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(71) Applicant: **Japan Tobacco Inc.**
**Tokyo 105-6927 (JP)**

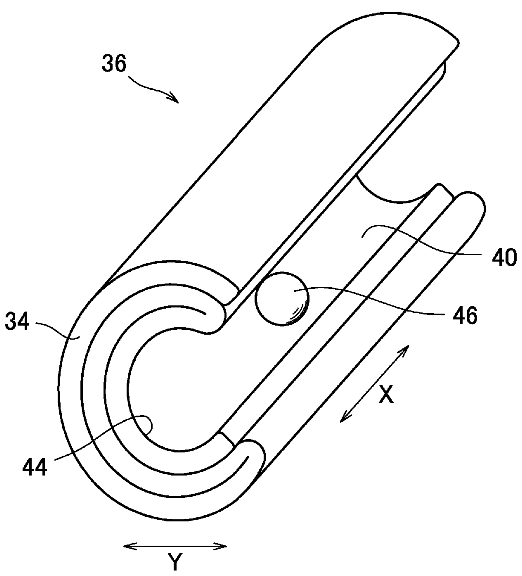
(72) Inventors:
- **IKEDA, Junichiro**
  **Tokyo 130-8603 (JP)**
- **SHIOYA, Yosuke**
  **Tokyo 130-8603 (JP)**

(74) Representative: **Hoffmann Eitle**
**Patent- und Rechtsanwälte PartmbB**
**Arabellastraße 30**
**81925 München (DE)**

(54) **FILLER ELEMENT, FILLER ELEMENT MANUFACTURING METHOD, AND FILLER ELEMENT MANUFACTURING DEVICE**

(57) This filler element 6 is used in a flavor inhaler 1, and comprises: a folded part 36 in which one sheet 34 composed of a nonwoven fabric has been folded in the width direction Z intersecting the longitudinal direction X thereof, and the diameter thereof has been reduced to a size not greater than the diameter of the filler element 6; and wrapping paper 18 that is wrapped on the folded part 36. A section of the folded part 36 in the circumferential direction thereof has an opening 40 that is open along the axial direction X of the folded part 36, and a capsule 46 encapsulating an additive is placed on the interior of the folded part 36 via the opening 40.

FIG. 15

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## Description

### Technical Field

**[0001]** The present invention relates to a filler element, a filler element manufacturing method, and a filler element manufacturing device.

### Background Art

**[0002]** A manufacturing method for manufacturing a filter element used in a cigarette is disclosed in PTL 1. This filter element is formed by causing two or more sheets having a filtering function as a filter material to overlap each other while being shifted from each other by a certain width, folding the overlapping sheets into an S shape or a Z shape, and then, drawing and wrapping the sheets into a circular pillar shape.

### Citation List

### Patent Literature

**[0003]** PTL 1: Japanese Examined Patent Application Publication No. 44-3727

### Summary of Invention

### Technical Problem

**[0004]** In addition to burning heating-type flavor inhalers including the cigarette described in PTL 1, the filter element can be used in a non-burning heating-type flavor inhaler. A filling density of the filter material filled into the filter element exerts a significant influence on an airflow resistance generated when a user inhales a flavor inhaler, and further, on a smoke taste that can be obtained by the user. When the filling density of the filter element reduces, gaps or cavities are generated in the filter element. This significantly impairs the smoke taste and the appearance of the flavor inhaler. That is, the filling density of the filter element is an important factor for ensuring the quality of the flavor inhaler.

**[0005]** According to the manufacturing method described in PTL 1, when the specifications of the flavor inhaler and the filter element used in the flavor inhaler are changed, the following operation is required to adjust the filling density of the filter element: preparing a plurality of sheets and varying the number of the sheets; adjusting a shifting width of the overlapping sheets, or changing the specifications of the sheet itself.

**[0006]** As described above, with the related art, there are various parameters for controlling the filling density of the filter element formed by filling the sheet, in other words, a filler element used in the flavor inhaler. Thus, it is difficult to easily and highly accurately control the filling density of the filler element in accordance with the required specifications. According to the manufacturing method described in PTL 1, no particular consideration is made to placement, in the filler element, of a capsule in which an addition agent is encapsulated. Accordingly, it is difficult to place the capsule in an appropriate position in the filler element while the filling density of the filler element is optimized.

**[0007]** The present invention is made in view of such problems, and an object of the present invention is to provide a filler element, a filler element manufacturing device, and a filler element manufacturing method with which the filling density can be easily and highly accurately controlled and a capsule can be placed in an appropriate position in the filler element.

### Solution to Problem

**[0008]** In order to achieve the above-described object, a filler element according to an aspect is used in a flavor inhaler and includes a folded part formed by folding a single sheet formed of a nonwoven fabric in a width direction intersecting a longitudinal direction of the sheet such that the folded part has a diameter reduced to a value smaller than or equal to a diameter of the filler element; and wrapping paper wrapped around the folded part. The folded part has an opening open in an axial direction of the folded part at part in a circumferential direction of the folded part. A capsule in which an addition agent is encapsulated is placed inside the folded part through the opening.

**[0009]** A filler element manufacturing device according to an aspect is a manufacturing device for manufacturing a filler element used in a flavor inhaler. The filler element manufacturing device includes a sheet processing section configured to process a single sheet formed of a nonwoven fabric while transporting the sheet through a transport path, a folding section configured to fold, in a transport process of the sheet through the transport path, the sheet in a width direction intersecting a longitudinal direction of the sheet, the sheet having been processed in the sheet processing section, thereby to form a folded rod such that the folded rod has a diameter reduced to a value smaller than or equal to a diameter of the filler element, a wrapping section configured to wrap, with wrapping paper, the folded rod having been formed in the folding section, thereby to form a filler rod, and a cutting section configured to cut, into the filler element, the filler rod having been formed in the wrapping section. In a process of folding the sheet, the folding section forms an opening open in an axial direction of the folded rod at part in a circumferential direction of the folded rod. The folding section includes a capsule supplying unit configured to supply, into the folded rod through the opening, a capsule in which an addition agent is encapsulated.

**[0010]** A filler element manufacturing method according to an aspect is a manufacturing method for manufacturing a filler element used in a flavor inhaler. The filler element manufacturing method includes the steps of processing a single sheet formed of a nonwoven fabric while transporting the sheet, folding, in a transport process of the sheet, the sheet in a width direction intersecting a longitudinal direction of the sheet, the sheet having been processed in the processing of the sheet, thereby to form a folded rod such that the folded rod has a diameter reduced to a value smaller than or equal to a diameter of a filter element, wrapping, with wrapping paper, the folded rod having been formed in the folding, thereby to form a filler rod, and cutting, into the filler element, the filler rod having been formed in the wrapping. In the folding, an opening open in an axial direction of the folded rod is formed at part in a circumferential direction of the folded rod in a process of folding the sheet. Also in the folding, capsule supplying processing is performed to supply, into the folded rod through the opening, a capsule in which an addition agent is encapsulated.

Advantageous Effects of Invention

**[0011]** The filling density of the filler element can be easily and highly accurately controlled, and the capsule can be placed in an appropriate position in the filler element.

Brief Description of Drawings

**[0012]**

[Fig. 1] Fig. 1 is a cross-sectional view of a non-burning heating-type flavor inhaler

[Fig. 2] Fig. 2 is a cross-sectional view of a non-burning heating-type flavor inhaler according to a variant.

[Fig. 3] Fig. 3 is a cross-sectional view of a burning heating-type flavor inhaler.

[Fig. 4] Fig. 4 is a cross-sectional view of a burning heating-type flavor inhaler according to a variant.

[Fig. 5] Fig. 5 is a cross-sectional view of a burning heating-type flavor inhaler according to another variant.

[Fig. 6] Fig. 6 illustrates an end surface of a filler element.

[Fig. 7] Fig. 7 is a perspective view of a sheet on which a process has not been performed.

[Fig. 8] Fig. 8 is a perspective view of the sheet on which a drawing process has been performed.

[Fig. 9] Fig. 9 is a perspective view of the sheet on which a compression process has been performed.

[Fig. 10] Fig. 10 is an enlarged view of part of an end surface of the sheet illustrated in Fig. 9.

[Fig. 11] Fig. 11 is a perspective view of a folded part.

[Fig. 12] Fig. 12 is a perspective view of the filler element formed to have a diameter reduced from a state illustrated in Fig. 11.

[Fig. 13] Fig. 13 is a perspective view of the folded part in which an additive is placed.

[Fig. 14] Fig. 14 is a perspective view of the filler element formed to have the diameter reduced from a state illustrated in Fig. 13.

[Fig. 15] Fig. 15 is a perspective view of the folded part in which a capsule is placed.

[Fig. 16] Fig. 16 is a perspective view of the filler element formed to have the diameter reduced from a state illustrated in Fig. 15.

[Fig. 17] Fig. 17 generally illustrates a manufacturing device for manufacturing the filler element.

[Fig. 18] Fig. 18 is a flowchart explaining a manufacturing method for manufacturing the filler element.

[Fig. 19] Fig. 19 is a perspective view of a first roller set pinching a sheet.

[Fig. 20] Fig. 20 is an enlarged view of part of the cross section of a roller illustrated in Fig. 19.

[Fig. 21] Fig. 21 is a cross-sectional view of the first roller set.

[Fig. 22] Fig. 22 is a cross-sectional view of a second roller set.

[Fig. 23] Fig. 23 is a cross-sectional view of a third roller set.

[Fig. 24] Fig. 24 illustrates an end surface of the sheet having passed through the roller sets illustrated in Figs. 21 to 23.

[Fig. 25] Fig. 25 is a front view of a preliminary folding guide.

[Fig. 26] Fig. 26 is a cross-sectional view of a transport jet.

[Fig. 27] Fig. 27 illustrates an end surface of the transport jet.

[Fig. 28] Fig. 28 is a cross-sectional view of a trumpet guide.

[Fig. 29] Fig. 29 illustrates an end surface of the trumpet guide.

[Fig. 30] Fig. 30 is a cross-sectional view of a tongue.

Description of Embodiments

<Flavor Inhaler>

**[0013]** Fig. 1 illustrates a cross-sectional view of a non-burning heating-type flavor inhaler 1 (hereinafter, also referred to as an inhaler). The inhaler 1 includes a flavor element 2, a tubular element 4, and a filler element 6 in order from the left side (a distal end side of the inhaler 1) of the page of Fig. 1. The flavor element 2 is formed by filling a flavor material 8.

**[0014]** The device (flavor inhaler) used to heat the flavor element 2 includes a heater 10 having, for example, a needle shape. Only the heater 10 of the device is illustrated in Fig. 1. Heating is performed by setting the inhaler 1 in the device and inserting the flavor element 2 into the heater 10. Thus, a flavor component of the flavor material 8 is volatilized and dispersed.

**[0015]** A conductive member such as a metal plate or a metal particle may be mixed in the flavor material 8 filled in the flavor element 2. The conductive member is heated by an induced current when a magnetic field is generated by the device, and the heated conductive member heats the flavor element 2 so as to volatilize and disperse the flavor component of the flavor material 8.

**[0016]** The flavor material 8 is, for example, shredded tobacco, a cut cigarette sheet, or a cigarette sheet folded into a gathered shape. The flavor material 8 may be a sheet which is formed from pulp not containing tobacco and to which a flavor is added, a sheet which is formed of a non-tobacco plant and cut, or one of these sheets folded into a gathered shape. A circumferential surface of the flavor material 8 is wrapped with wrapping paper 12.

**[0017]** The tubular element 4 defines an airflow channel in the inhaler 1 and is formed from a paper tube 14 having, for example, a cylindrical shape. The paper tube 14 is formed of a single or double paper web. The filler element 6 is a filtering body filled with a filler material 16. The filler material 16 is formed by folding a single sheet 34 made of a nonwoven fabric. A circumferential surface of the filler element 6 is wrapped with wrapping paper 18.

**[0018]** The elements 2, 4, and 6 are coaxially arranged so as to butt against each other in an axial direction X to form a continuous body. The elements 2, 4, and 6 are connected to each other when tipping paper 20 is wrapped around a circumferential surface of the continuous body. Air holes 22 are formed in the tubular element 4 and the tipping paper 20 to bring air into the inhaler 1 during inhalation using the inhaler 1. The flavor component of the flavor element 2 and a volatilized component of an addition agent, which will be described later, are cooled by the air brought into the inhaler 1 from outside through the air holes 22, and thereby, aerosolization of these components is promoted.

**[0019]** Fig. 2 illustrates a cross-sectional view of a non-burning heating-type inhaler 1 according to a variant. The inhaler 1 includes the filler element 6 at a position the same as or similar to that illustrated in Fig. 1. The inhaler 1 includes another filler element 6 at a position adjacent to the flavor element 2 on the opposite side of the flavor element 2 from the tubular element 4, that is, at a distal end of the inhaler 1. The filler element 6 at the distal end is connected to the flavor element 2 with wrapping paper 24. The heater 10 penetrates the filler element 6 at the distal end and is inserted into the flavor element 2.

**[0020]** In so doing, the filler element 6 at the distal end suppresses spilling of the flavor material 8 from the flavor element 2 to a base portion of the heater 10. That is, in the inhaler 1, the filler element 6 at the distal end functions as a supporting segment that supports so that the flavor material 8 filled in the flavor element 2 does not spill toward the heater 10. This suppresses contamination, with the spilled flavor material 8, of a portion at or around the base portion of the heater 10 of the device.

