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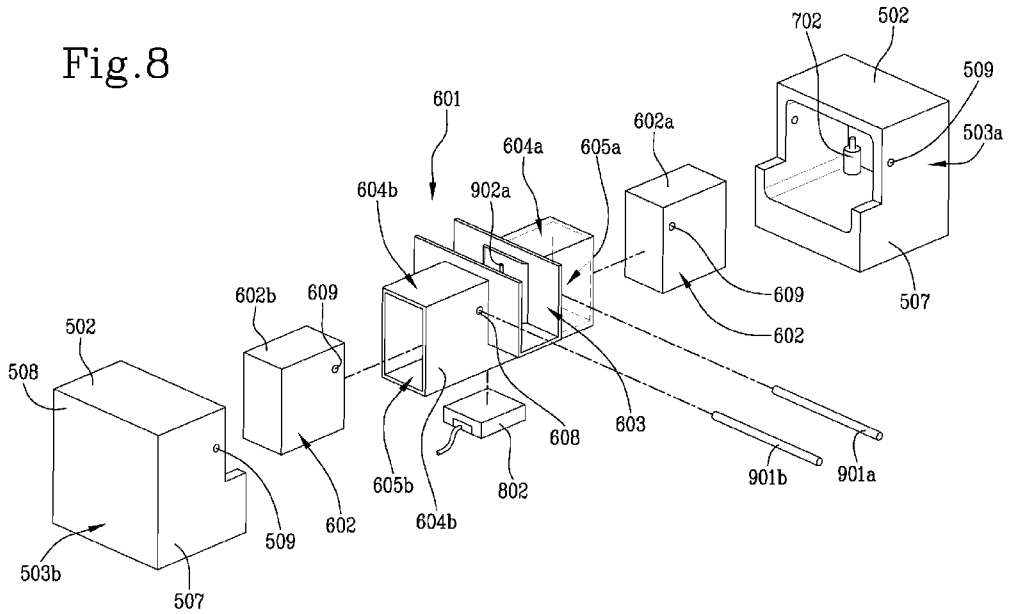
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Fig.8



(57) Abstract: Herein is proposed an electromagnetic detector (1) for detecting one or more properties of a product (2), for example of a rod-shaped article (3), or of a semi-finished product, of the tobacco industry, which comprises a detecting channel (4) open on three sides to allow the product (2) to pass through the electromagnetic detector (1) along a conveying line (D), the detecting channel (4) being the seat of an electromagnetic field. The electromagnetic detector (1) comprises: a hollow body (5), which is made of conductive material and has an interruption configured to define the detecting channel (4), and a dielectric structure (601, 602), housed in the body (5) and made of non-conductive material, which is configured to at least partly cover the detecting channel (4). The dielectric structure (601, 602) comprises at least one first component (601) having a first dielectric permittivity and at least one second component (602) having a second dielectric permittivity, the first dielectric permittivity and the second dielectric permittivity being different from each other, wherein preferably the first dielectric permittivity is less than the second dielectric permittivity.

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ELECTROMAGNETIC DETECTOR FOR DETECTING PROPERTIES OF PRODUCTS OF THE TOBACCO INDUSTRY

This invention relates to an electromagnetic detector for detecting one or more properties of a product, for example an additional element contained in a rod-shaped article such as a cigarette, or a filter, of the tobacco industry, or for example a semi-finished product of the tobacco industry, intended to be wrapped.

In particular, this invention is intended for making an electromagnetic detector, which is the seat of an electromagnetic field, which comprises a detecting channel which is open on three sides to allow the product to pass through the electromagnetic detector itself along a conveying line.

The rod-shaped article, containing the additional element whose properties must be detected, may be made of fibrous material, in this text the term fibrous material meaning a material containing fibres which may be selected in the group consisting of: tobacco and cellulose acetate. Indeed, the article may be, for example, a piece of filter, or a continuous filter, in a machine for making cigarette filters, or a piece containing tobacco, or a rod of tobacco for making cigarettes, in which the additional element may be included.

Alternatively, the product may be a semi-finished product of the tobacco field intended to be wrapped, containing tobacco particles, which may be retained by a suction belt. In this case, the detecting channel may be configured to slidably receive, along the conveying line, at least one portion of the suction belt and at least one portion of the semi-finished product retained on the suction belt.

For some time now there has been a widespread presence on the market of cigarettes containing flavouring substances which the consumer can decide whether or not to activate at the moment of use. Those flavouring substances, for example menthol, may be in liquid form, and are contained in one or more mechanically breakable capsules positioned in the filters in such a way that the consumer can decide, immediately before smoking

each cigarette, whether or not to crush the capsule contained in the filter and disperse the contents in the filter itself to flavour it at the moment of use. The additional element may therefore be a capsule intended to be crushed at the moment of use.

