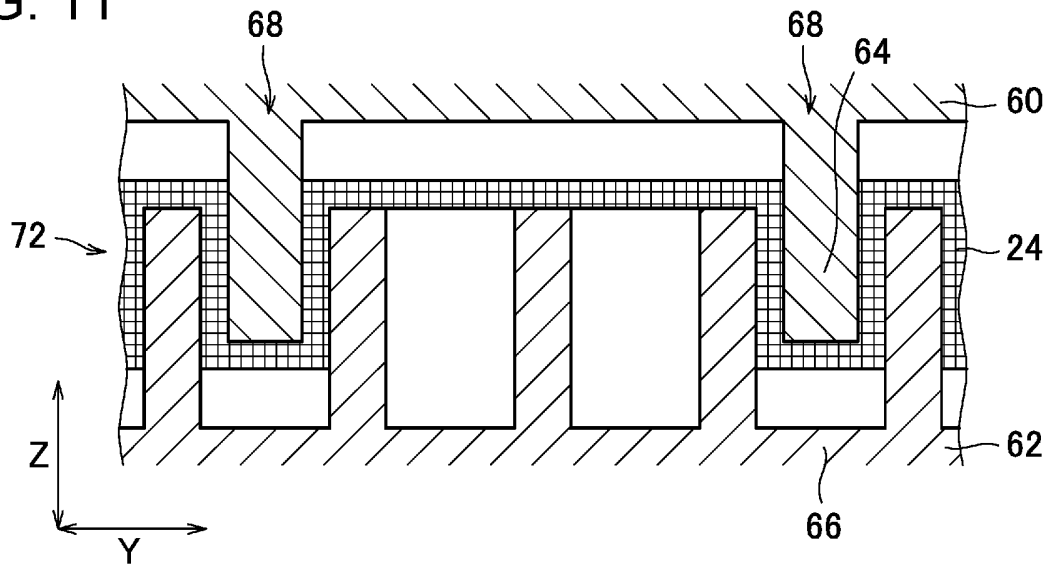


FIG. 12

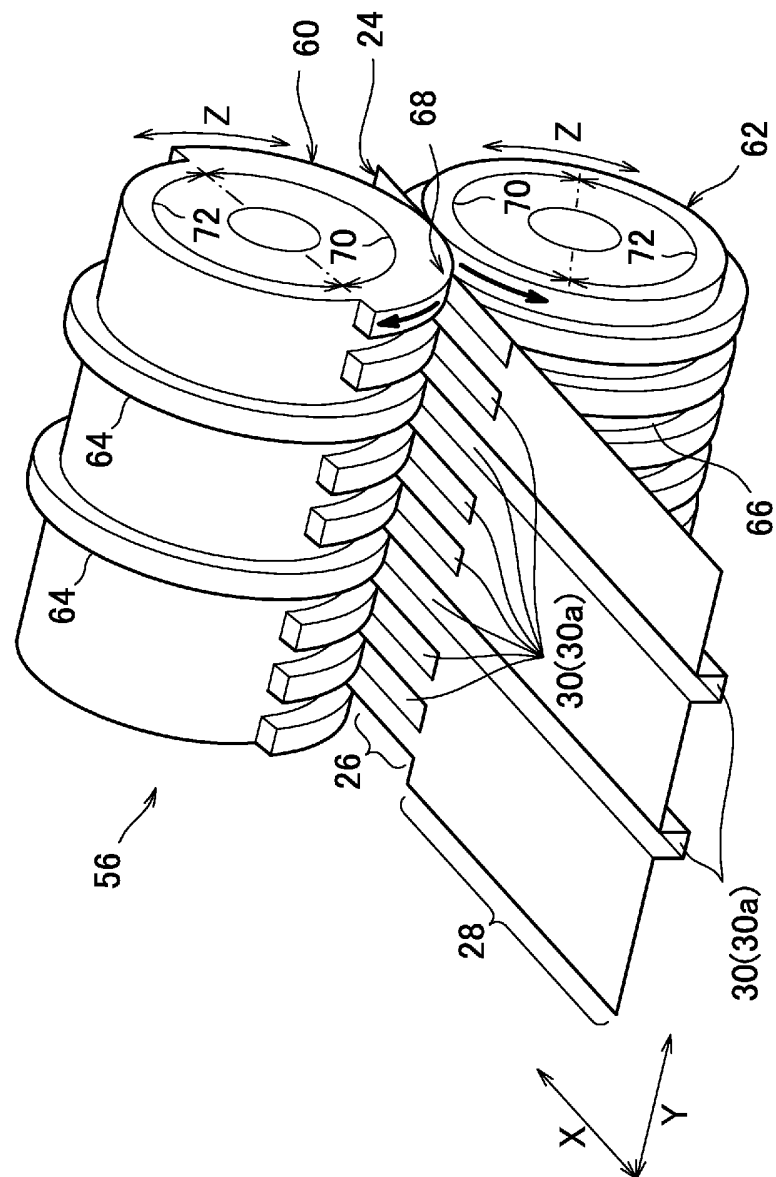


FIG. 13

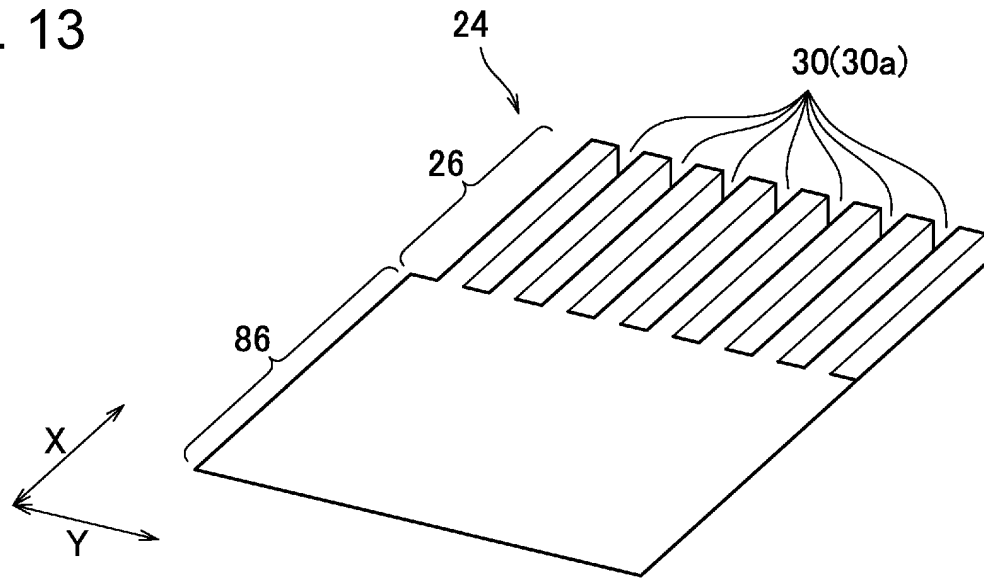


FIG. 14

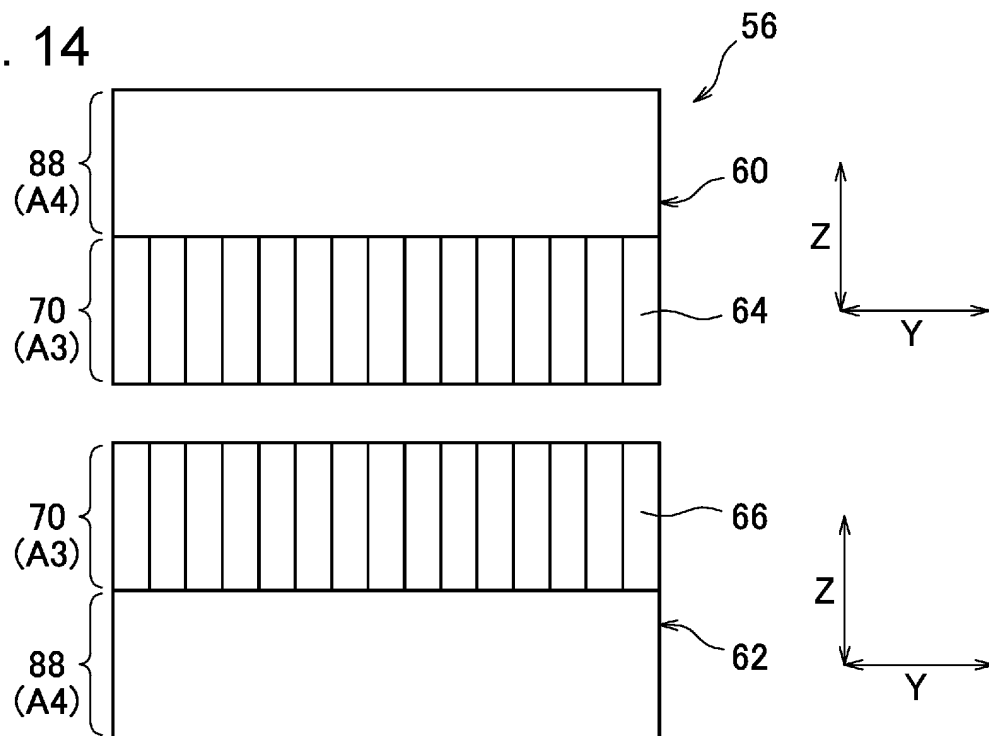


FIG. 15

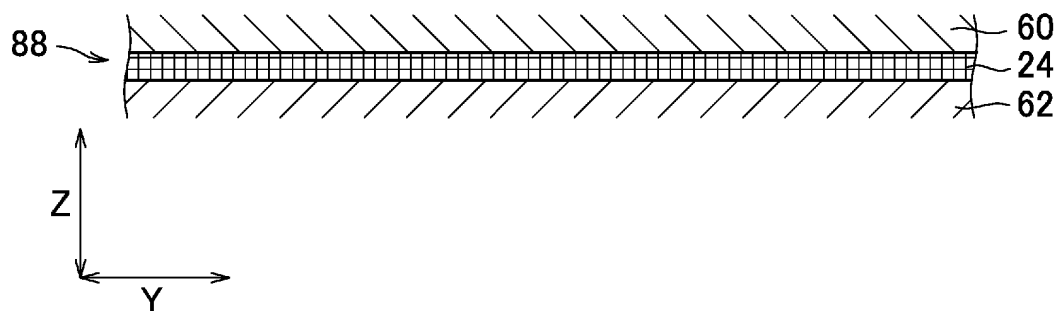


FIG. 16

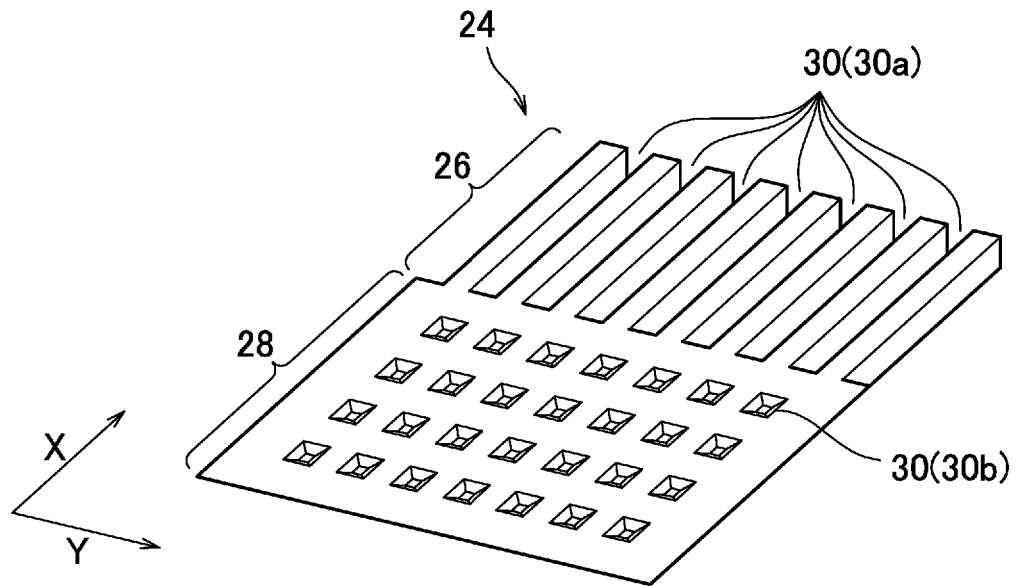


FIG. 17

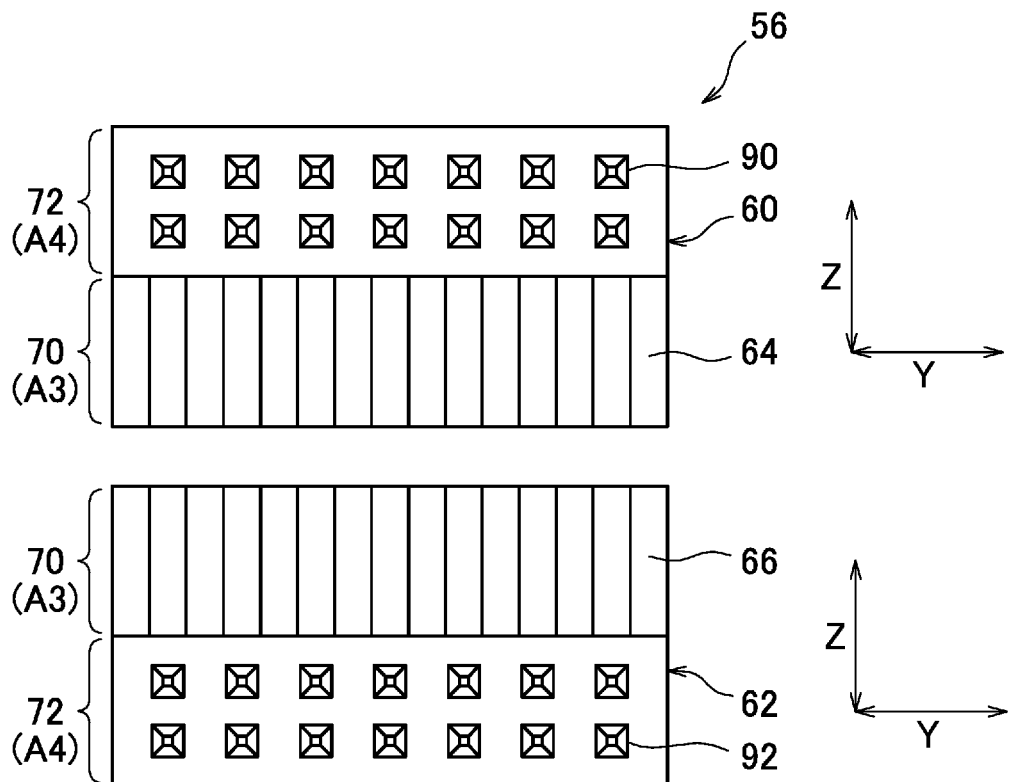


FIG. 18

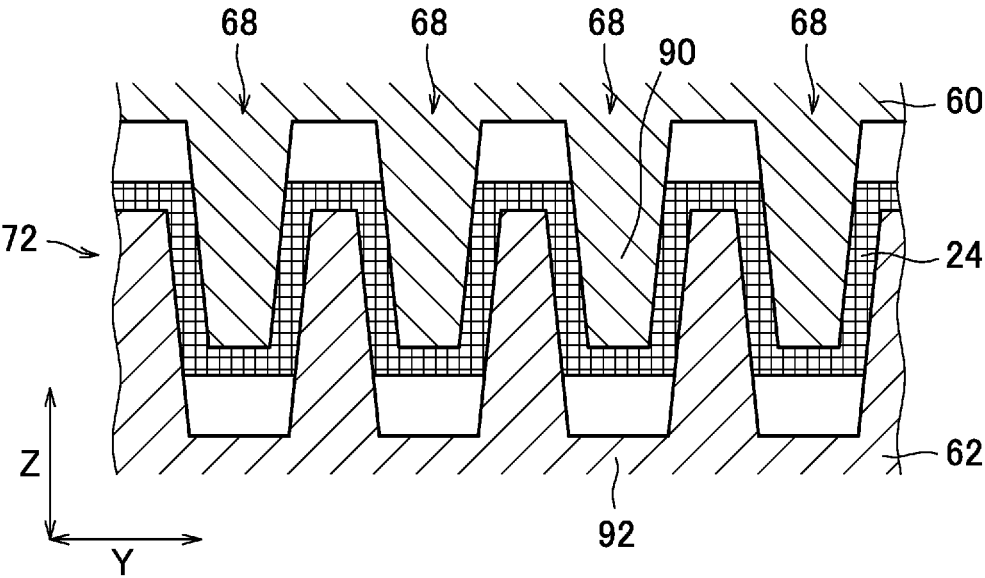


FIG. 19

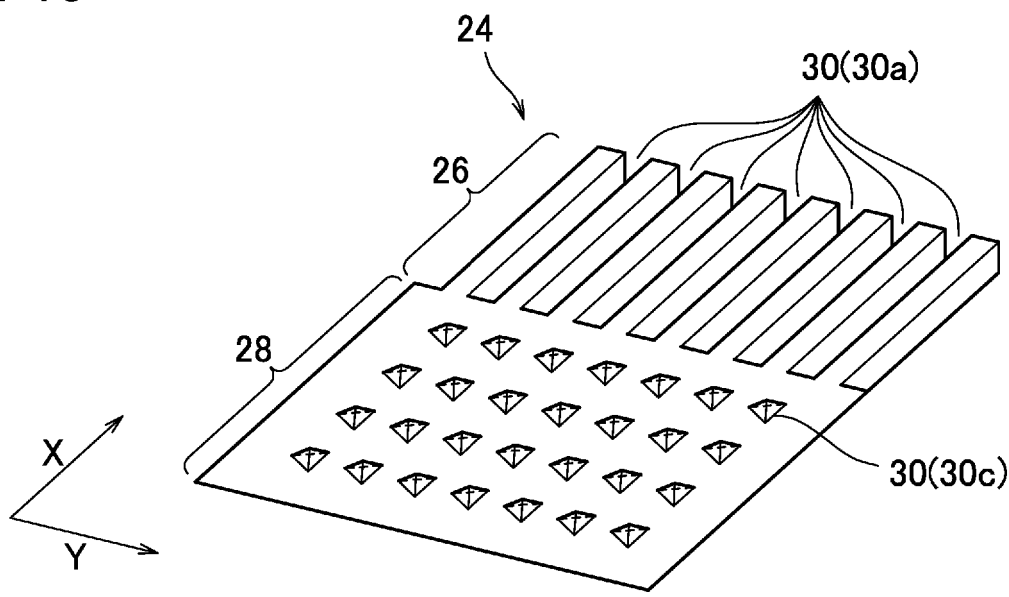