**[0021]** Fig. 3 illustrates a cross-sectional view of a burning heating type inhaler 1. The inhaler 1 includes the flavor element 2 and the filler element 6 in order from the distal end side. When the flavor element 2 is ignited and heated, the flavor component of the flavor material 8 is volatilized. Fig. 4 illustrates a cross-sectional view of a burning heating-type inhaler 1 according to a variant. The inhaler 1 includes the flavor element 2, a filter element 26, and the filler element 6 in order from the distal end side. The filter element 26 is formed by wrapping wrapping paper 30 around a filter material 28 different from the filler material 16 of the filler element 6, for example, acetate tow. The filter element 26 is connected to the filler element 6 by using wrapping paper 32.

**[0022]** Fig. 5 illustrates a cross-sectional view of a burning heating-type inhaler 1 according to another variant. This inhaler 1 includes the flavor element 2, the filler element 6, and the filter element 26 in order from the distal end side. This is a pattern in which the arrangement of the filter element 26 and the filler element 6 is changed from that of the inhaler 1 illustrated in Fig. 4, and the other configurations are the same as or similar to those of the inhaler 1 illustrated in Fig. 4.

<Filler Element>

**[0023]** Fig. 6 illustrates an end surface of the filler element 6. The filler material 16 of the filler element 6 is the single sheet 34 that is mainly formed of a dry-type nonwoven fabric formed by bonding pieces of plant pulp to each other with a watersoluble binder. The plant pulp may be wood pulp that is a non-tobacco plant. The sheet 34 may be formed by adding a ground tobacco plant or an extract of a tobacco plant to the nonwoven fabric.

**[0024]** In this case, the flavor component derived from the tobacco plant can be volatilized and dispersed not only from the flavor element 2 but also from the filler element 6. That is, the filler element 6 using the sheet 34 formed of the nonwoven fabric containing ground tobacco or the extract of tobacco has not only the function of a filtering element serving as a filtering body but also the function of the flavor element 2.

**[0025]** When this sheet 34 is folded a predetermined number of times, for example, three or four times in the width direction Z such that the diameter is reduced, a folded rod 90, which will be described later, is formed, and further, a folded part 36 is formed by cutting the folded rod 90. The width direction Z is a direction intersecting a longitudinal direction X of the sheet 34 (coincident with the axial direction X).

**[0026]** The filler element 6 is formed by wrapping a circumferential surface of the folded part 36 with the wrapping paper 18, and both ends of the wrapping paper 18 is wrapped by using glue. When the folded part 36, and further, the filler element 6 are formed by folding the single sheet 34, unlike the related art, none of the following operations for adjusting a filling density of the filler element 6 is required: preparing a plurality of sheets 34 and varying the number of the sheets 34; adjusting a shifting width of the overlapping sheets 34; and changing the specifications of the sheet 34 itself.

**[0027]** Accordingly, compared to the related-art case, the filling density of the filler element 6 can be easily and highly accurately controlled. Furthermore, for the folded part 36, the filling density of the sheet 34 as the filler material 16 can be further optimized by performing a process described below on the sheet 34. Thus, generation of gaps or cavities in the filler element 6 can be more effectively prevented.

**[0028]** Fig. 7 illustrates a perspective view of the sheet 34 on which the process has not been performed. Since the sheet 34 is formed of a nonwoven fabric that has not been woven but intertwined, the sheet 34 has a substantially irreversible drawing property in the longitudinal direction X and has a rising parts 38 at front and rear surfaces thereof. The sheet 34 has a thickness t including the rising parts 38.

<Sheet Drawing Process>

**[0029]** Fig. 8 illustrates a perspective view of the sheet 34 on which a drawing process has been performed. When the drawing process has been performed, the length of the sheet 34 increases in the longitudinal direction X and the thickness t of the sheet 34 reduces to t1 representing a smaller thickness than the thickness t. When the length of the sheet 34 increases in the longitudinal direction X and the surface area of the sheet 34 increases, the density of the rising parts 38 (rising density) on the front and rear surfaces of the sheet 34 reduces. When the degree of drawing of the sheet 34 is adjusted, the thickness and the rising density of the entirety of the sheet 34 can be controlled. Accordingly, the folded part 36, and further, the filler element 6 having a plurality of filling densities can be formed by using the single sheet 34 of a single type.

<Sheet Compression Process>

**[0030]** Fig. 9 illustrates a perspective view of the sheet 34 on which a compression process has been performed. Fig. 10 illustrates an enlarged view of part of an end surface of the sheet 34 illustrated in Fig. 9. The compression process in which at least parts of the sheet 34 in the width direction Z are compressed is performed on the sheet 34. In the sheet 34 illustrated in Fig. 9 serving as an example of a compressed form, as illustrated in Fig. 10, many compressed regions A1 having a width D1 in the width direction Z and many non-compressed regions A2 having a width D2 in the width direction Z are formed in the longitudinal direction X.

**[0031]** The non-compressed regions A2 are regions other than the compressed regions A1 in the sheet 34 and each of the non-compressed regions A2 has incompletely compressed inclined surfaces and a flat surface that has not been compressed at all. When the sum of widths D1 of the compressed regions A1 in the width direction Z where the sheet 34 is compressed is defined as a total compressed width Dt1 of the sheet 34, the percentage of the total compressed width Dt1 with respect to the width of the sheet 34 in the width direction Z, that is, a sheet width Ds is a predetermined percentage. This predetermined percentage is set to be smaller than or equal to 50%.

**[0032]** In the compressed regions A1 of the sheet 34, the thickness t1 reduces to a smaller thickness t2 due to compression. When the rising parts 38 are crushed, the rising density in the compressed regions A1 of the front and rear surfaces of the sheet 34 reduces significantly. Meanwhile, the thickness t1 and the rising density after the drawing process has been performed are substantially maintained in the non-compressed regions A2 of the sheet.

**[0033]** When a formation range of the compressed regions A1 of the sheet 34 is adjusted and the percentage of the total compressed width Dt1 with respect to the sheet width Ds is set to be the predetermined percentage, that is, the degree of compressing the sheet 34 is adjusted, the thickness and the rising density of the entirety of the sheet 34 can be controlled. Accordingly, the folded part 36, and further, the filler element 6 having a plurality of filling densities can be easily formed by using the single sheet 34 of a single type.

**[0034]** Fig. 11 illustrates a perspective view of the folded part 36. Fig. 12 illustrates a perspective view of the filler element 6 formed to have the diameter reduced from the state illustrated in Fig. 11. As a result of folding the sheet 34, the folded part 36 has an opening 40 formed in the axial direction X at part of the folded part 36 in a circumferential direction. When the folded part 36 in which the opening 40 has been formed is wrapped with the wrapping paper 18 after the diameter of the folded part 36 has been reduced, the opening 40 is closed and the filler element 6 illustrated in Fig. 12 is formed.

**[0035]** When the folded part 36 is formed by folding the single sheet 34 as described above, unlike the related art, none of the following operations for adjusting the filling density of the filler element 6 is required: preparing a plurality of sheets 34 and varying the number of the sheets 34; adjusting the shifting width of the overlapping sheets 34; and changing the specifications of the sheet 34 itself.

**[0036]** Accordingly, the filling density of the filler element 6 can be easily and highly accurately controlled. Furthermore, when the number of times of folding the single sheet 34, the form of folding, or the degree of reduction of the diameter of the folded part 36 is adjusted, the filling density of the filler element 6 can be optimized. Accordingly, since generation of gaps or cavities in the filler element 6 can be prevented, the quality of the inhaler 1 can be ensured.

**[0037]** Furthermore, when the drawing process and the compression process are performed on the sheet 34, parameters for controlling the filling density of the filler element 6 are only settings of the degrees of drawing and compressing performed on the single sheet 34. Thus, the filling density of the filler element 6 can be more easily and highly accurately controlled. Furthermore, when the filling density of the filler element 6 is further optimized by the drawing process and the compression process of the sheet 34, the generation of gaps or cavities in the filler element 6 can be more effectively prevented, and accordingly, the reliability in ensuring the quality of the inhaler 1 is improved.

**[0038]** In particular, when the compression process is performed on the sheet 34, the predetermined percentage of the total compressed width Dt1 with respect to the sheet width Ds is set to be smaller than or equal to 50%. In this way, the rising parts 38 can remain in the sheet 34 in a range more than 50% of the sheet width Ds. Accordingly, a significant reduction of the rising density of the sheet 34 is suppressed, and the generation of gaps or cavities in the filler element 6 can be still more reliably prevented.

<Placement of Additive in Folded Part>

**[0039]** Fig. 13 illustrates a perspective view of the folded part 36 in which an additive 42 is placed. The folded part 36 has the opening 40 open in the axial direction X of the folded part 36 at part in the circumferential direction of the folded part 36. The additive 42 is placed inside the folded part 36 through the opening 40. Thus, the additive 42 can be placed in an appropriate position in the filler element 6 while the filling density of the filler element 6 is optimized.

**[0040]** Furthermore, a linear recess 44 having a U-shaped section is formed in the folded part 36. The linear recess 44 is continuous with the opening 40 and recessed to the center of the folded part 36 in a radial direction Y The additive 42 is placed in the axial direction X of the linear recess 44 through the opening 40. Thus, the additive 42 can be reliably placed in the center of the folded part 36 in the radial direction Y

**[0041]** Fig. 14 illustrates a perspective view of the filler element 6 formed to have the diameter reduced from the state illustrated in Fig. 13. When the diameter of the folded part 36 is reduced, and the folded part 36 is wrapped with the wrapping paper 18, the opening 40 is closed. Accordingly, the additive 42 does not extend off the folded part 36, and the filler element 6 in which the additive 42 is placed inside the folded part 36 can be easily and reliably formed. Furthermore, when the diameter of the folded part 36 is reduced, the linear recess 44 in which the additive 42 is placed is filled with the sheet 34.

**[0042]** Thus, the additive 42 is reliably positioned in the center of the folded part 36 in the radial direction Y Furthermore, a component of the additive 42 can be uniformly volatilized and dispersed in the radial direction Y from the center of the filler element 6 in the radial direction Y Accordingly, the reliability of ensuring the quality of the filler element 6, and further, the inhaler 1 is improved. The additive 42 may be an addition agent including a liquid subjected to sorption to the linear recess 44 or a thread placed in the linear recess 44. When the thread is placed, the thread is impregnated with an addition agent including a liquid.

**[0043]** Furthermore, the additive 42 may be a conductive member having a thread shape or an elongated flat plate shape. The filler element 6 using the sheet 34 formed of the nonwoven fabric containing ground tobacco or the extract of tobacco has the function of the flavor element 2. The conductive member is heated by the induced current when the magnetic field is generated by the device, and the heated conductive member heats the filler element 6 so as to volatilize and disperse the flavor component derived from the tobacco plant included in the filler element 6.

<Placement of Capsule in Folded Part>

**[0044]** Fig. 15 illustrates a perspective view of the folded part 36 in which a capsule 46 is placed. An outer shell of the capsule 46 is formed of an easily destructive material, and the addition agent is encapsulated in the outer shell. When the opening 40 is formed in the folded part 36, the capsule 46 can be placed at a predetermined position inside the folded part 36 through the opening 40. The capsule 46 is placed at, for example, a central position in the folded part 36 in the axial direction X.

**[0045]** Fig. 16 illustrates a perspective view of the filler element 6 formed to have the diameter reduced from the state illustrated in Fig. 15. When the diameter of the folded part 36 is reduced, and the folded part 36 is wrapped with the wrapping paper 18, the opening 40 is closed. Accordingly, the capsule 46 does not extend off the folded part 36, and the filler element 6 in which the capsule 46 is placed inside the folded part 36 can be easily and reliably formed. Furthermore, when the diameter of the folded part 36 is reduced, the linear recess 44 is filled with the sheet 34, and the sheet 34 is brought into close contact with a circumference of the capsule 46.

**[0046]** Thus, the capsule 46 is reliably fixed at a predetermined position in the axial direction X in the center of the folded part 36 in the radial direction Y Furthermore, a component of the addition agent released from the capsule 46 can be uniformly volatilized and dispersed in the radial direction Y from the center of the filler element 6 in the radial direction Y Accordingly, the quality of the filler element 6, and further, the inhaler 1 can be ensured.

**[0047]** Furthermore, since the capsule 46 is fixed and in close contact with the sheet 34 in the center of the folded part 36 in the radial direction Y, an operation performed when a user crushes the capsule 46 with the fingers to release the addition agent becomes easy, and accordingly, convenience of the user is improved. Furthermore, the above-described addition agent included in the additive 42 subjected to sorption to the linear recess 44, the above-described addition agent with which the thread is impregnated, and the above-described addition agent encapsulated in the capsule 46 are, for example, a flavor agent such as menthol, and further, may include, for example, active carbon or an aerosol extender.

**[0048]** Instead of the capsule 46, a substantially spherical conductive member may be used. One or a plurality of conductive members are placed in the filler element 6. The filler element 6 using the sheet 34 formed of the nonwoven fabric containing ground tobacco or the extract of tobacco has the function of the flavor element 2. The conductive member is heated by the induced current when the magnetic field is generated by the device, and the heated conductive member heats the filler element 6 so as to volatilize and disperse the flavor component derived from the tobacco plant included in the filler element 6.