It should be added that, at present, it is possible to make very complex cigarettes comprising series of portions of different types and composition. For this reason, generically, the term “cigarette” refers to an article for the tobacco industry comprising an active portion intended to release a substance to be inhaled. The additional element whose one or more properties must be detected could be, in this case, a composite portion, which has a different composition to that of the tobacco, or the filter, in which it may be included.

While the rod-shaped articles are being made and packaged, it is therefore important to carry out checks on quality in order to verify that the products contained in them, whether they are capsules or composite portions, comply with quality requirements and meet predetermined acceptability criteria in order to guarantee that the articles for smoking offered to the consumer are always of a predetermined quality.

Each product, whether it is a capsule, or a composite portion, must be contained in the respective article in a reference position which must remain within a longitudinal acceptability range, that is to say, considered along a longitudinal axis of the rod-shaped article, which is established beforehand in order for the product to be considered present and of acceptable quality. For example, if the capsule is in a position which is outside the acceptability range, or if it is present in a quantity which is less than the predetermined quantity, for example because it broke while the cigarette, or the filter, was being made, and has already completely dispersed in the article, the article must be rejected since it does not meet the necessary quality requirements.

In this text the term “property of the product” therefore means, if the product is an additional element contained in an article for smoking, a feature selected in the group consisting of: presence, or absence, of the product in

the article for smoking, correct quantity/correct filling, and if necessary breaking during production of the article for smoking itself, longitudinal positioning in the article for smoking, weight, dimensions, and if necessary material used to make the product.

If, in contrast, the product is a semi-finished product of the tobacco field, intended to make a rod of tobacco, the term “property of the product” may be understood to mean, a feature such as for example density and/or moisture, in such a way as to be able to assess a correct quantity of tobacco inside the semi-finished product and to ensure that the rod, and therefore ultimately the finished article, obtained from that rod, is made correctly.

An example of a system for checking articles for smoking containing capsules is given in document EP2848133B1, which discloses an assembly for checking capsules with liquid contents in articles such as cigarette filters, in which the check is carried out when the articles are conveyed through a microwave detecting device which has at least one lateral inlet. Projecting sections of the articles, which are housed in respective cavities of a conveyor, project from said cavities and pass through the microwave detecting field for checking the liquid content of the capsules contained in the projecting sections.

The microwave detecting device is a waveguide resonator which has a coupling to a transmitting antenna by means of a transmitting iris and a further coupling to a receiving antenna by means of a further receiving iris.

In this way, present in the microwave resonator there is a microwave measuring field fed through the transmitting iris, which has a maximum in a central part of the resonator and comes out through the receiving iris.

The presence of the two irises determines the measuring sensitivity of the resonator. Indeed, the distance between the two irises determines the resonance frequency of the resonator which, in turn, determines the quality factor of the microwave resonator which expresses the measuring sensitivity of the resonator and, therefore, the resonator capability for precisely determining the features of the capsules in the articles.

Even if the presence of the two irises allows the microwave resonator to be operated at a low resonance frequency, thereby avoiding dispersing the electromagnetic field outside the detecting channel, the two irises introduce a complexity to the making of the microwave resonator itself which in that case is made up of three separate parts (the transmitting iris, the receiving iris and the body of the resonator) which are difficult to precisely assemble. Indeed, the three parts require particular care when coupling the transmitting iris to the transmitting antenna and the receiving iris to the receiving antenna, in order to be able to guarantee a correct measurement. On the other hand, in the absence of the irises and where the aim is to work at low resonance frequencies, the electromagnetic detectors may be relatively bulky as they extend substantially perpendicularly both to the product conveying line and to the depth of the detecting channel and this makes it necessary to reserve a considerable space for the electromagnetic detector in the machine for making articles for smoking, and therefore makes it impossible to freely choose a preferred installation position for the detector.

Document EP2965640 relates to a rotary conveyor drum for rod-shaped articles, with one or more measuring devices associated with the drum, wherein each measuring device is provided with a passage channel open on one side to allow the passage of sections of the rod-shaped articles.

Document WO2020058868 shows an electromagnetic detector comprising an emitting probe for creating an electromagnetic field and a receiving probe for receiving an electromagnetic field altered by the presence of the product, wherein the probes are positioned inside the electromagnetic detector and have an angled shape, that is to say, they have at least one angle.

The aim of this invention is to make an electromagnetic detector for detecting one or more properties of a product, for example of a capsule in a rod-shaped article or of a semi-finished product intended to be wrapped which is free of the problems described above and which at the same time is easy and inexpensive to make.

Another aim of this invention is to make an electromagnetic detector which has reduced dimensions in such a way that it can easily be installed in any position in a machine for making rod-shaped articles of the tobacco industry.