FIG. 20

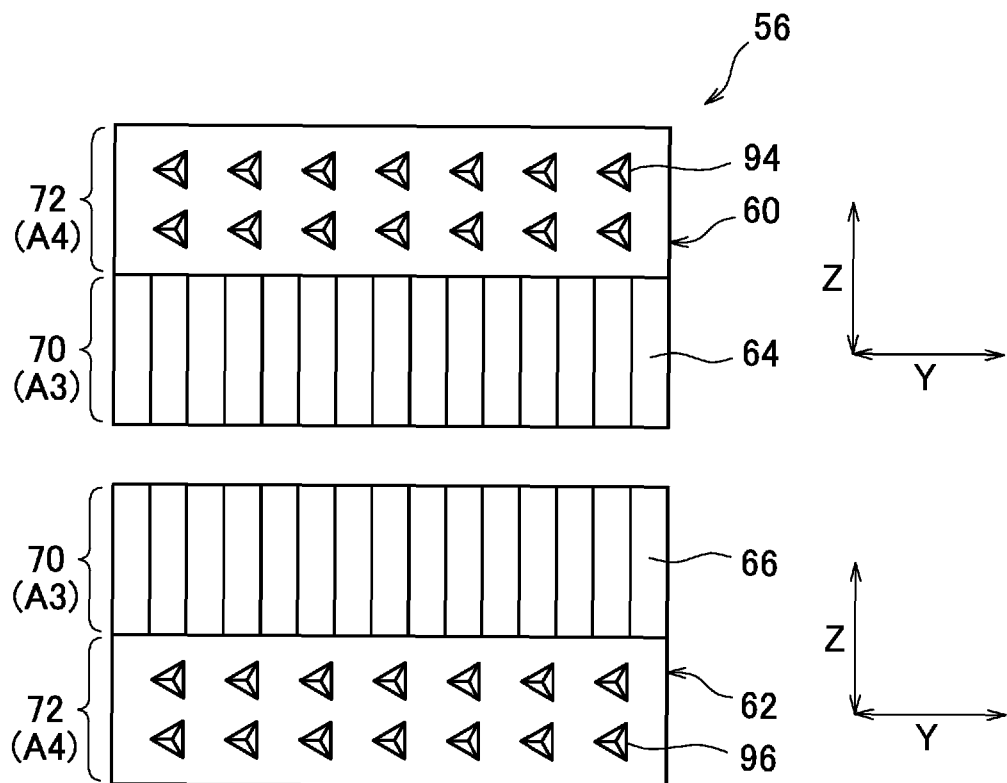


FIG. 21

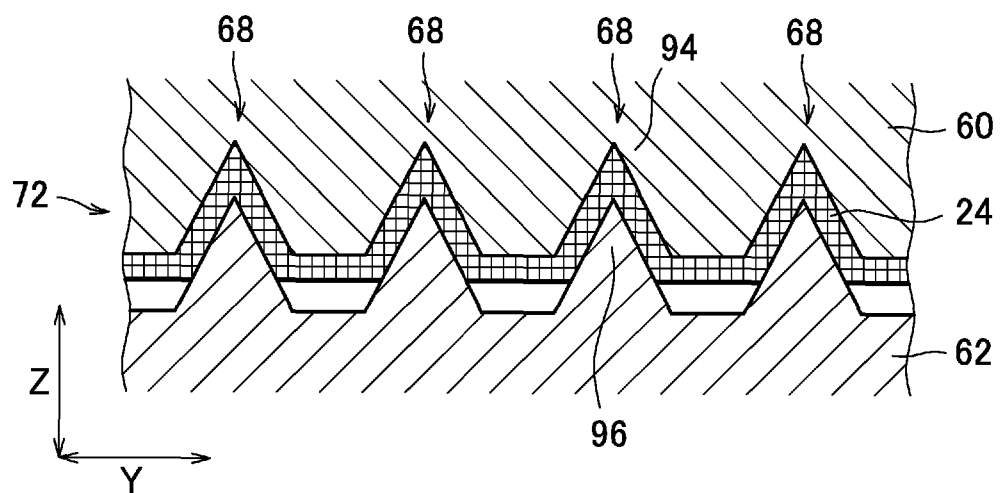


FIG. 22

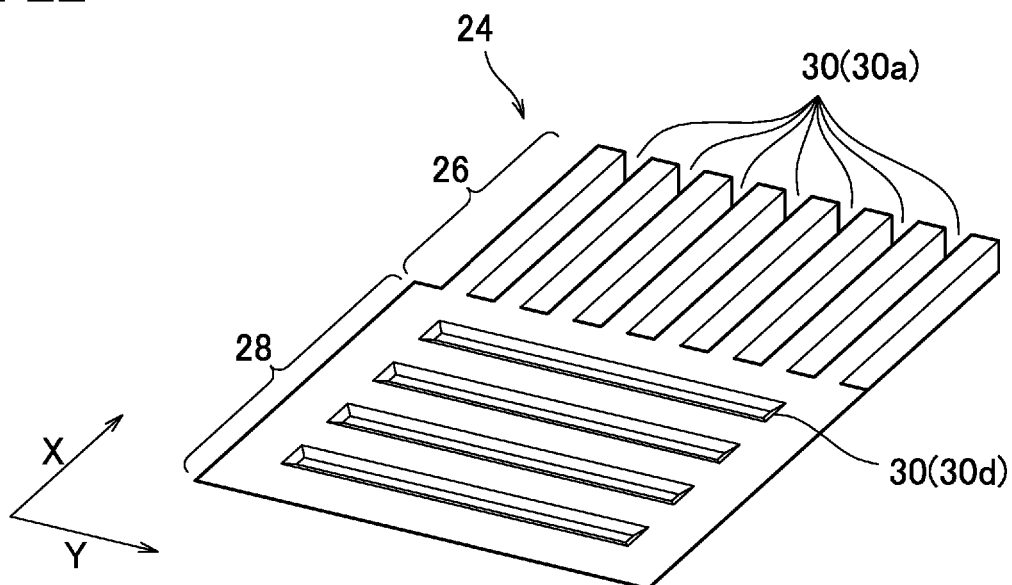


FIG. 23

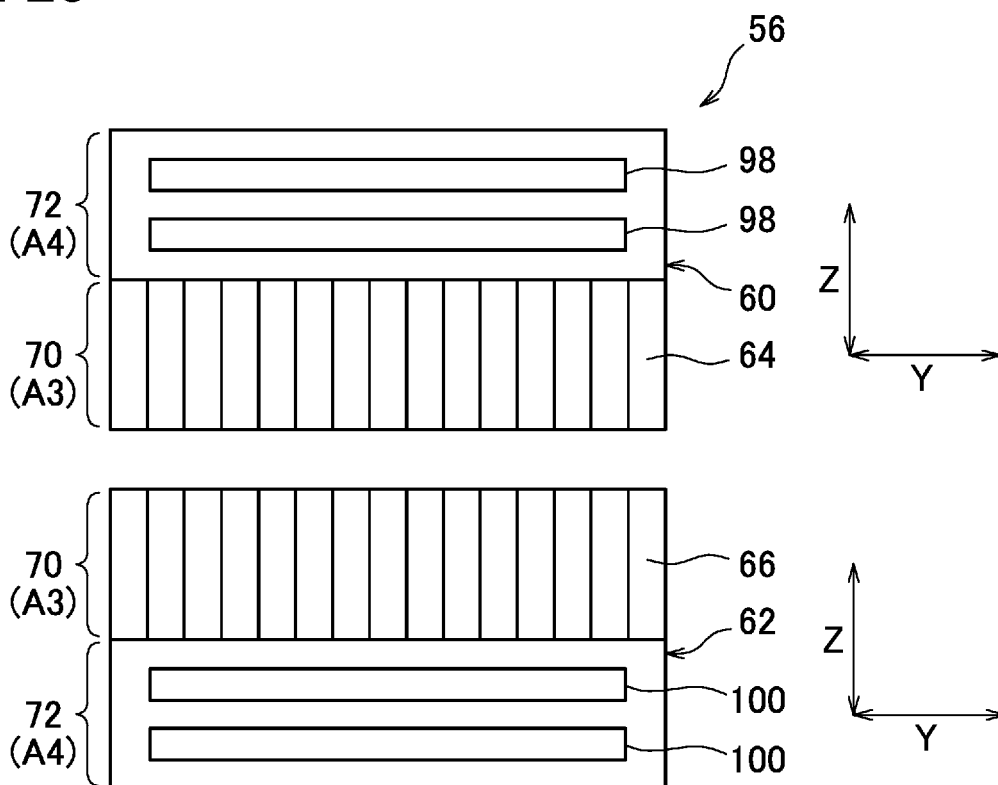


FIG. 24

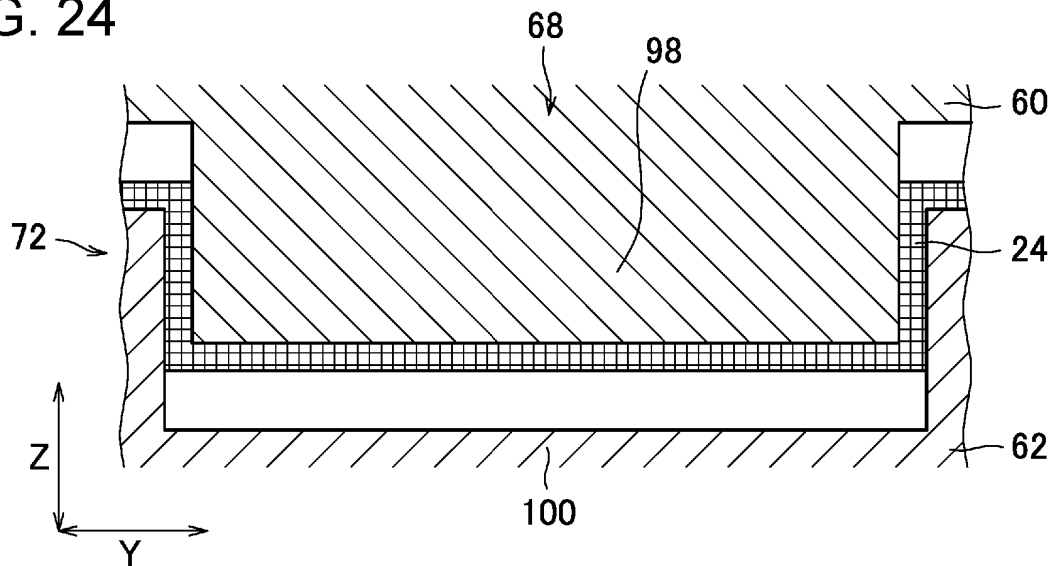


FIG. 25

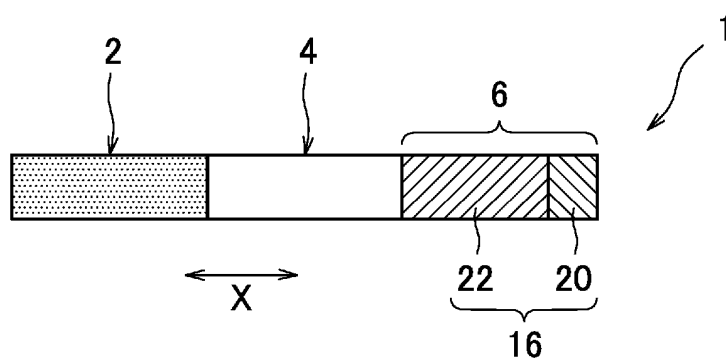


FIG. 26

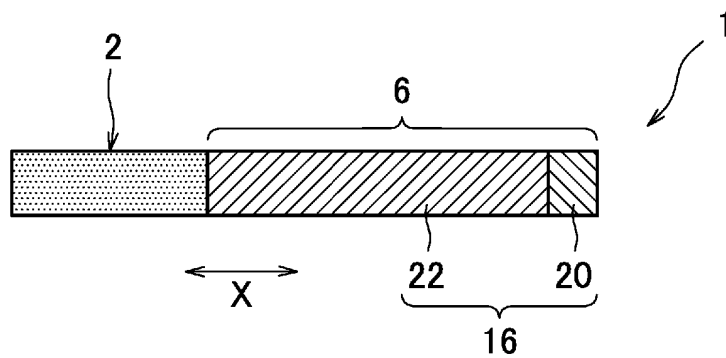


FIG. 27

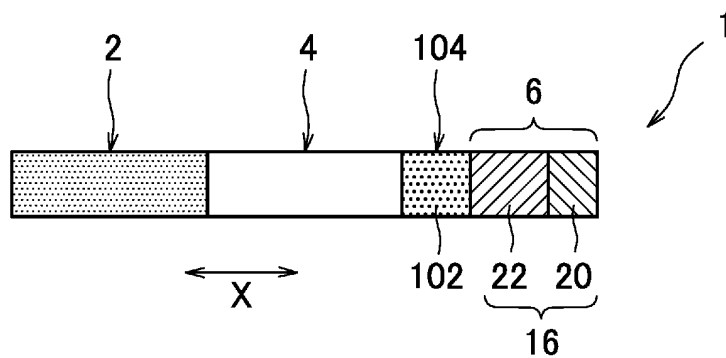


FIG. 28

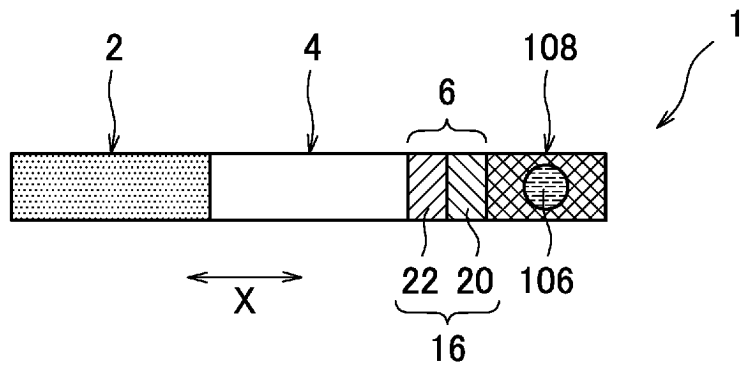