<Filler Element Manufacturing Device and Filler Element Manufacturing Method>

**[0049]** Fig. 17 generally illustrates a manufacturing device 50 for manufacturing the filler element 6. Fig. 18 illustrates a flowchart explaining a manufacturing method for manufacturing the filler element 6. The manufacturing device 50 includes a sheet supplying section 52, a sheet processing section 54, a folding section 56, a wrapping section 58, a cutting section 60, and the like.

**[0050]** When manufacturing of the filler element 6 is started, the sheet supplying section 52 supplies the single continuous sheet 34 formed of the nonwoven fabric to a transport path 62 (S1: sheet supplying step). Next, the sheet processing section 54 processes the sheet 34 while transporting the sheet 34 through the transport path 62 (S2: sheet processing step).

**[0051]** The sheet processing section 54 includes a first roller set 64, a second roller set 66, a third roller set 68, and a control unit 70. Each of the roller sets 64, 66, and 68 includes a corresponding one of pairs of rollers Ra and Rb and is configured to transport the sheet 34 while pinching the sheet 34 in the transport path 62 with the pair of rollers Ra and Rb.

**[0052]** A rotation shaft of at least one of the pair of the rollers Ra and Rb included in each of the roller sets 64, 66, and 68 is connected to a drive shaft of a corresponding one of motors (not illustrated) and separately rotated by the motor. The motors are electrically connected to the control unit 70. The rotation speed of each of the roller sets 64, 66, and 68 is controlled through the motor by using a signal from the control unit 70.

**[0053]** The control unit 70 is configured to adjust the difference in rotation speed between the roller sets 64, 66, and 68, thereby to adjust the difference in transportation speed of the sheet 34 between the roller sets 64, 66, and 68. Thus, in the sheet processing step, the drawing process illustrated in Fig. 8 is performed on the sheet 34 (P1: drawing processing).

**[0054]** Specifically, the rotation speed of the roller set on the downstream side in the transport path 62 (for example, the second roller set 66 or the third roller set 68) is set to be greater than the rotation speed of the roller set on the upstream side in the transport path 62 (the first roller set 64). Thus, the transportation speed of the sheet 34 at the roller set on the downstream side becomes greater than the transportation speed of the sheet 34 at the roller set on the upstream side, and the sheet 34 is drawn in the longitudinal direction X between the roller set on the upstream side and the roller set on the downstream side.

**[0055]** Fig. 19 illustrates a perspective view of the first roller set 64 pinching the sheet 34. Many linear protrusions 72 are formed in the roller Ra so as to protrude throughout the circumference of an outer circumferential surface of the roller Ra. The compressed regions A1 are formed in the sheet 34 by using the linear protrusions 72. Many linear grooves 74 are formed in the outer circumferential surface of the roller Ra along with the formation of the linear protrusions 72. The non-compressed regions A2 are formed in the sheet 34 by using the linear grooves 74.

**[0056]** In a transport process of the sheet 34, when the linear protrusions 72 are pushed into the surface of the sheet 34 so as to compress the sheet 34, in other words, grip the sheet 34, the sheet 34 is fed from the first roller set 64 toward the second roller set 66. Thus, in the sheet processing step, the compression process illustrated in Fig. 9 is performed on the sheet 34 (P2: compression processing).

**[0057]** Fig. 20 illustrates an enlarged view of part of the cross section of the roller Ra illustrated in Fig. 19. Compressing surfaces 76 are formed at protruding ends of the linear protrusions 72. The compressing surfaces 76 have a width D3 in the width direction Z of the roller Ra (coincident with an axial direction of the roller Ra). Bottom surfaces 78 are formed in the linear grooves 74. The linear grooves 74 have a width D4 in the width direction Z. The width D3 of the compressing surfaces 76 is equal to the width D1 of the compressed regions A1 of the sheet 34 illustrated in Fig. 10. The width D4 of the linear grooves 74 of the roller Ra is equal to the width D2 of the non-compressed regions A2 of the sheet 34 illustrated in Fig. 10.

**[0058]** Figs. 21 to 23 illustrate examples of combinations of the rollers Ra and Rb included in each of the roller sets 64, 66, and 68. Fig. 21 illustrates a cross-sectional view of the first roller set 64. As illustrated in Fig. 19, in this first roller set 64, many linear protrusions 72 are formed throughout the width direction Z of the roller Ra throughout the circumference of the outer circumferential surface of the roller Ra. Fig. 22 illustrates a cross-sectional view of the second roller set 66. In this second roller set 66, the linear protrusions 72 having a greater width than that in the case of Fig. 21 are formed at both ends of the roller Ra in the width direction Z throughout the circumference of the outer circumferential surface of the roller Ra.

**[0059]** Fig. 23 illustrates a cross-sectional view of the third roller set 68. In this third roller set 68, three linear protrusions 72 having a width the same as or similar to that in the case of Fig. 21 are formed at three positions in the center and at both the ends of the roller Ra in the width direction Z throughout the circumference of the outer circumferential surface of the roller Ra. Also in this third roller set 68, a single linear protrusion 72 having a width the same as or similar to that in the case of Fig. 22 is formed at each of three positions, that is, the center and both the ends of the roller Rb in the width direction Z throughout the circumference of the outer circumferential surface of the roller Rb.

**[0060]** As described above, the linear protrusions 72 protruding throughout the circumference of the outer circumferential surface of the roller are formed in at least one roller out of the pair of rollers Ra and Rb included in each of the roller sets 64, 66, and 68 so as to allow the roller sets 64, 66, and 68 to grip and transport the sheet 34. Each of the linear protrusions 72 performs the compression process in which at least part of the sheet 34 in the width direction Z is compressed, and thereby the above-described compression processing is performed.

**[0061]** Fig. 24 illustrates the end surface of the sheet 34 having passed through the roller sets 64, 66, and 68 illustrated in Figs. 21 to 23. When the sum of widths D1 of the compressed regions A1 where the sheet 34 is compressed with the linear protrusions 72 in the width direction Z is defined as the total compressed width Dt1 of the sheet 34, the percentage of the total compressed width Dt1 with respect to the sheet width Ds is adjusted to the predetermined percentage. As has been described, the predetermined percentage is smaller than or equal to 50%. Here, as illustrated in Fig. 24, the compressed regionAl is formed in the center of the rear surface of the sheet 34 in the width direction Z due to the compression with the linear protrusion 72 of the roller Rb of the third roller set 68.

**[0062]** Meanwhile, the compressed region A1 is formed in the center of the front surface of the sheet 34 in the width direction Z by using the linear protrusion 72 of the roller Ra of the first roller set 64 and the linear protrusion 72 of the roller Ra of the third roller set 68. The width D1 of compressed regions A1 formed by the linear protrusion 72 of the roller Rb of the third roller set 68 is greater than the width D1 of the compressed region A1 formed by the linear protrusion 72 of the roller Ra of the first roller set 64 and the linear protrusion 72 of the roller Ra of the third roller set 68.

**[0063]** In this case, in the case of Fig. 24, the width D1 of the compressed region A1 formed by the linear protrusion 72 of the roller Rb of the third roller set 68 is added in calculating the total compressed width Dt1, but the width D1 of the compressed regionAl formed by the linear protrusions 72 of the roller Ra of the first roller set 64 and the roller Ra of the third roller set 68 is not added in calculating the total compressed width Dt1. That is, in the width direction Z, when the compressed regions A1 formed by the roller sets 64, 66, and 68 overlap, the width D1 of the larger compressed region A1 representing the widths D1 and is added in calculating the total compressed width Dt1.

**[0064]** The percentage of the total compressed width Dt1 with respect to the sheet width Ds can be set to be the desired predetermined percentage by adjusting, in advance, the area of the compressing surfaces 76, the number, a formation range, and the like of the linear protrusions 72 formed in each of the roller sets 64, 66, and 68. Specifically, in each of the roller sets 64, 66, and 68, with consideration of the formation range of the linear protrusions 72 overlapping in the width direction Z of the sheet 34, the area of the compressing surfaces 76, the number, the formation range, and the like of the linear protrusions 72 contributing to the total compressed width Dt1 of the sheet 34 are adjusted.

**[0065]** In this way, the percentage of the total compressed width Dt1 with respect to the sheet width Ds can be adjusted. Furthermore, a gripping force of the linear protrusions 72 exerted on the sheet 34 can be adjusted by varying the gap between the pair of rollers Ra and Rb, the protruding height of the linear protrusions 72, the area of the compressing surfaces 76 of the linear protrusions 72, the number of the linear protrusions 72, and the like. When the gripping force of the linear protrusions 72 exerted on the sheet 34 is optimized, accuracy of the drawing processing is improved.

**[0066]** Next, in the transport process of the sheet 34 through the transport path 62, the folding section 56 folds, in the width direction Z, the sheet 34 having been processed in the sheet processing section 54 to form the folded rod 90 such that the folded rod 90 has the diameter reduced to a value smaller than or equal to the diameter of the filler element 6 (S3: folding step). The folded rod 90 becomes the folded part 36 when a filler rod 98 to be formed in a later step is cut into the filler element 6.

**[0067]** Furthermore, in the process of folding the sheet 34, the folding section 56 forms the opening 40 open in the axial direction X of the folded rod 90 at part of the folded rod 90 in the circumferential direction. Furthermore, the folding section 56 forms the linear recess 44 having a U-shaped section. The linear recess 44 is continuous with the opening 40 and recessed to the center of the folded rod 90 in the radial direction Y. Specifically, the folding section 56 includes, in order from the upstream side of the transport path 62, a preliminary folding guide 80, a transport jet 82, a trumpet guide 84, a tongue 86, and the like.

**[0068]** Fig. 25 illustrates a front view of the preliminary folding guide 80. The preliminary folding guide 80 includes a guide roller 80a and a rotation shaft 80b by which the guide roller 80a is rotatably supported. In the transport process of the sheet 34 through the transport path 62, the guide roller 80a is brought into contact with the center of the sheet 34, from below, in the width direction Z. Thus, the sheet 34 is curved so as to have an upwardly convex shape in the thickness direction of the sheet 34.

**[0069]** Fig. 26 illustrates a cross-sectional view of the transport jet 82. Fig. 27 illustrates an end surface of the transport jet 82 on the upstream side in the transport path 62. The transport jet 82 has a cylindrical shape and has a large diameter portion 82a on the upstream side of the transport path 62 and a small diameter portion 82b continuous with the large diameter portion 82a. The diameter of an inner circumferential surface 82c of the transport jet 82 reduces from the large diameter portion 82a to the small diameter portion 82b so as to have a stepped shape.

**[0070]** A baffle plate 88 stands erect on the inner circumferential surface 82c toward the center in the radial direction inside the transport jet 82. Regarding the sheet 34 that has passed through the preliminary folding guide 80 and has been curved, the transport jet 82 folds this sheet 34 a predetermined number of times in the width direction Z with the baffle plate 88 interposed between portions of the sheet 34 while pulling the sheet 34 thereinto by using air with a wind pressure. In addition, the transport jet 82 reduces the diameter of the sheet 34 while transporting the sheet 34 from the large diameter portion 82a to the small diameter portion 82b. In this way, the folded rod 90 is formed.

**[0071]** Fig. 28 illustrates a cross-sectional view of the trumpet guide 84. Fig. 29 illustrates an end surface of the trumpet guide 84 on the upstream side in the transport path 62. The trumpet guide 84 has a cylindrical shape and has an inner circumferential surface 84a the diameter of which gradually reduces from the upstream side of the transport path 62. Furthermore, a baffle plate 92 stands erect on the inner circumferential surface 84a toward the center in the radial direction inside the trumpet guide 84. The baffle plates 88 and 92 respectively extend in the axial directions X of the transport jet 82 and the trumpet guide 84 inside the transport jet 82 and the trumpet guide 84.

**[0072]** In the trumpet guide 84, the folded rod 90 having passed through the transport jet 82 is released together with the air with the wind pressure, and the fabric of the folded rod 90 is loosened and opened by dissipation of the air due to the release. Furthermore, the folded rod 90 having formed in the transport jet 82 passes through the trumpet guide 84 with the baffle plate 92 interposed between portions thereof. Thus, a folded state of the folded rod 90 formed in the transport jet 82 is also maintained in the trumpet guide 84.

**[0073]** As described above, the baffle plates 88 and 92 respectively stand erect on the inner circumferential surfaces 82c and 84a of the transport jet 82 and the trumpet guide 84 toward the centers in the radial directions in the transport jet 82 and the trumpet guide 84. The curved sheet 34 passing through the preliminary folding guide 80 is subjected to the air with the wind pressure and folded with the baffle plates 88 and 92 interposed between portions of the sheet 34, and thereby the sheet 34 is formed into the folded rod 90. When the sheet 34 is folded with the baffle plates 88 and 92 interposed between portions of the sheet 34, the above-described opening 40 and the linear recess 44 are formed in part of the folded rod 90 in the circumferential direction.

**[0074]** Fig. 30 illustrates a cross-sectional view of the tongue 86. The tongue 86 has a cylindrical shape and has an inner circumferential surface 86a the diameter of which is smaller than or equal to the diameter of the filler element 6. Regarding the folded rod 90 having passed through the trumpet guide 84, the diameter is reduced to a value smaller than or equal to the diameter of the filler element 6, the opening 40 is closed, and the linear recess 44 is filled with the sheet 34 in the tongue 86.