A further aim of this invention is to make an electromagnetic detector having a detecting channel which is the seat of an electromagnetic field and is open on three sides to allow a product to be conveyed through the electromagnetic detector along a conveying line, which is capable of checking with a high level of measuring sensitivity the features of the product, whether the product is a capsule included in a filter, or in a cigarette, or whether it is the semi-finished product intended to be wrapped.

These aims and others are all achieved by an electromagnetic detector according to this invention as set out in the independent claims below or in any of the claims directly or indirectly dependent on the independent claims mentioned.

Further features and advantages of this invention will be more apparent from the approximate, and therefore non-limiting description of a preferred, non-limiting embodiment of an electromagnetic detector, as illustrated in the accompanying drawings in which:

- Figure 1 is a front perspective view of the electromagnetic detector according to this invention which comprises a detecting channel, which is the seat of an electromagnetic field;
- Figure 2 is a rear perspective view of the electromagnetic detector of Figure 1, in which it can be seen how the electromagnetic detector comprises a source of emission and a source of reception, a heating device, and two temperature sensors, which are all fixed to a rear wall of a hollow body made of a conductive material;
- Figure 3 is a front view of the electromagnetic detector of Figure 1, in which the cross-section planes IV-IV, of Figure 4, V-V of Figure 5 and VI-VI of Figure 6 are indicated;
- Figure 4 is a front perspective view of the electromagnetic detector of Figure 1 sectioned with the cross-section plane IV-IV of Figure 3, showing

the source of emission (or of reception) positioned in an emission cavity (or reception cavity) delimited in the hollow body by an inner part of a first component of a dielectric structure, made of a non-conductive material, which is configured to at least partly cover the detecting channel;

- Figure 5 is a front perspective view of the electromagnetic detector of Figure 1 sectioned with the cross-section plane V-V of Figure 3, showing the inner part of the first component and a second component of the dielectric structure, which is housed in the inner part of the first component;

- Figure 6 is a front perspective view of the electromagnetic detector of Figure 1 sectioned with the cross-section plane VI-VI of Figure 3, showing the source of reception (or of emission) positioned in a reception cavity (or emission cavity) delimited in the hollow body by the inner part of the first component;

- Figure 7 is a perspective view of the first component of the dielectric structure, comprising an outer part, which is configured to at least partly cover the detecting channel and the inner part, which is configured to be contained in the hollow body;

- Figure 8 is an exploded view of the electromagnetic detector of Figure 1;

- Figure 9 is another exploded view of the electromagnetic detector of Figure 1;

- Figure 10 is a cross-section view of the detector of Figure 1 at the cross-section plane IV-IV of Figure 4, showing electromagnetic field oriented parallel to a longitudinal axis of a rod-shaped article, that is to say, of a cigarette, positioned in the detecting channel, in which a capsule is present in a filter of the cigarette, the electromagnetic detector being capable of measuring the characteristic properties of the capsule.

Hereinafter the same elements will be referred to using the same numbers for the various figures.

Figures 1 to 10 show an electromagnetic detector 1, hereinafter indicated more simply as a detector, for detecting one or more properties of a product 2 of the tobacco industry.

The product 2 may be a capsule included in an article 3, for example a cigarette as shown in Figure 10. In general, the product 2 may be an additional element contained in a rod-shaped article 3 such as a cigarette, or a filter, of the tobacco industry, or it may be a semi-finished product of the tobacco industry.

What the term “product” means has been described in detail previously and for brevity will not be repeated now.

In this text the term “property of the product” therefore means, if the product 2 is an additional element included in an article for smoking 3, a feature selected in the group consisting of: presence, or absence, of the product in the article 3, correct quantity/correct filling, and if necessary breaking during production of the article 3 itself, longitudinal positioning in the article 3, weight, dimensions, and if necessary material used to make the product 2.

If the product 2 is a semi-finished product intended to be wrapped, the electromagnetic detector 1 can detect the following “properties of the product”: weight or density of the semi-finished product, for example before it is wrapped with metallized paper (or paper containing metallic particles).

As has already been described in detail, the detector 1 according to this invention may advantageously be used in various machines of the tobacco industry, and even in other automatic machines of other industrial fields, where one or more properties of a product 2 must be detected.

The detector 1 comprises a detecting channel 4 which is the seat of an electromagnetic field, which is open on three sides to allow the product 2 to pass through the detector 1 along a conveying line D.

The electromagnetic field is altered by the presence of the product 2 in the detecting channel 4 and that allows detection of one or more properties of the product 2 during said passage of the product 2.

Indeed, the alteration in the electromagnetic field can be measured and from this measurement, by means of subsequent processing, it is possible to determine the properties of the product 2.