FIG. 29

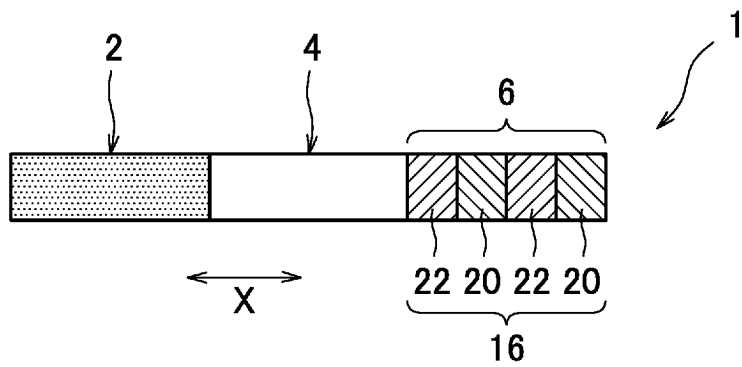


FIG. 30

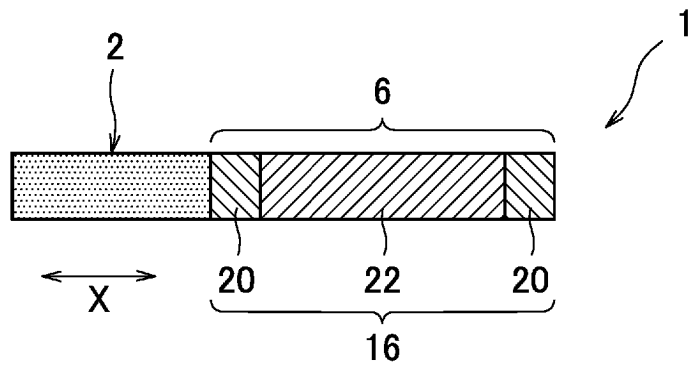


FIG. 31

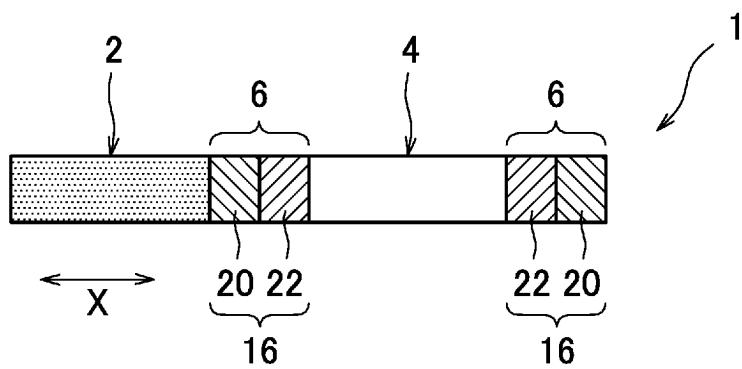


FIG. 32

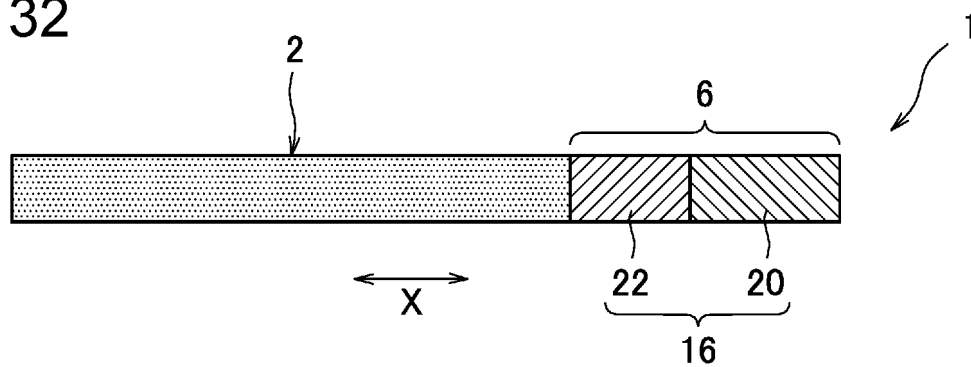


FIG. 33

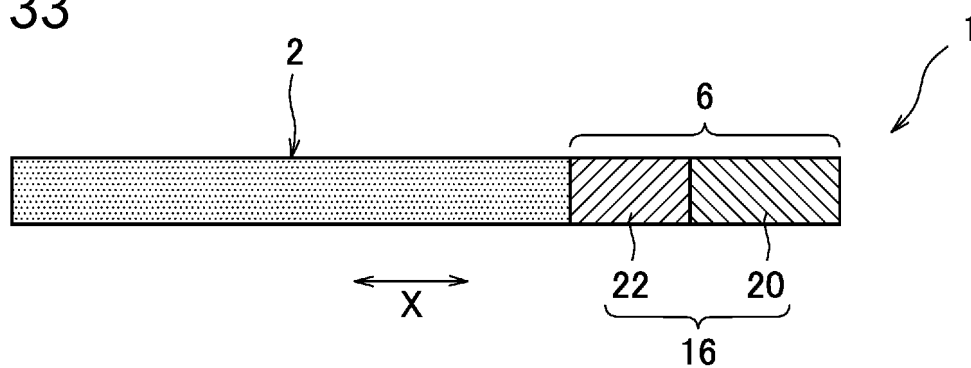


FIG. 34

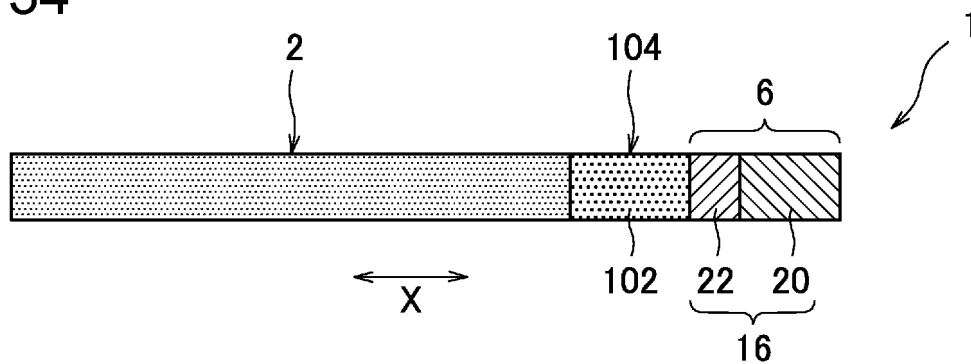
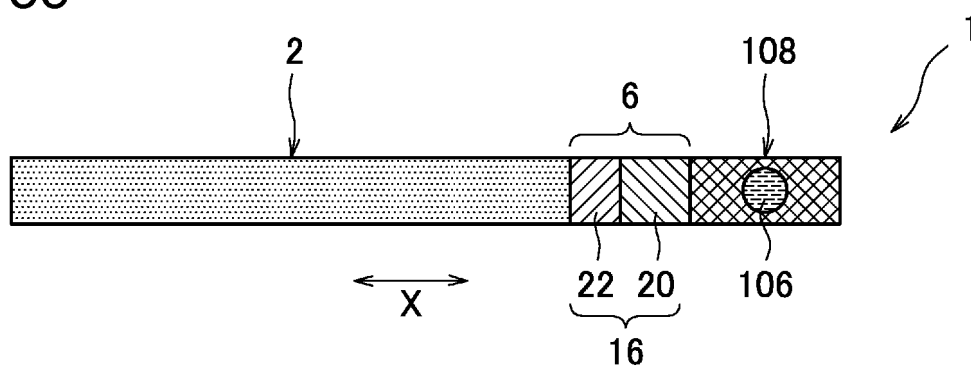


FIG. 35



INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/045134

A. CLASSIFICATION OF SUBJECT MATTER