**[0075]** As illustrated in Fig. 17, the folding section 56 includes an additive supplying unit 94. The additive supplying unit 94 includes a nozzle 94a for supplying the additive 42. The nozzle 94a is inserted into both the transport jet 82 and the trumpet guide 84. At least before the folded rod 90 is transported to the tongue 86, the additive supplying unit 94 supplies the additive 42 into the folded rod 90 from the nozzle 94a through the opening 40 (P3: additive supplying processing). Specifically, the additive supplying unit 94 supplies the additive 42 in the axial direction X of the linear recess 44 through the opening 40.

**[0076]** Furthermore, the folding section 56 includes a capsule supplying unit 96. The capsule supplying unit 96 includes a rotation holder 96a having a circular pillar shape. The capsule 46 is held by the rotation holder 96a. At least before the folded rod 90 is transported to the tongue 86, the capsule supplying unit 96 supplies the capsule 46 held by the rotation holder 96a by intermittently dropping the capsule 46 into the folded rod 90 through the opening 40 while rotating the rotation holder 96a (P4: capsule supplying processing). Specifically, the capsule supplying unit 96 supplies the capsule 46 to a predetermined position in the axial direction X of the linear recess 44 through the opening 40, for example, to a central position in the axial direction X when the folded rod 90 becomes the folded part 36.

**[0077]** Next, as illustrated in Fig. 17, the wrapping section 58 supplies the wrapping paper 18 and wraps the folded rod 90 having been formed in the folding section 56 with the wrapping paper 18 so as to form the filler rod 98 (S4: wrapping step). Next, the cutting section 60 cuts, into the filler element 6, the filler rod 98 having been formed in the wrapping section 58 (S5: cutting step), and the manufacturing of the filler element 6 ends.

**[0078]** As has been described, the filler element 6 according to the embodiment includes the folded part 36 and the wrapping paper 18 wrapped around the folded part 36. The folded part 36 is formed by folding the single sheet 34 formed of the nonwoven fabric in the width direction Z such that the diameter is reduced to a value smaller than or equal to the diameter of the filler element 6. When the folded part 36 is formed by folding the single sheet 34, unlike the related art, none of the following operations for adjusting the filling density of the filler element 6 is required: preparing a plurality of sheets 34 and varying the number of the sheets 34; adjusting the shifting width of the overlapping sheets 34; and changing the specifications of the sheet 34 itself.

**[0079]** Accordingly, compared to the related-art case, the filling density of the filler element 6 can be easily and highly accurately controlled. Furthermore, when the number of times of folding the single sheet 34, the form of folding, or the degree of reduction of the diameter of the folded part 36 is adjusted, the filling density of the filler element 6 can be optimized. Accordingly, since generation of gaps or cavities in the filler element 6 can be prevented, the quality of the inhaler 1 can be ensured.

**[0080]** Furthermore, the folded part 36 has the opening 40 open in the axial direction X of the folded part 36 at part in the circumferential direction of the folded part 36. The capsule 46 is placed inside the folded part 36 through the opening 40. Thus, the capsule 46 can be placed in an appropriate position in the filler element 6 while the filling density of the filler element 6 is optimized.

**[0081]** Furthermore, the folded part 36 has the linear recess 44 having a U-shaped section. The linear recess 44 is continuous with the opening 40 and recessed to the center of the folded part 36 in the radial direction Y The capsule 46 is placed in a predetermined position in the axial direction X in the linear recess 44. Thus, the capsule 46 can be reliably placed in the center of the folded part 36 in the radial direction Y

**[0082]** Furthermore, the component of the addition agent released from the capsule 46 can be uniformly volatilized and dispersed in the radial direction Y from the center of the filler element 6 in the radial direction Y Accordingly, the reliability of ensuring the quality of the filler element 6, and further, the inhaler 1 is improved. Furthermore, since the capsule 46 is fixed and in close contact with the sheet 34 in the center of the folded part 36 in the radial direction Y, an operation performed when the user crushes the capsule 46 with the fingers to release the addition agent becomes easy, and accordingly, convenience of the user is improved.

**[0083]** The folding section 56 included in the manufacturing device 50 according to the embodiment forms the opening 40 in the process of folding the sheet 34 and includes a capsule supplying unit 96. The capsule supplying unit 96 supplies the capsule 46 into the folded rod 90 through the opening 40. The capsule supplying unit 96 supplies the capsule 46 through the opening 40 in the capsule supplying processing of the folding step. Thus, in the process of folding the sheet 34, the capsule 46 can be easily placed in an appropriate position in the filler element 6 while folding the sheet 34.

**[0084]** Furthermore, the folding section 56 forms the linear recess 44 having a U-shaped section. The linear recess 44 is continuous with the opening 40 and recessed to the center of the folded rod 90 in the radial direction Y The capsule supplying unit 96 supplies the capsule 46 to the predetermined position in the axial direction X in the linear recess 44 through the opening 40. The capsule supplying unit 96 supplies the capsule 46 to the linear recess 44 through the opening 40 in the capsule supplying processing of the folding step. Thus, the capsule 46 can be reliably placed in the center of the folded part 36 in the radial direction Y

**[0085]** Furthermore, the folding section 56 includes the preliminary folding guide 80, the transport jet 82, the trumpet guide 84, and the tongue 86. In the transport process of the sheet 34, when the sheet 34 passes through these portions of the folding section 56, the desired folded rod 90, and further, the desired filler element 6 can be reliably formed.

**[0086]** More specifically, the baffle plates 88 and 92 respectively stand erect on the inner circumferential surfaces 82c and 84a of the transport jet 82 and the trumpet guide 84 toward the centers in the radial directions in the transport jet 82 and the trumpet guide 84. The curved sheet 34 passing through the transport jet 82 and the trumpet guide 84 is folded, by using the air with the wind pressure, with the baffle plates 88 and 92 interposed between portions of the sheet 34, and thereby the sheet 34 is formed into the folded rod 90 having the opening 40 and the linear recess 44.

**[0087]** That is, the baffle plates 88 and 92 function as portions that start the folding of the sheet 34 and maintain the folded state of the sheet 34 during the folding of the sheet 34. Accordingly, when the baffle plates 88 and 92 are provided, the folded rod 90 in which the capsule 46 is placed, and further, the filler element 6 in which the capsule 46 is placed can be still more reliably formed.

**[0088]** Although the description of the embodiment is completed with the above description, the above-described embodiment is not limiting and can be changed in various manners without departing from the gist. For example, the number, the shape, or the formation range of the linear protrusions 72 is not limited to that in the described forms and can be changed in various manners. The linear protrusions 72 may be formed in both the rollers Ra and Rb or only in the roller Ra or the roller Rb.

**[0089]** Furthermore, it is sufficient that at least a plurality of the roller sets be provided in the sheet processing section 54 for performing the drawing processing. The number of the roller sets is not limited to the above-described three sets including the roller sets 64, 66, and 68. Furthermore, the percentage of the total compressed width Dt1 with respect to the sheet width Ds is preferably smaller than or equal to 50%. However, this percentage can exceed 50% in accordance with the specifications of the sheet 34 or the required specifications of the filler element 6.

**[0090]** It is not required that both the drawing process and the compression process be necessarily performed on the sheet 34. Only one of the drawing process and the compression process may be performed on the sheet 34 in accordance with the specifications of the sheet 34 or the required specifications of the filler element 6. In accordance with the specifications of the sheet 34 or the required specifications of the filler element 6, there can be a case where neither the drawing process nor the compression process is performed.

**[0091]** It is not required that both the additive 42 and the capsule 46 be necessarily placed in the folded part 36. In accordance with the specifications of the filler element 6, only one of the additive 42 and the capsule 46 may be placed. Furthermore, as illustrated in Figs. 6 and 12, there can be a case where nothing is placed inside the folded part 36 depending on the specifications of the filler element 6.

**[0092]** The configuration of the folding section 56 is not limited to the above-described configuration as long as the folded rod 90 can be formed. The configuration of the additive supplying unit 94 is not limited to the above-described configuration as long as the additive supplying processing can be performed. The configuration of the capsule supplying unit 96 is not limited to the above-described configuration as long as the capsule supplying processing can be performed. The configuration of the inhaler 1, the position of the filler element 6 in the inhaler 1, or the number of filler elements 6 in the inhaler 1 is not limited to that of the described forms.

Reference Signs List

**[0093]**

| | |
|---|---|
| 1 | flavor inhaler |
| 6 | filler element |
| 18 | wrapping paper |
| 34 | sheet |
| 36 | folded part |
| 40 | opening |
| 44 | linear recess |
| 46 | capsule |
| 50 | manufacturing device |
| 54 | sheet processing section |
| 56 | folding section |
| 58 | wrapping section |
| 60 | cutting section |
| 62 | transport path |
| 80 | preliminary folding guide |
| 82 | transport jet |
| 84 | trumpet guide |
| 86 | tongue |
| 88, 92 | baffle plate |
| 90 | folded rod |
| 96 | capsule supplying unit |
| 98 | filler rod |
| X | axial direction |
| Y | radial direction |
| Z | width direction |

## Claims

**1.** A filler element used in a flavor inhaler, the filler element comprising:

a folded part formed by folding a single sheet formed of a nonwoven fabric in a width direction intersecting a longitudinal direction of the sheet such that the folded part has a diameter reduced to a value smaller than or equal to a diameter of the filler element; and
wrapping paper wrapped around the folded part,
wherein the folded part has an opening open in an axial direction of the folded part at part in a circumferential direction of the folded part, and
a capsule in which an addition agent is encapsulated is placed inside the folded part through the opening.

**2.** The filler element according to claim 1,

wherein the folded part has a linear recess having a U-shaped section, the linear recess being continuous with the opening and recessed to a center of the folded part in a radial direction, and
the capsule is placed in a predetermined position in the axial direction in the linear recess.

**3.** A filler element manufacturing device, a filler element used in a flavor inhaler, the device comprising:

a sheet processing section configured to process a single sheet formed of a nonwoven fabric while transporting the sheet through a transport path;
a folding section configured to fold, in a transport process of the sheet through the transport path, the sheet in a width direction intersecting a longitudinal direction of the sheet, the sheet having been processed in the sheet processing section, thereby to form a folded rod such that the folded rod has a diameter reduced to a value smaller than or equal to a diameter of the filler element;
a wrapping section configured to wrap, with wrapping paper, the folded rod having been formed in the folding section, thereby to form a filler rod; and
a cutting section configured to cut, into the filler element, the filler rod having been formed in the wrapping section, wherein, in a process of folding the sheet, the folding section forms an opening open in an axial direction of the folded rod at part in a circumferential direction of the folded rod, and
wherein the folding section includes a capsule supplying unit configured to supply, into the folded rod through the opening, a capsule in which an addition agent is encapsulated.

**4.** The filler element manufacturing device according to claim 3,

wherein, in the process of folding the sheet, the folding section forms a linear recess having a U-shaped section, the linear recess being continuous with the opening and recessed to a center of the folded rod in a radial direction, and
the capsule supplying unit supplies the capsule to a predetermined position in the axial direction

in the linear recess through the opening.

**5.** The filler element manufacturing device according to claim 4,

wherein the folding section includes
a preliminary folding guide configured to curve the sheet in a thickness direction of the sheet in the transport process of the sheet through the transport path,
a cylindrical transport jet configured to form the folded rod by folding, a predetermined number of times in the width direction, the curved sheet having passed through the preliminary folding guide while pulling the sheet by using air with a wind pressure,
a cylindrical trumpet guide to which the folded rod having passed through the transport jet is released together with the air with the wind pressure and which is configured to loosen and open a fabric of the folded rod by using dissipation of the air due to the release, and
a cylindrical tongue configured to reduce the diameter of the folded rod having passed through the trumpet guide to the value smaller than or equal to the diameter of the filler element.

**6.** The filler element manufacturing device according to claim 5,

wherein the transport jet includes a baffle plate that stands erect on an inner circumferential surface of the transport jet toward a center of the transport jet in a radial direction, and the trumpet guide includes a baffle plate that stands erect on an inner circumferential surface of the trumpet guide toward a center of the trumpet guide in a radial direction, and
wherein the curved sheet passing through the transport jet and the trumpet guide is folded due to reception of the air with the wind pressure with the baffle plate of the transport jet and the baffle plate of the trumpet guide interposed between portions of the sheet, thereby being formed into the folded rod having the opening and the linear recess.

**7.** A filler element manufacturing method, a filler element used in a flavor inhaler, the method comprising the steps of:

processing a single sheet formed of a nonwoven fabric while transporting the sheet;
folding, in a transport process of the sheet, the sheet in a width direction intersecting a longitudinal direction of the sheet, the sheet having been processed in the processing of the sheet, thereby to form a folded rod such that the folded rod has a diameter reduced to a value smaller than or equal to a diameter of the filler element;
wrapping, with wrapping paper, the folded rod having been formed in the folding, thereby to form a filler rod; and
cutting, into the filler element, the filler rod having been formed in the wrapping,
wherein, in the folding, an opening open in an axial direction of the folded rod is formed at part in a circumferential direction of the folded rod in a process of folding the sheet, and
wherein, also in the folding, capsule supplying processing is performed to supply, into the folded rod through the opening, a capsule in which an addition agent is encapsulated.

**8.** The filler element manufacturing method according to claim 7,

wherein, in the folding, a linear recess having a U-shaped section is formed in the process of folding the sheet, the linear recess being continuous with the opening and recessed to a center of the folded rod in a radial direction, and
wherein, in the capsule supplying processing, the capsule is supplied to a predetermined position in the axial direction in the linear recess through the opening.