The detector 1 comprises a hollow body 5, which is made of a conductive

material and has an interruption configured to define the detecting channel 4. Therefore, a cavity is delimited inside the body.

The detector 1 comprises a dielectric structure, which is housed in the body 5 and is made of a non-conductive material, which is configured to at least partly cover the detecting channel 4.

The dielectric structure comprises at least one first component 601, for example shown in Figure 7, having a first dielectric permittivity and at least one second component 602, for example shown in Figure 8, having a second dielectric permittivity.

It should be noticed that the first dielectric permittivity of the first component and the second dielectric permittivity of the second component are different from each other.

Thanks to the fact that the first dielectric permittivity and the second dielectric permittivity are different, they can be selected in an appropriate way and it is possible to obtain a detector 1 which, having the electromagnetic field at a predetermined resonance frequency, has compact dimensions.

Indeed, advantageously, it is possible to use a resonance frequency greater than or equal to 100 MHz and less than or equal to 3 GHz; preferably greater than or equal to 100MHZ and less than or equal to 2 GHZ; even more preferably greater than or equal to 1 GHZ and less than or equal to 1.9GHZ, preferably equal to 1.8GHZ. At this resonance frequency of the electromagnetic field, it is possible to concentrate the electromagnetic field itself inside the detecting channel 4, increasing the merit factor of the electromagnetic detector 1 and the sensitivity of the measurement.

The first component 601 comprises an outer part 603, which is configured to at least partly cover the detecting channel 4 and has two lateral panels 603a; 603b which are opposite each other and a back panel 603c which delimits a back of the detecting channel 4. The back panel 603c is positioned between the two lateral panels 603a, 603b. The detecting channel is open at the opposite side to the back panel 603c.

As shown in the appended Figures 1 to 10, the lateral panels 603a, 603b may be parallel to each other and, in contrast, are perpendicular to the back panel 603c.

The first component 601 comprises an inner part 604, which is contained inside the body 5.

It should be noticed that the second component 602 is entirely contained inside the body 5.

Thanks to the fact that the second component 602 is entirely contained inside the body 5 and does not have parts exposed in the detecting channel 4, it is possible to make the second component 602 using any dielectric material, even a dielectric material which is not permitted for use with food, which therefore could not be used to cover, even partly, the detecting channel 4.

The first dielectric permittivity of the first component 601, made of a first dielectric material, is less than, preferably much less than, the second dielectric permittivity of the second component 602, made of a second dielectric material.

This simplifies the selection of the second dielectric material, in the sense that it is possible to use materials with very high dielectric permittivity, capable of concentrating the electric field in the detecting channel 4 and of guaranteeing compact dimensions for the electromagnetic detector 1 itself, without the constraint of having to select one of the dielectric materials permitted for use with food.

Indeed, the first dielectric material of the first component 601 must be an inert material, accepted amongst those intended for contact with food, and may be a material of the plastic type, which may be selected in the group consisting of: high density polyethylene (abbreviated as HDPE); polystyrene (abbreviated as PS); Polytetrafluoroethylene (a polymer belonging to the class of perfluorocarbons, abbreviated as PFC known through its trade name Teflon™); and if necessary any combination of them.

Indeed, it is known that the plastic materials indicated above do not

negatively impact consumer health and do not affect the quality of the articles for smoking with which they may come into contact.

In contrast, the second dielectric material of the second component 602 may be selected in the group consisting of: ceramic material (for example aluminium oxide Al2O3, or alumina, barium titanate BaTO3); crystalline material (for example aluminium oxide Al2O3 in the mineral form as corundum, or sapphire); and if necessary any combination of them.

The second dielectric material may therefore have a very high dielectric permittivity, thereby promoting concentration of the electromagnetic field.

Consequently the detector 1 may be made inexpensively to the sensitivity specifications required for detecting properties of the product 2.

Advantageously, the second component 602 may be contained in the inner part 604 of the first component 601.

In this case, the first component 601 also acts as a protective case for the second component 602 and can hold the second component 602 in position, absorbing any vibrations to which the detector 1 may be subjected, during operation of the machine for articles for smoking in which it is installed.

Indeed, some of the dielectric materials selectable for the second component 602 may be fragile but, thanks to the containment offered by the second component 602, the dielectric structure comprising the first component 601 and the second component 602 is in any case very sturdy.

The inner part 604 of the first component 601 comprises two separating elements 604a and 604b which extend transversally, in particular perpendicularly, starting respectively from the lateral panels 603a and 603b and are positioned on opposite sides of the detecting channel 4.

It shall be understood that the two separating elements 604a and 604b are configured and positioned to divide the cavity of the body 5. In particular, the two separating elements 604a and 604b are configured and positioned to divide the cavity delimited by the body 5 into an emission cavity 505 and into a reception cavity 506.