A24D 3/02(2006.01)i; A24D 3/04(2006.01)i; A24D 3/17(2020.01)i
 FI: A24D3/04; A24D3/17; A24D3/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

A24D3/02; A24D3/04; A24D3/17; A24C5/34

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Published examined utility model applications of Japan 1922-1996
 Published unexamined utility model applications of Japan 1971-2022
 Registered utility model specifications of Japan 1996-2022
 Published registered utility model applications of Japan 1994-2022

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 8-120517 A (DAICEL CHEM IND LTD) 14 May 1996 (1996-05-14) paragraphs [0057]-[0058]	1
Y		2-18
Y	JP 2020-516236 A (PHILIP MORRIS PRODUCTS SA) 11 June 2020 (2020-06-11) paragraphs [0101]-[0112], fig. 3	2-18, 20-23, 25-26
A		27
X	JP 2016-528909 A (PHILIP MORRIS PRODUCTS SA) 23 September 2016 (2016-09-23) paragraphs [0072]-[0075], fig. 3	19, 24
Y		6-18, 20-23, 25-26
A		27
Y	JP 2015-506680 A (PHILIP MORRIS PRODUCTS SA) 05 March 2015 (2015-03-05) paragraph [0040], fig. 2	11-18
Y	JP 2017-163847 A (JAPAN TOBACCO INC) 21 September 2017 (2017-09-21) paragraphs [0024], [0047]-[0048], fig. 6	14-18

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

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Date of the actual completion of the international search

13 January 2022

Date of mailing of the international search report

01 February 2022

Name and mailing address of the ISA/JP

Japan Patent Office (ISA/JP)
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 Japan

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2021/045134

C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 2017-529829 A (PHILIP MORRIS PRODUCTS SA) 12 October 2017 (2017-10-12) paragraphs [0002]-[0004]	17-18
A	EP 3654275 A1 (XEPICS SA) 20 May 2020 (2020-05-20) paragraphs [0071]-[0082], fig. 5	27

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/JP2021/045134

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
JP 8-120517 A	14 May 1996	US 5692527 A column 9, lines 24-44	
		EP 711512 A2	
		CN 1132052 A	
JP 2020-516236 A	11 June 2020	US 2020/0337361 A1 paragraphs [0109]-[0120], fig. 3	
		WO 2018/189325 A1	
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		KR 10-2019-0134640 A	
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