FIG. 1

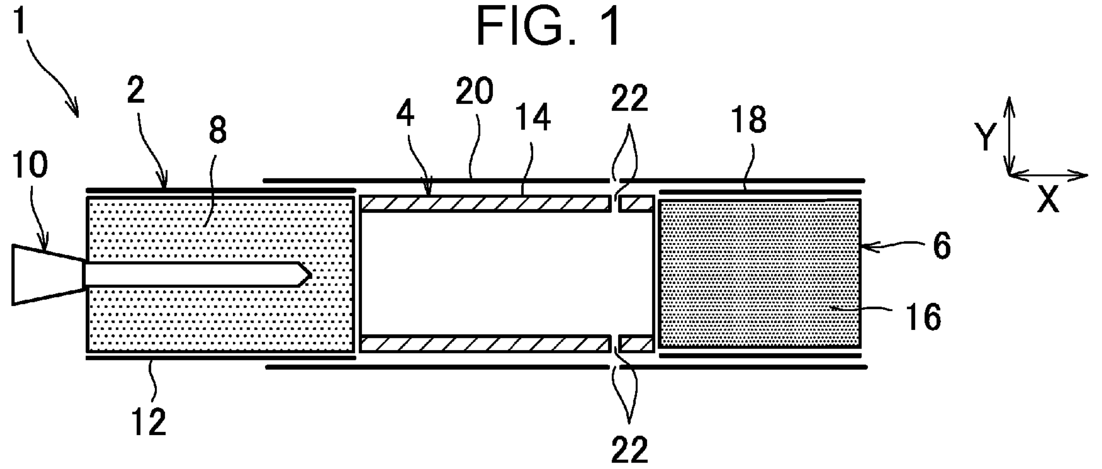



FIG. 2

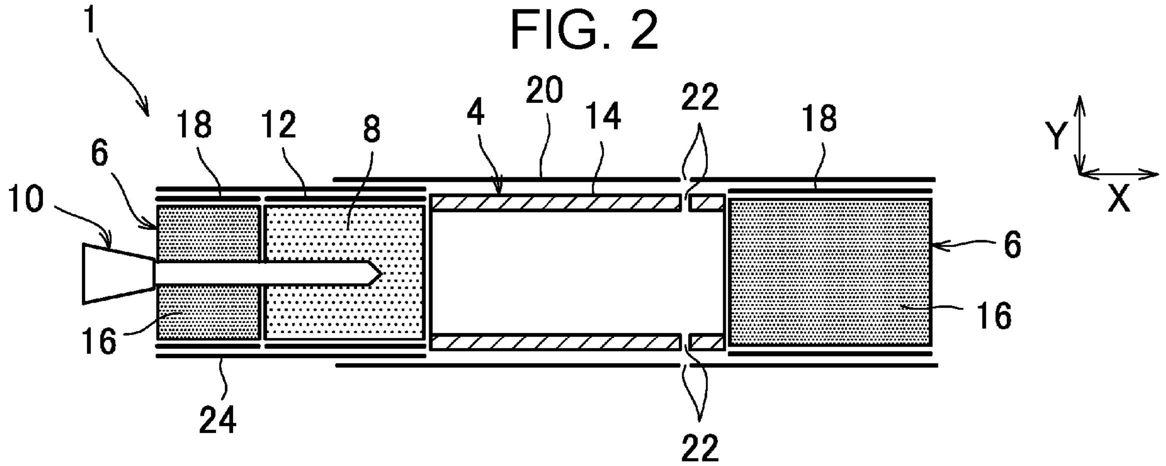



FIG. 3

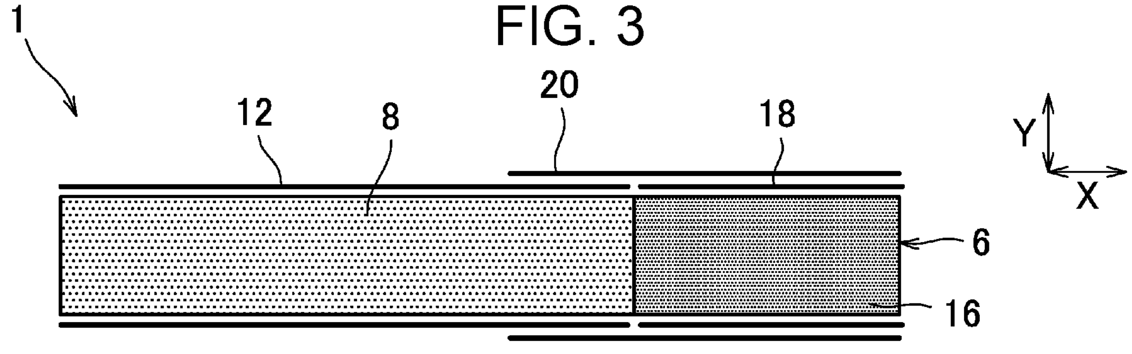



FIG. 4

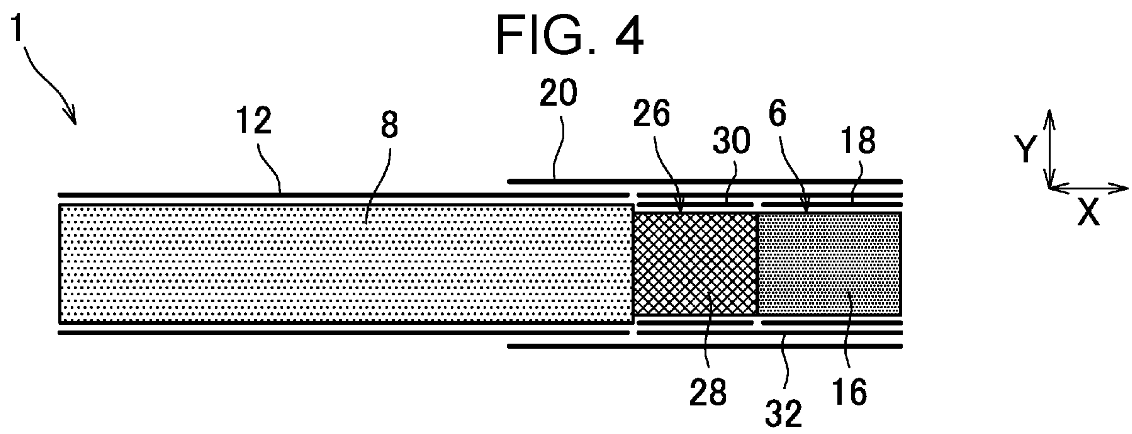


FIG. 5

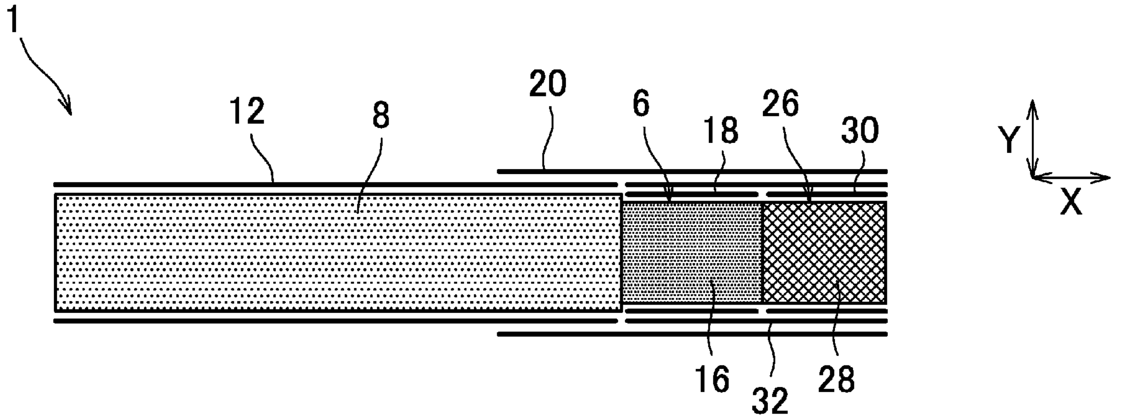



FIG. 6

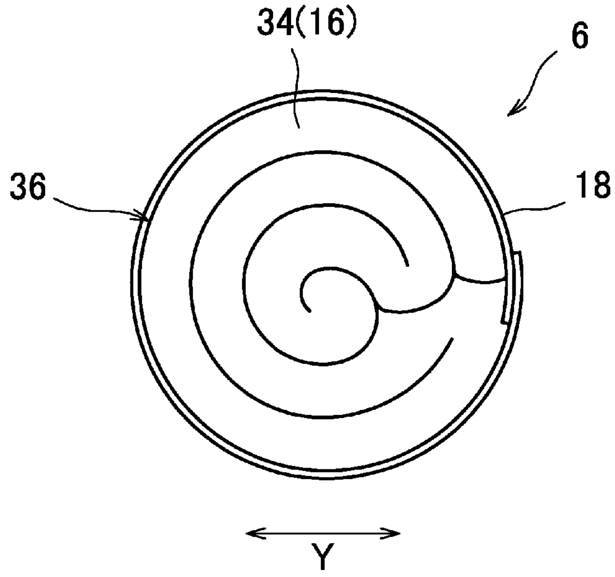



FIG. 7

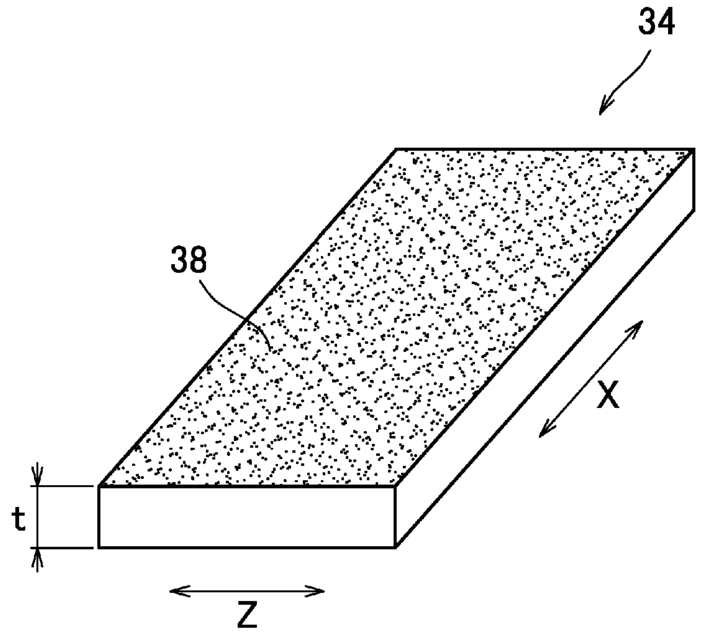


FIG. 8

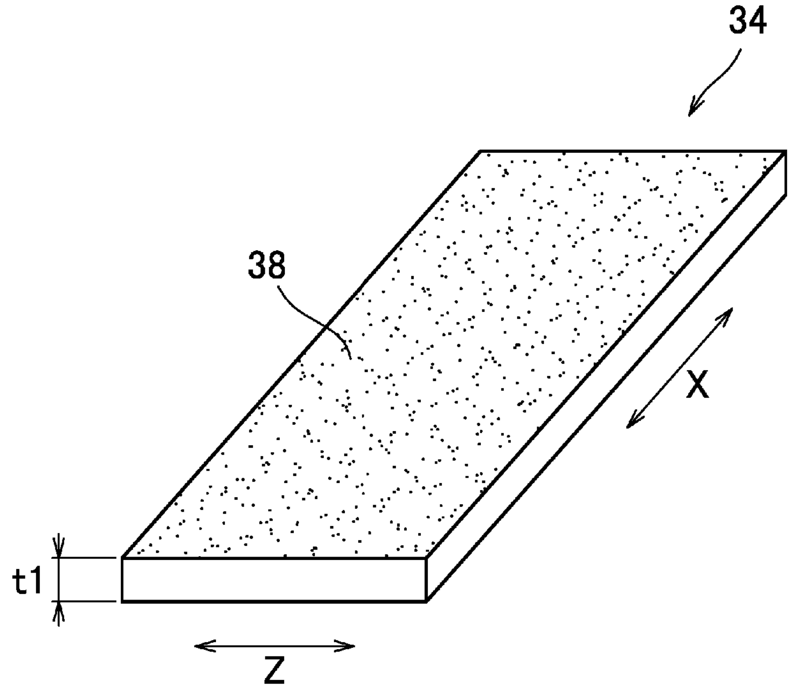