It should be noticed that each separating element 604a, 604b comprises a

respective seat 605a and 605b, configured to house a respective block 602a and 602b of the second component 602.

Indeed, the second component 602 comprises at least two blocks 602a and 602b and each block 602a, or 602b, may be separate and distinct from the other block 602b, or 602a, as also shown in Figures 8 and 9.

Alternatively, according to one variant not illustrated, each block 602a, or 602b, may be joined to the other block 602b, or 602a by means of a connecting portion, not illustrated, configured to connect the two blocks 602a and 602b to each other which may also be housed in the first component 601, for example in a seat made, at least partly, in the back panel 603c.

It should be noticed that despite the blocks 602a and 602b being shown as prismatic blocks, in particular having the shape of a parallelepiped, they may also be made with a different shape, for example cylindrical.

In the case illustrated, each seat 605a, or 605b, of the respective separating element 604a, 604b, is delimited by respective outer walls 604a', or 604b', which are opposite each other, and by at least one intermediate wall 604a'', 604b'', positioned between the outer walls 604a', 604b'. A rear wall, opposite the intermediate wall 604a'', 604b'', may be placed to delimit each seat 605a and 605b on three sides to effectively contain each block 602a, 602b. According to one variant not shown, the rear walls of the separating elements 604a, 604b are absent and each seat 605a and 605b is open on two sides.

According to one variant, not shown, the dielectric structure may comprise a plurality of components, having respective dielectric permittivities which are different from each other and made of different respective dielectric materials to make a composite dielectric structure.

That composite dielectric structure is capable of increasing the merit factor, and the measuring sensitivity, of the detector 1 itself.

In the case of a plurality of components, the first component 601 which comprises the outer part 603 configured to at least partly cover il detecting

channel 4 may be present, but both the second component 602 and other components, entirely contained in the body 5 may be present.

In other words, the dielectric structure may comprise the first component 601, which is made of the first dielectric material, which comprises the outer part 603 at least partly covering the detecting channel 4 and the inner part 604, contained in the body 5; the second component 602 and a plurality of further components which are different from each other, made of respective dielectric materials, wherein the second component 602 and the plurality of further components are entirely contained in the body 5, in particular are entirely contained in the inner part 604 of the first component 601.

In addition, or alternatively, the dielectric structure may comprise the first component 601 and a plurality of other components which are different from each other, made of respective dielectric materials which are different from each other, wherein that first component 601 and those other components may be present partly covering the detecting channel 4.

In the latter case, the first component 601 and those other components must be made of respective inert dielectric materials, which are permitted for use with food. For example, each lateral panel 603a, 603b may be made using two different plastic dielectric materials combined with each other.

It remains the case that the dielectric structure may comprise the inner part 604 made only in the first component 601 and that the second component 602 and a plurality of further components which are different from each other, made of respective dielectric materials, may be entirely contained in the body 5, and in particular contained in the inner part 604.

In one embodiment, both of the lateral panels 603a; 603b may have respective central zones 606 which are opposite each other, which project further into the detecting channel 4 than the remaining zones 607, which surround each central zone 606, in such a way that a passage section of the detecting channel 4 between the central zones 606 is smaller than the passage section between the remaining zones 607.

The lateral panels 603a, 603b are substantially planar, in the sense that

both the central zones 606 and the remaining zones 607 are planar, but each central zone 606 projects relative to the remaining zone 607. The central zones 606 of both of the lateral panels 603a, 603b are parallel to each other, and the remaining zones 607 of the lateral panels 603a, 603b are also parallel to each other.

However, it is not necessary for both of the lateral panels 603a, 603b to have the central zone 606, projecting relative to the remaining zone 607, since it is sufficient for the central zone 606 to be present in only one of the two lateral panels 603a, or 603b.

One of the two lateral panels 603a, or 603b, may have a central zone 606, which projects further into the detecting channel 4 than a remaining zone 607, which surrounds the central zone 606. The other lateral panel 603b, or 603a may be entirely planar.

In this case too, a passage section of the detecting channel 4 at the central zone 606 is smaller than the passage section of the detecting channel 4 at the remaining zone 607.

It should be noticed that at the central zone 606 the distance between the product 2 and the detector 1 is reduced during the passage of the product 2 in the detecting channel 4. This allows an increase in the measuring sensitivity, movement of the product 2 towards the detector 1 in the central zone 606 being promoted as far as possible.

It should be noticed that, along the conveying line D the central zone 606 has end edges 606a which are rounded, or inclined, in such a way as to promote the entry, or the exit of the product 2 along the conveying line D. That is optional and may be advantageous for products 2 such as capsules contained in elongate articles for smoking 3, such as cigarettes, or filters, a stretch of which can pass through the detecting channel 4 along the conveying line D, as described in more detail below.

According to a different embodiment, the electromagnetic detector 1 may comprise at least one field concentrator 902a, or 902b, which is associated with one of the two lateral panels 603a, or 603b and has at least one final

end positioned along a path for conveying the product 2 in the detecting channel 4 along the conveying line D.

The field concentrator 902a, 902b is configured to concentrate the electromagnetic field at said final end in such a way as to promote a further increase in the measuring sensitivity, and therefore a precision in the measurement itself, when the product 2 is conveyed in the detecting channel 4.

It should be noticed that, preferably, the electromagnetic detector 1 comprising two field concentrators 902a and 902b, respectively associated with the lateral panels 603a and 603b. For example, the final end of each field concentrator 902a and 902b in the respective lateral panels 603a and 603b may be positioned along the conveying path of the capsule 2 in the cigarette 3, that is to say, along the trajectory described by the capsule 3 inside the detecting channel 4, in such a way as to concentrate the electromagnetic field at the capsule 2, during the passage of the capsule 2 in the detecting channel 4 and the detecting of the properties of the capsule 2 itself.

Each field concentrator 902a, 902b is made of a conductive material, is housed in the respective lateral panel 603a, 603b and has an elongate shape, for example is shaped like a strip. Each field concentrator 902a, 902b is positioned transversally, in particular perpendicularly to the conveying line D. Each field concentrator 902a, 902b is therefore associated with the respective lateral panel 603a, 603b since it is housed inside it. Optionally, each field concentrator 902a, 902b may be fixed to the respective lateral panel 603a, 603b.

Specifically, each field concentrator 902a, 902b may be housed in the central zone 606 of the lateral panel 603a, 603b, for example at a centre line of that same central zone 606, along the conveying line D.

Having an elongate shape, each field concentrator 902, 903 comprises two final ends, at which the electromagnetic field is concentrated, one of which is near the back panel 603c whilst the other is positioned towards the

opening of the detecting channel 4.

Therefore, advantageously, there may be two separate zones in the lateral panel 603a, 603b, in which the electromagnetic field can be concentrated.

This facilitates measuring if two separate capsules 2 are present in a cigarette 3, when the properties of those capsules 2 must be measured. Indeed, each field concentrator 902a, 902b may have a length equal to a longitudinal distance between the two capsules 2 in the cigarette 3 to concentrate the electromagnetic field along the respective conveying paths of each capsule 2 in the cigarette 3.

It should be noticed that each lateral panel 603a, 603b, and in detail each central zone 606, has a respective seat which is not a through seat (for example as shown in Figures 3 and 5) to house the respective field concentrator 902a, 902b in such a way that an outer surface of the latter is flush with the central zone 606.

However, according to one variant not illustrated, each field concentrator 902a, 902b may even extend for an entire thickness of the lateral panel 603a, 603b, that is to say, each zone 606 may have a through seat in such a way that each field concentrator housed in it may have the outer surface flush with the central zone 606 and a further outer surface, opposite the outer surface, in contact with the second component 602.

In particular, the further outer surface of each field concentrator 902a, 902b can be positioned in contact with the respective block 602a and 602b, inserted into the respective seat 605a, 605b.

The first component 601, shown in Figure 7, has a complex three-dimensional shape and may be made by injection moulding the first dielectric material, which is a plastic material. However, if the first dielectric material allows it, advantageously, the first component 601 may even be made by 3D printing. Given the simplicity of making the first component 601 and the second component 602, made using the two blocks 602a and 602b, the dielectric structure can be made inexpensively.

The body 5 has a rear wall 501 and a front wall 502, which is interrupted by

the detecting channel 4, which are opposite and parallel to each other.

If we consider the detecting channel 4, it extends along a longitudinal axis X, parallel to the conveying line D.

The detector 1 has a first transversal axis Y, in particular perpendicular, to the longitudinal axis X which is also perpendicular to the rear wall 501, and a second transversal axis Z, in particular perpendicular, both to the longitudinal axis X and to the first transversal axis Y.

The body 5 comprises two housings 503a and 503b which extend from the rear wall 501 along respective axes which are parallel to the first transversal axis Y.

The inner part 604 of the first component 601, which is positioned inside the body 5, is configured to divide the cavity delimited by the body 5 into the emission cavity 505, comprising a source of emission 701 for creating the electromagnetic field, and into the reception cavity 506, comprising a source of reception 702 for receiving an electromagnetic field altered by the presence of the product 2 in the detecting channel 4.

It should be noticed that the two separating elements 604a and 604b are positioned on opposite sides of the detecting channel 4, each separating element 604a and 604b being contained in a respective housing 503a and 503b.