FIG. 9

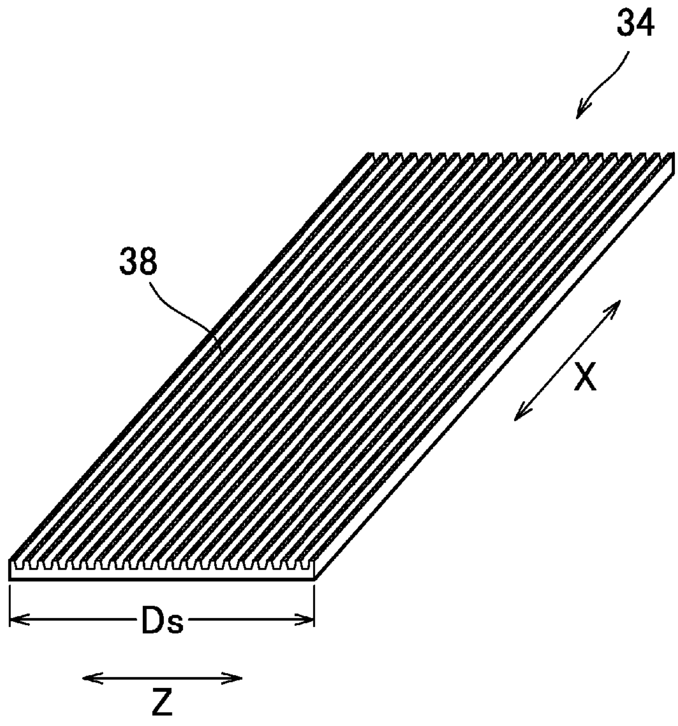


FIG. 10

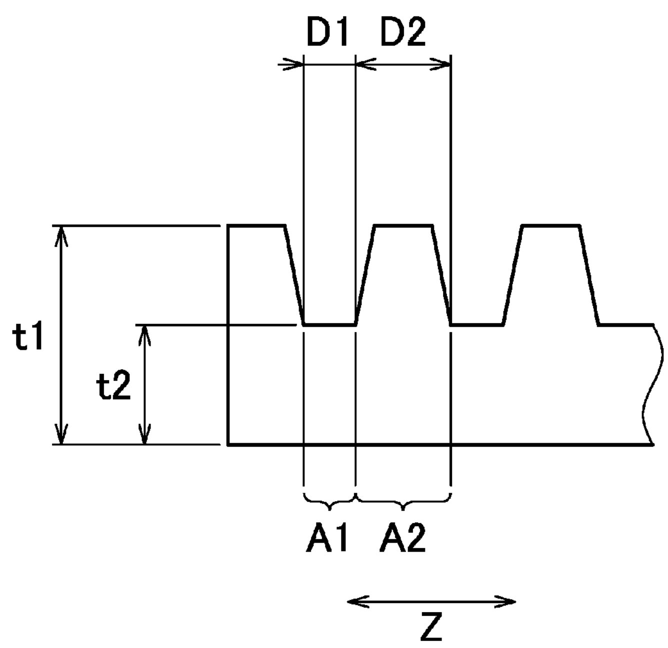



FIG. 11

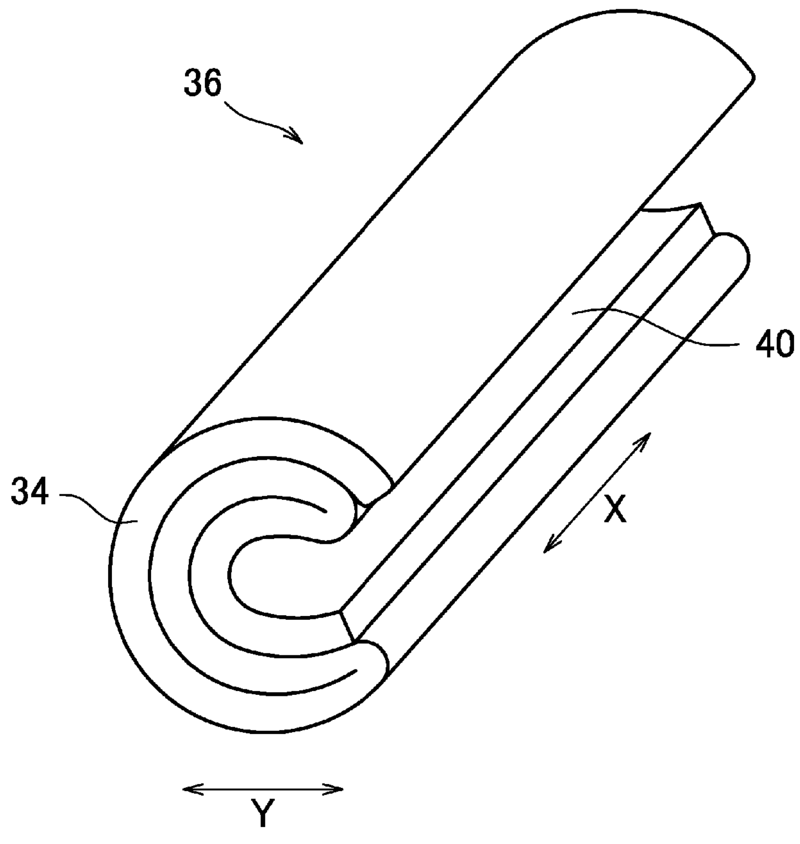


FIG. 12

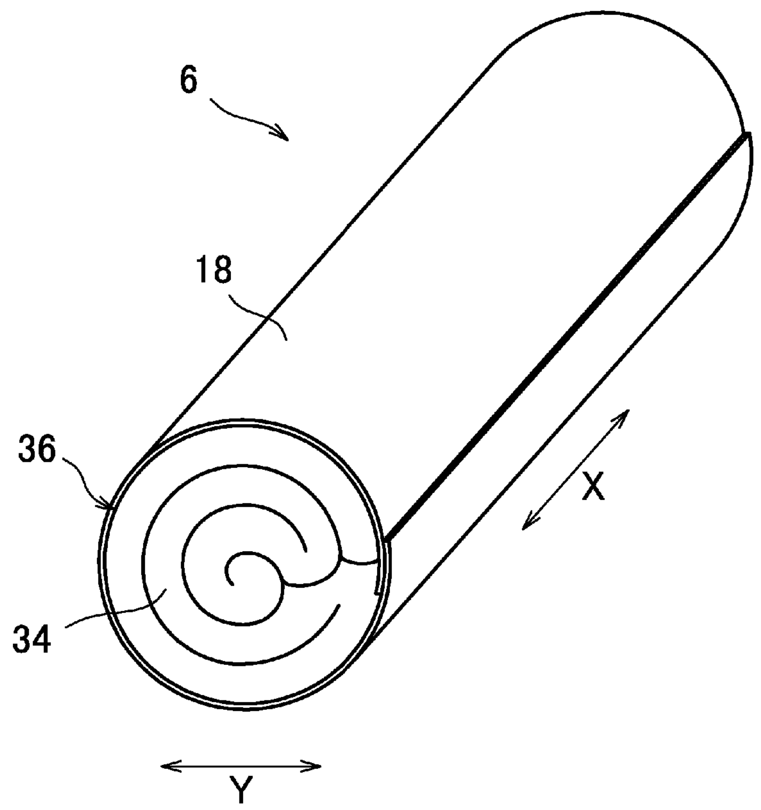



FIG. 13

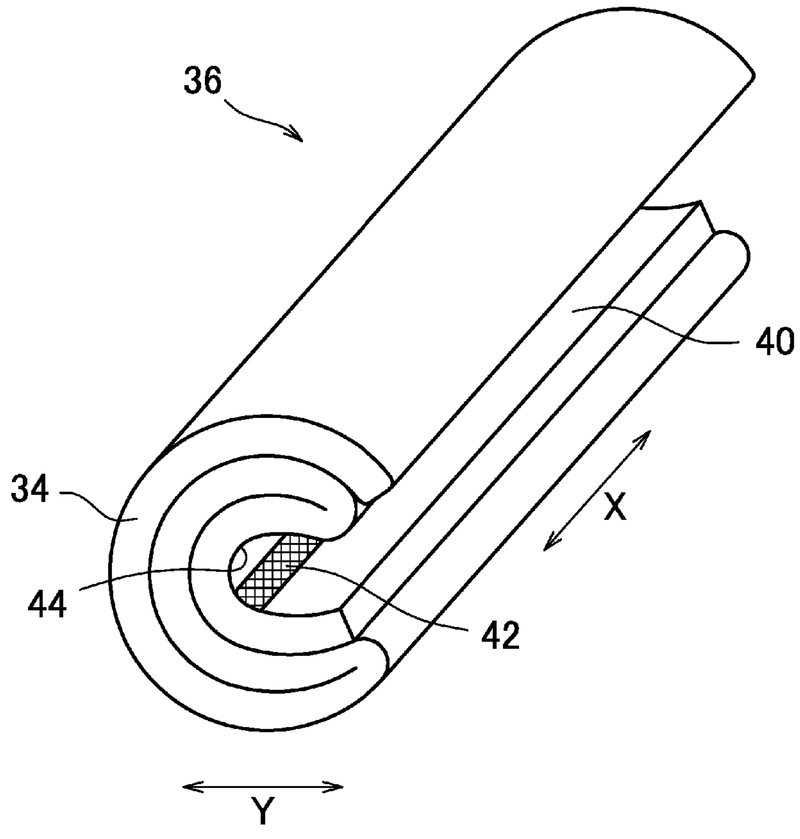


FIG. 14

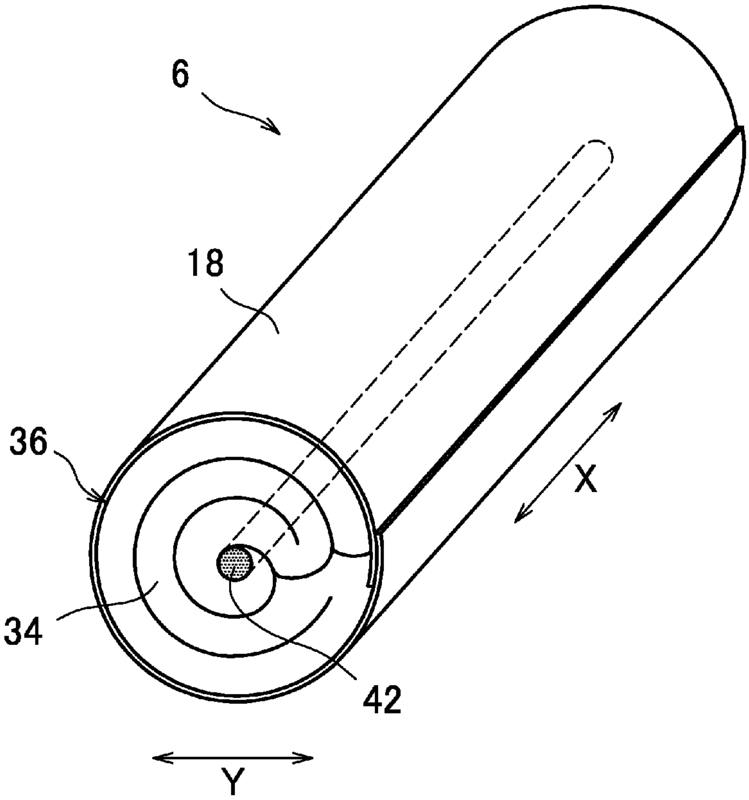



FIG. 15

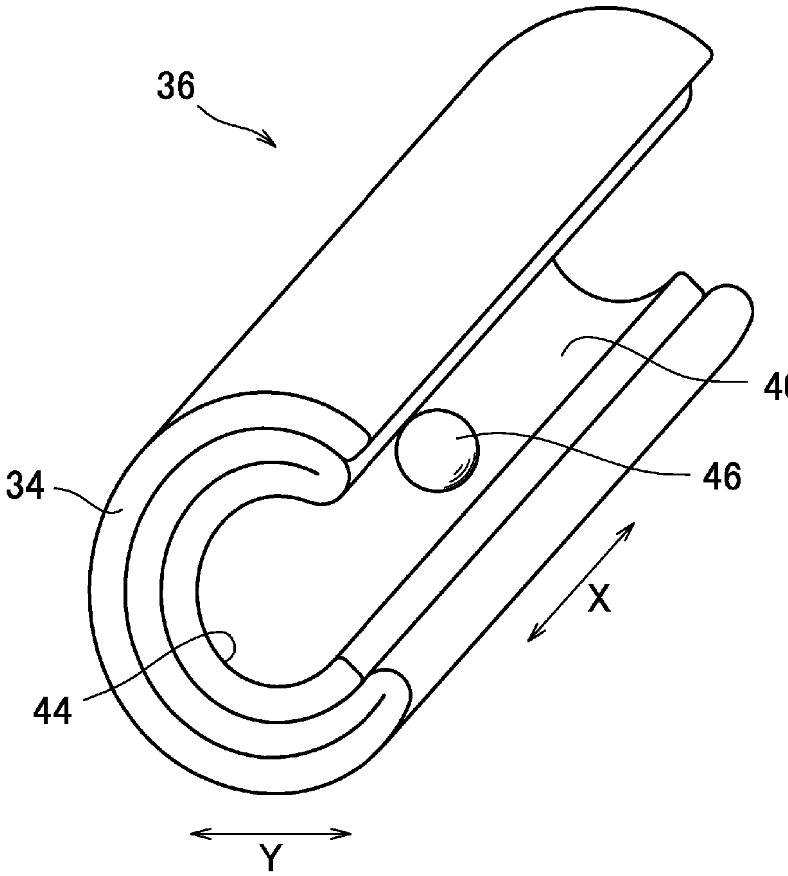


FIG. 16