In more detail, the two separating elements 604a and 604b are aligned with each other along an axis parallel to the second transversal axis Z. This makes the first component symmetrical relative to a plane of symmetry perpendicular to the longitudinal axis X but that is not necessary, since the two separating elements 604a and 604b could be offset relative to the plane of symmetry.

Along a line parallel to the first transversal axis Y, each separating element 604a and 604b extends from the rear wall 501 to the front wall 502 to divide the cavity into the emission cavity 505 and into the reception cavity 506.

This means that the outer walls 604a', or 604b', of each separating element 604a, or 604b, extend from the rear wall 501 to the front wall 502 and that

each intermediate wall 604a'', 604b'' is positioned in contact with the front wall 502, as shown in Figure 5, or rather with the part of the front wall 502 which is part of the respective housing 503a, or 503b. In this way, each block 602a, or 602b, is protected from contact with the front wall 502 by interposing the intermediate wall 604a'' and 604b'', that is to say, as previously indicated, it increases the sturdiness of the dielectric structure since any vibrations to which the body 5 may be subjected are filtered, or in any case attenuated.

The lateral panels 603a, 603b extend in respective planes which are parallel to each other, and are also parallel to a plane X-Y defined by the longitudinal axis X and by the first transversal axis Y. It should be noticed that each field concentrator 902a, 902b has its longitudinal axis positioned parallel to the first transversal axis Y and is placed at the centre line of the respective lateral panel 603a, 603b.

The body 5 may have the shape of a parallelepiped and, as shown in Figures 1 to 10, may comprise two lateral walls 507 which are parallel to each other, opposite each other and "C"-shaped, and two end walls 508 which are opposite each other.

It should be noticed that, along a line parallel to the second transversal axis Z, each separating element 604a, 604b extends from the respective lateral panel 603a, 603b until it makes contact with the respective end wall 508. Therefore, both the outer walls 604a', 604b' and the intermediate wall 604a'' and 604b'' extend along an axis parallel to the second transversal axis Z until they make contact with an end wall 508.

Alternatively, according to a variant not shown, the body 5 may have the shape of a cylinder with an axis of symmetry parallel to the first transversal axis Y.

Although the rear wall 501 and the front wall 502 are present, the lateral walls 507 and the end walls 508 would be absent in this case, there being a curved wall present to externally delimit the detector 1. What was previously indicated regarding the shape of the dielectric structure still

applies, however it will differ due to a different shape of the separating elements 604a, 604b, which will extend appropriately along the second transversal axis Z to make contact with the curved wall if it is present.

The source of emission 701 and the source of reception 702 are fixed to the rear wall 501 in a diametrically opposed position relative to a plane of symmetry which is transversal, in particular perpendicular to the longitudinal axis X of the detecting channel 4. That plane of symmetry is parallel to the first transversal axis Y and to the second transversal axis Z.

The position of the source of emission 701 and of the source of reception 702 is such that the electromagnetic field is parallel to the first transversal axis Y, as examined in more detail below.

It should be noticed that the detector 1 comprises at least one temperature sensor 801a, which is fixed to the rear wall 501 and is positioned in the body 5 to measure the temperature of a housing 503a, or 503b.

According to one variant, the detector 1 comprises a pair of temperature sensors 801a, 801b, which are fixed to the rear wall 501, each positioned in the body 5, in particular inside a respective housing 503a, or 503b, to measure the temperature of these housings. Indeed, in each housing 503a and 503b respective openings are made in which the temperature sensors 801a, 801b are housed.

The temperature sensor 801a, or the pair of temperature sensors 801a and 801b, perform a temperature measurement capable of correcting the detection of the properties of the product 2 performed, if the electromagnetic field detected is affected by the internal temperature and, therefore, the measurement obtained from the electromagnetic field would also be affected.

The temperature sensor 801a or, if they are present, the two temperature sensors 801a and 801b, is positioned, or are positioned, in a position diametrically opposed to the source of emission 701, or to the source of reception 702.

Advantageously, the detector 1 may comprise a heating device 802 fixed to

the rear wall 501 to heat the body 5 to a preset operating temperature T.

The preset operating temperature T may be, for example, a few degrees higher than the maximum temperature which the detector 1 can reach when it is, in use, installed in a machine of the tobacco field. This maximum temperature reachable may depend on the outside temperature of the factory, in which the machine of the tobacco field is installed, or may be selected in an appropriate way after a step of training and of detecting the average operating temperature.

Thanks to the heating device 802 a stability in the measurements performed by the detector 1 is guaranteed and therefore correction of the detection of the properties of the product 2 performed is avoided as far as possible, if the electromagnetic field detected is affected by the internal temperature of the detector 1 itself.