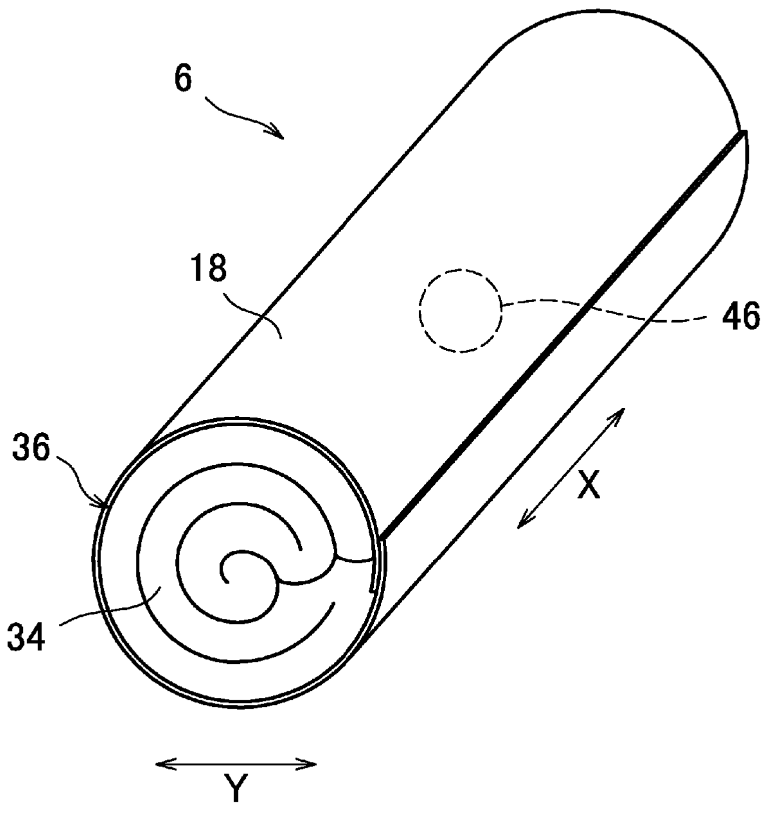


FIG. 17

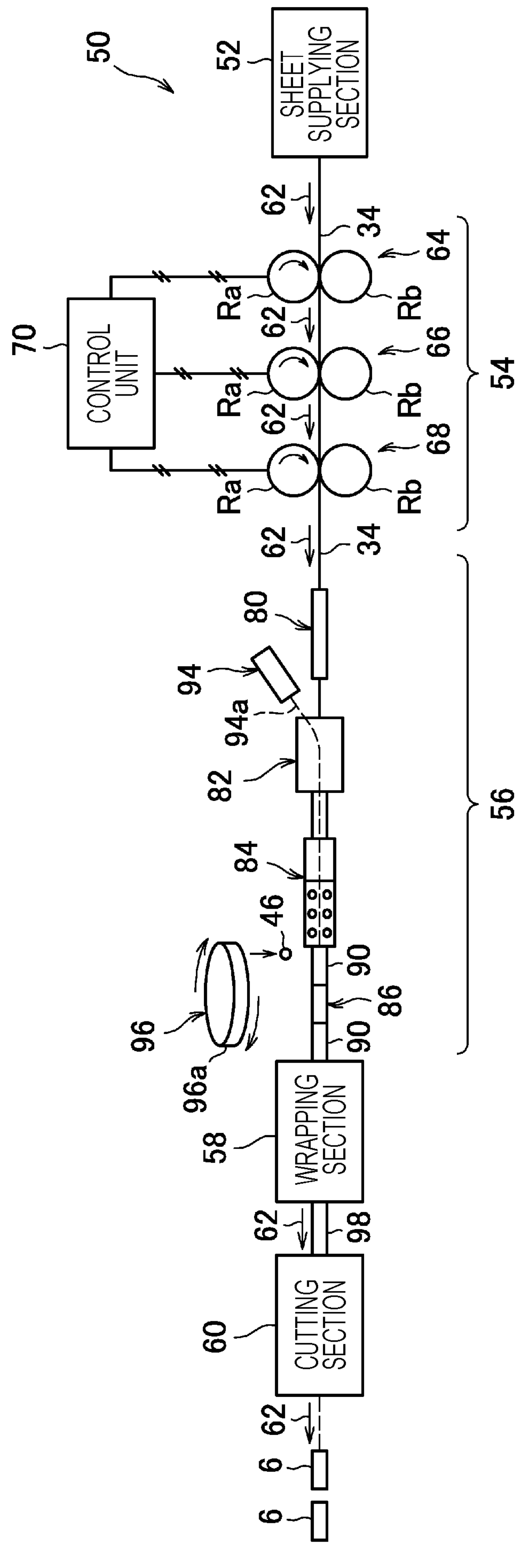

50
52
SHEET SUPPLYING SECTION
62
34
64
Ra
Rb
66
68
54
70
CONTROL UNIT
80
94
94a
82
84
46
90
86
56
96
96a
58
WRAPPING SECTION
98
60
CUTTING SECTION
6

FIG. 18

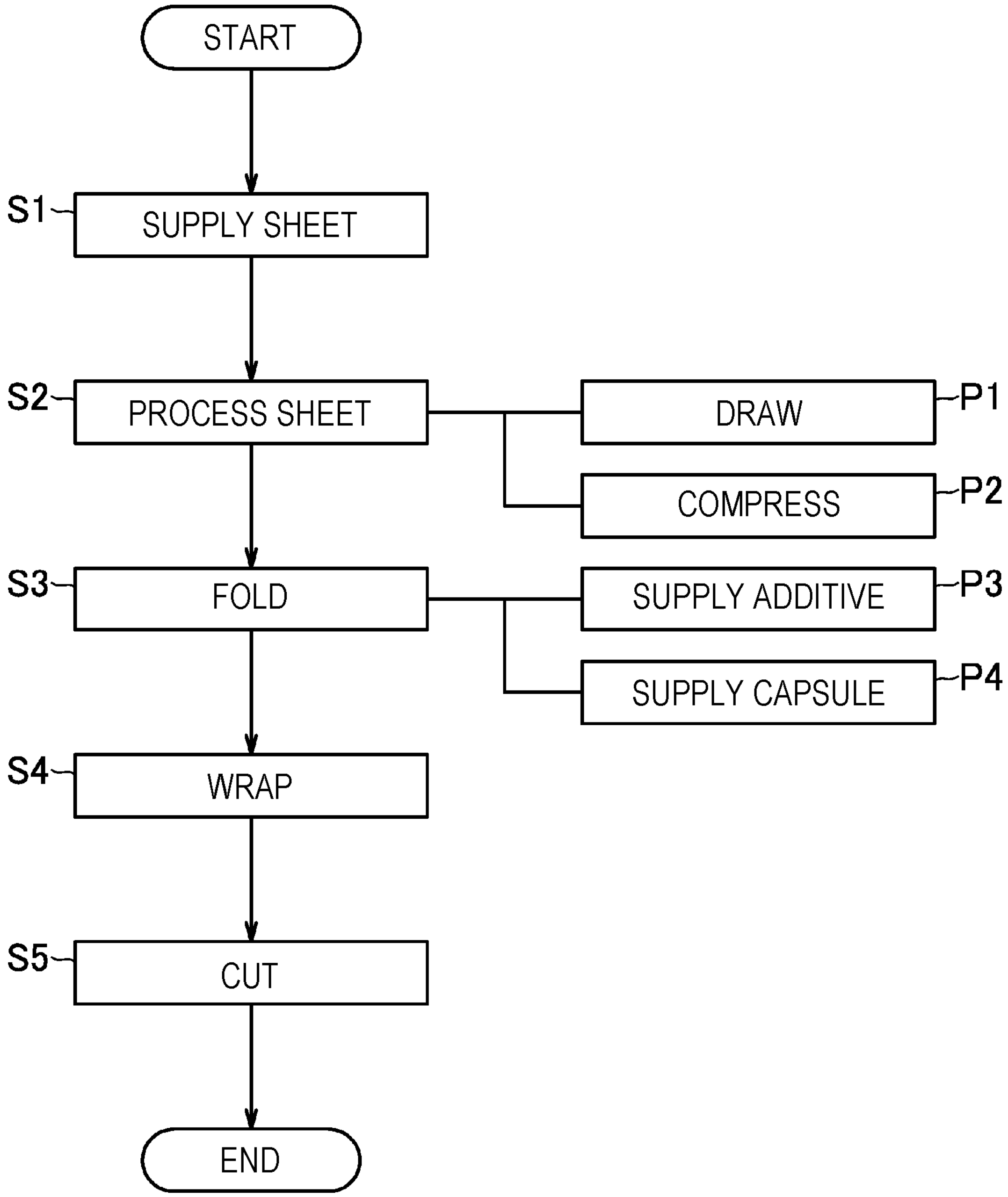

START
S1
SUPPLY SHEET
S2
PROCESS SHEET
DRAW
P1
COMPRESS
P2
S3
FOLD
SUPPLY ADDITIVE
P3
SUPPLY CAPSULE
P4
S4
WRAP
S5
CUT
END

FIG. 19

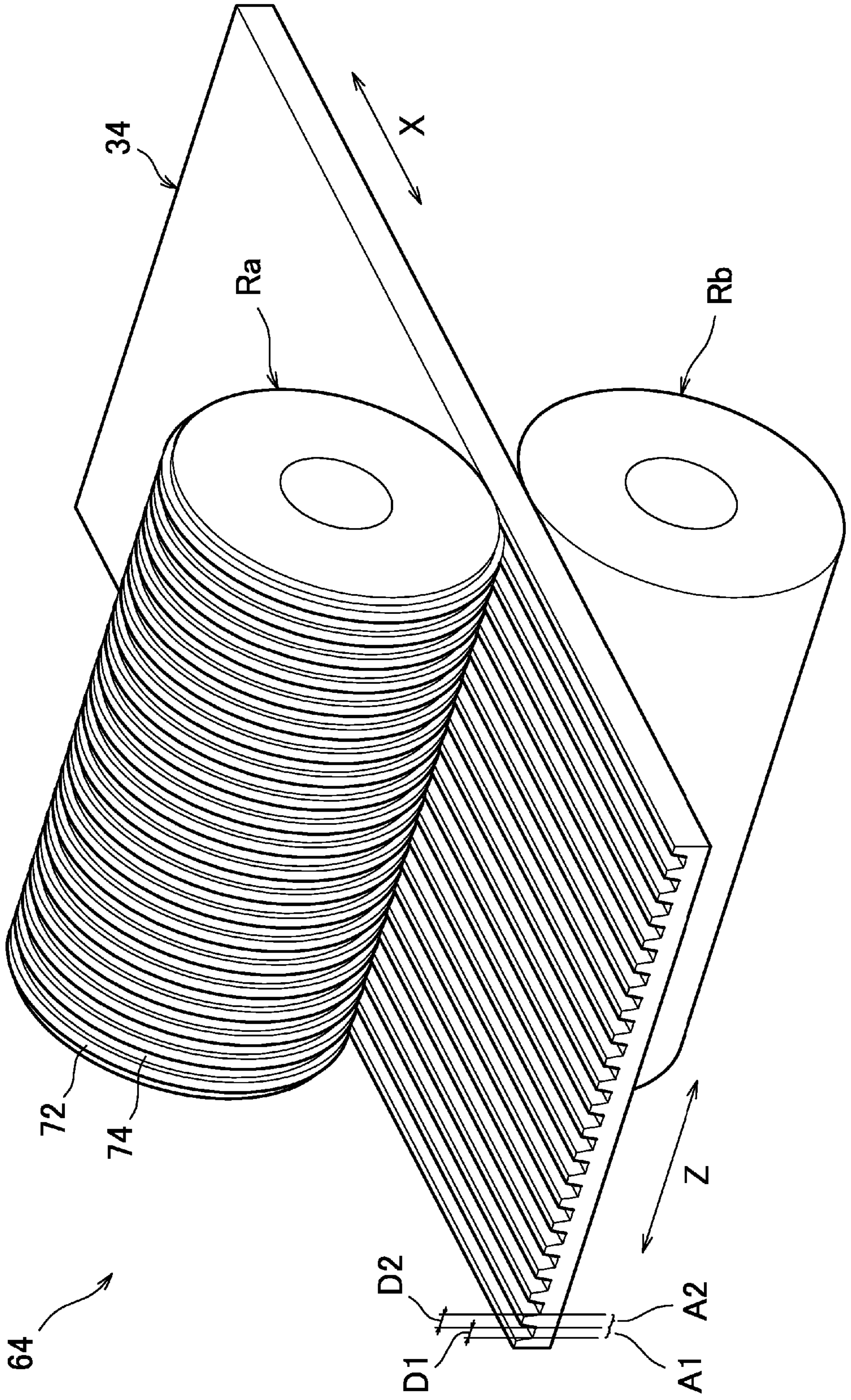


FIG. 20

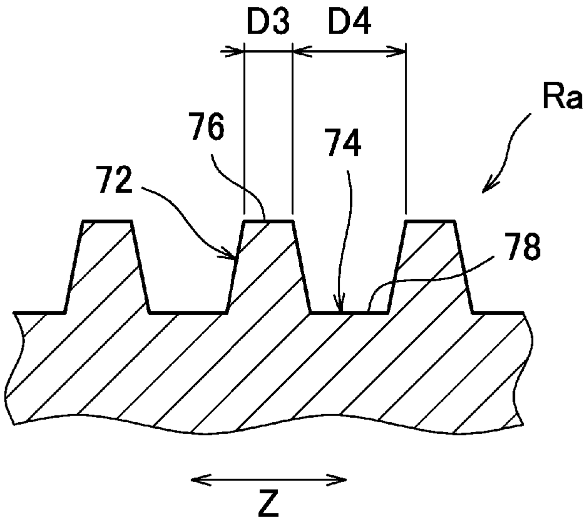



FIG. 21

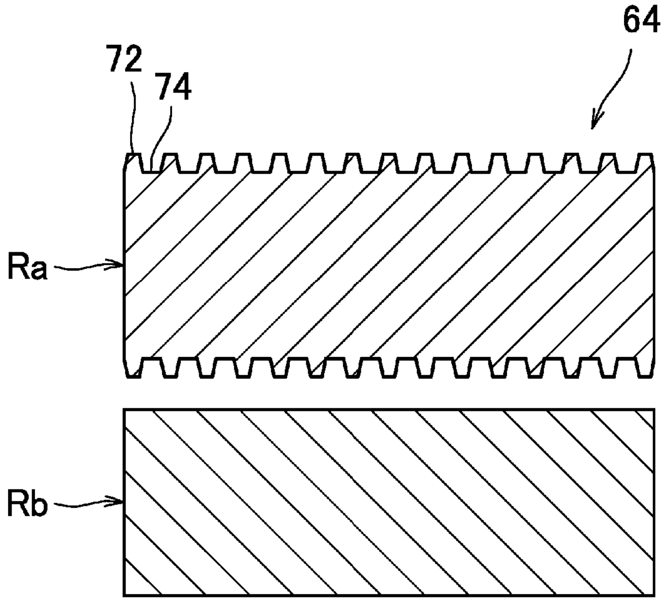



FIG. 22

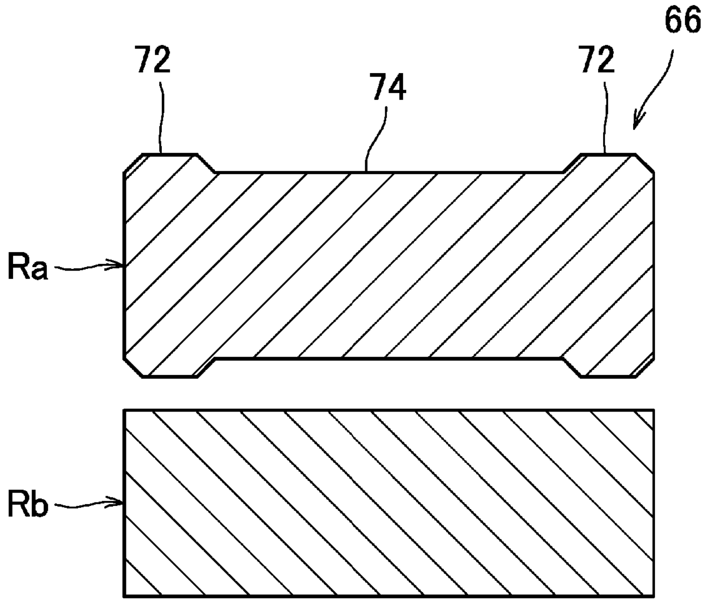


FIG. 23

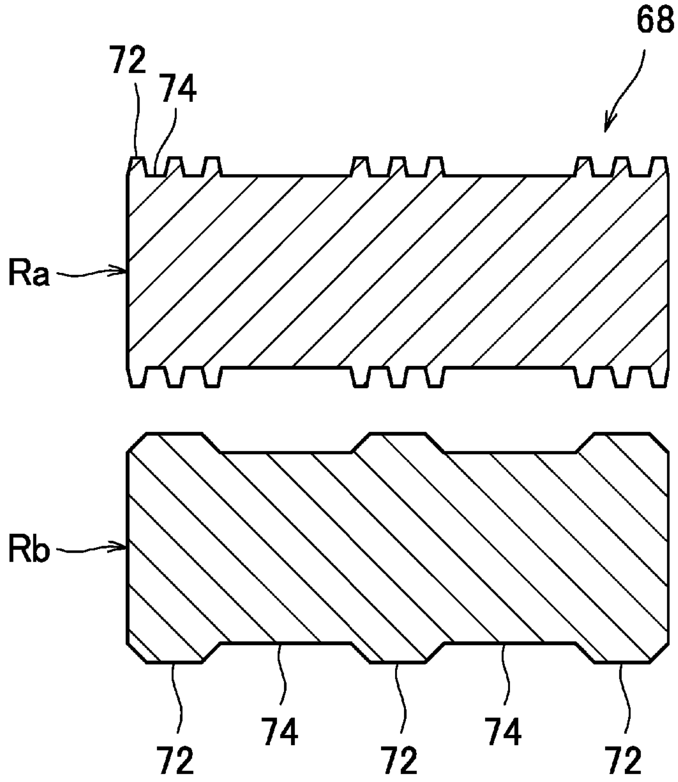



FIG. 24

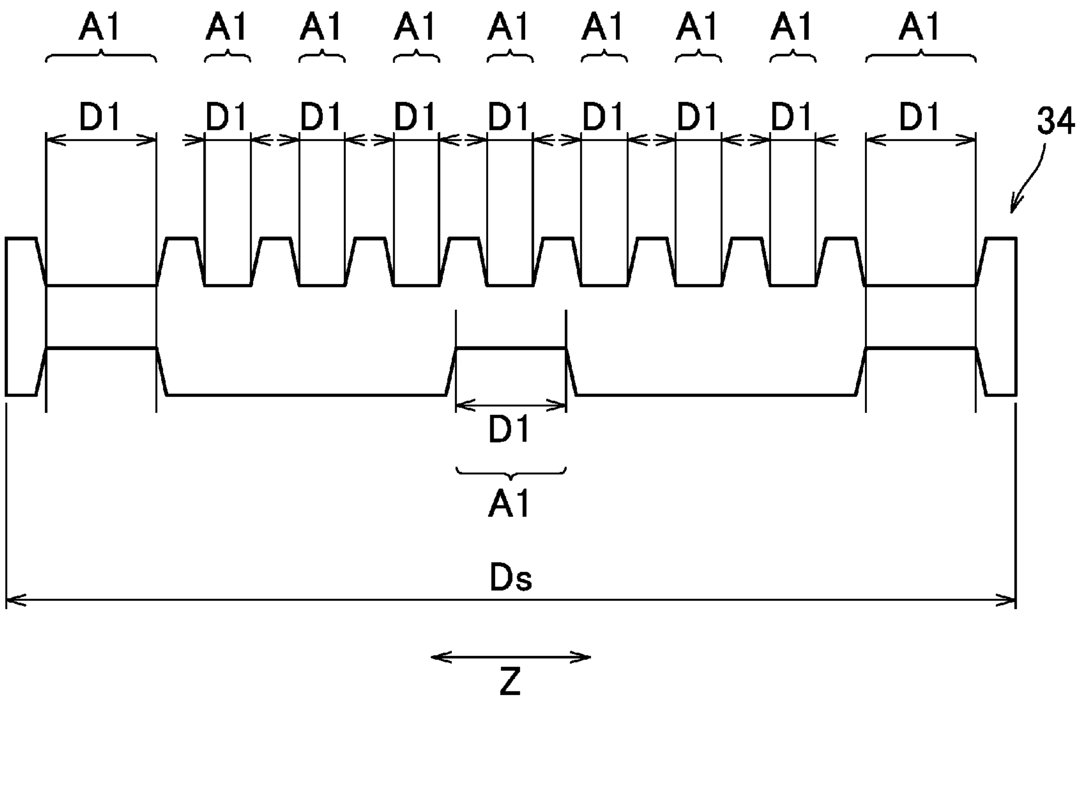


FIG. 25

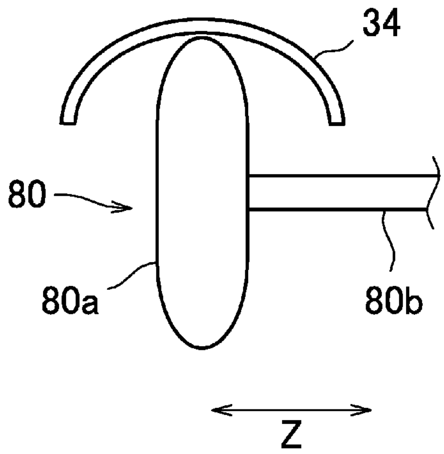



FIG. 26

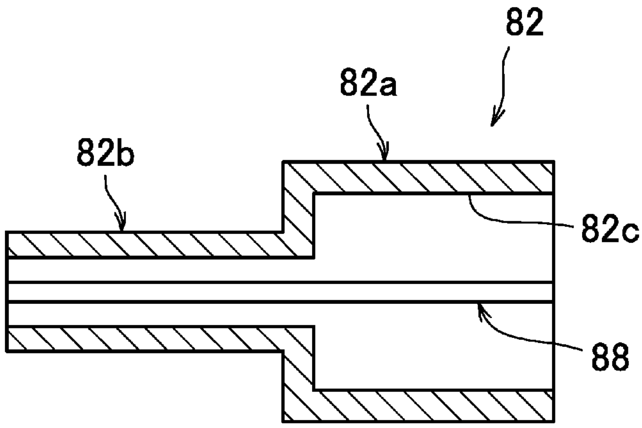



FIG. 27

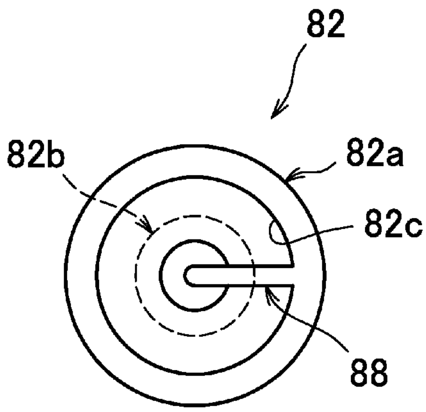



FIG. 28

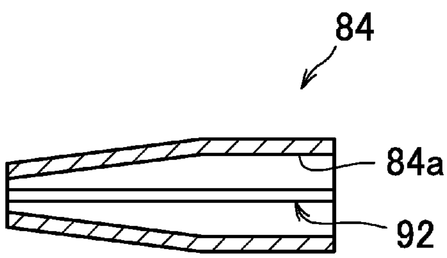


FIG. 29

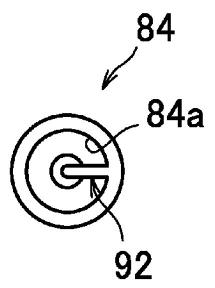
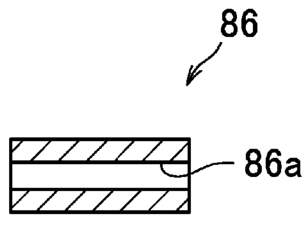



FIG. 30



# INTERNATIONAL SEARCH REPORT

International application No.
**PCT/JP2021/046518**

**A. CLASSIFICATION OF SUBJECT MATTER**

***A24D 3/00***(2020.01)i
FI: A24D3/00

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)

A24D3/00

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. |
|---|---|---|
| Y<br>A | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 161486/1985 (Laid-open No. 133647/1987) (KAMIYA, Taiji) 22 August 1987 (1987-08-22), description, p. 6, line 2 to p. 7, line 1, fig. 2 | 1-4, 7-8<br>5-6 |
| Y<br>A | JP 2013-523108 A (BRITISH AMERICAN TOBACCO (INVESTMENTS) LTD) 17 June 2013 (2013-06-17)<br>paragraphs [0031]-[0035], fig. 7-9 | 1-4, 7-8<br>5-6 |
| Y<br>A | JP 2010-528680 A (R.J. REYNOLDS TOBACCO COMPANY) 26 August 2010 (2010-08-26)<br>paragraphs [0024]-[0034], [0060], fig. 1-13 | 3-4, 7-8<br>5-6 |
| A | JP 11-318418 A (JAPAN TOBACCO INC) 24 November 1999 (1999-11-24)<br>entire text, all drawings | 1-8 |
| A | US 2164702 A (DAVIDSON, Glenn) 04 July 1939 (1939-07-04)<br>entire text, all drawings | 1-8 |

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

* Special categories of cited documents:
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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| **07 February 2022** | **22 February 2022** |

| Name and mailing address of the ISA/JP | Authorized officer |
|---|---|
| **Japan Patent Office (ISA/JP)**<br>**3-4-3 Kasumigaseki, Chiyoda-ku, Tokyo 100-8915**<br>**Japan** | Telephone No. |

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**INTERNATIONAL SEARCH REPORT**
**Information on patent family members**

International application No.
**PCT/JP2021/046518**

| Patent document cited in search report | Publication date (day/month/year) | Patent family member(s) | Publication date (day/month/year) |
|---|---|---|---|
| JP 62-133647 U1 | 22 August 1987 | (Family: none) | |
| JP 2013-523108 A | 17 June 2013 | US 2013/0140197 A1<br>paragraphs [0058]-[0062], fig. 7-9<br>WO 2011/121326 A2<br>EP 2552257 A2<br>AU 2011234200 A1<br>AR 81748 A1<br>CA 2793621 A1<br>KR 10-2013-0009823 A<br>CN 103025181 A<br>MX 2012010499 A<br>RU 2012145730 A<br>ZA 201207263 B | |
| JP 2010-528680 A | 26 August 2010 | US 2008/0302373 A1<br>paragraphs [0035]-[0045], [0071], fig. 1-13<br>WO 2008/154539 A2<br>EP 2162024 A2<br>ES 2535727 T3 | |
| JP 11-318418 A | 24 November 1999 | (Family: none) | |
| US 2164702 A | 04 July 1939 | (Family: none) | |

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