It should be noticed that one of the two temperature sensors 801a, or 801b, may be used to detect the temperature of the detector 1 for the purposes of a feedback check of the heating device 802, whilst the other temperature sensor 801b, or 801a, may be used, in the presence of the two temperature sensors 801a and 801b, for the correction depending on the temperature measured of the detection of the properties of the product 2 performed. In the presence of only the temperature sensor 801a, the latter may be used for the correction of the detection of the properties of the product 2 performed whilst the feedback check of the heating device 802 may be delegated to a temperature sensor optionally integrated in the heating device 802 itself.

The detector 1 additionally comprises at least one mode selector, which is made of a conductive material and is fixed to the body 5 to eliminate unwanted modes of resonance of the electromagnetic field.

It can be seen how the mode selector is shaped like a bar and is positioned parallel to the conveying line D of the detecting channel 4.

As shown in Figures 8 and 9, the detector 1 may comprise a pair of mode selectors 901a, 901b, since each housing 503a and 503b comprises a

respective mode selector 901a, 901b which is configured to pass through the emission cavity 505, the inner part 604 of the first component 601, and the reception cavity 506. Each mode selector 901a, 901b also passes through the respective second component 602, the latter being entirely contained in the inner part 604 of the first component 601.

In detail, each mode selector 901a, or 901b, is configured to pass through a respective separating element 604a, or 604b, in whose seat 605a, or 605b the respective block 602a, or 602b is housed. In Figure 8 each mode selector 901a, or 901b, is shown exploded at the position of insertion into the respective separating element 604a, 604b.

For that purpose, it should be noticed that the ends of each mode selector 901a, or 901b, are fixed to the lateral walls 507 of the detector 1, at their portions which are part of the housing 503a, or of the other housing 503b. The fixing to the lateral walls 507 is shown by way of example in Figure 9 with reference to the housing 503a, with which the mode selector 901a is shown to be associated. In contrast, the mode selector 901b is shown in the position of insertion into the separating element 604b, as in Figure 8.

The fixing of each mode selector 901a, or 901b, to the respective housing 503a, 503b may occur, in a way not shown, with coupling by means of a threaded portion or by means of retaining in a seat with a washer closing respective holes 509, which are present in the housing 503a, 503b itself for the insertion of each mode selector 901a, 901b.

It should be noticed that each separating element 604a, or 604b, is also provided with respective holes 608, to allow insertion of the respective mode selector 901a, or 901b. Similarly, holes 609 are made in each block 602a, or 602b, in such a way that the mode selector 901a, or 901b can pass through them.

As already indicated, preferably, the detector 1 is a microwave resonator operating at a resonance frequency greater than or equal to 100 MHz and less than or equal to 3 GHz, preferably greater than or equal to 100MHZ and less than or equal to 2GHZ, even more preferably greater than or equal

to 1GHZ and less than or equal to 1.9GHZ, preferably equal to 1.8GHZ.

The microwave electromagnetic field has an electric field oriented parallel to a conveying plane in which the conveying line of the product 2 lies, which is defined by the longitudinal axis X and by the first transversal axis Y.

Indeed, as shown in Figure 10 in which a cylindrical article for smoking 3 such as a cigarette is shown, the product 2 such as the capsule contained in it can easily be inspected, since the electromagnetic field strikes the cigarette 3 itself longitudinally and renders the detection of one or more properties of the capsule 2 immune from the longitudinal positioning of the capsule 2 itself in the cigarette 3.

In other words, the electric field is oriented parallel to the longitudinal axis of the cigarette 3.

If the product 2 is the capsule included in the rod-shaped article for smoking 3, such as the cigarette, an apparatus may be proposed which comprises the detector 1 described above and a conveying device, not illustrated, provided with seats configured to retain the respective articles 3 to be inspected and to convey those articles 3 one after another perpendicularly to their longitudinal axis.

A stretch of each article 3, containing the product 2 to be checked, may in this case project relative to the conveying device in order to pass through the detecting channel 4 along the conveying line in such a way that during that passage the detector 1 can detect the features of the product 2. The electromagnetic field in the detecting channel 4 has an electric field oriented parallel to the longitudinal axis of the articles 3 conveyed, that is to say, parallel to the longitudinal axis of the cigarettes 3 conveyed by the conveying device.

In use, the source of emission 701 and the source of reception 702 create and respectively receive an electromagnetic field in the detecting channel 4.

Thanks to the dielectric structure which comprises the first component 601 and the second component 602, having respective dielectric permittivities

which are different from each other, wherein the second component 602 has a dielectric permittivity which is greater than that of the first component 601, it is possible to generate an electromagnetic field at a low resonance frequency within the range from 100 MHz to 3 GHz, preferably from 100MHZ to 2GHZ, even more preferably from 1GHZ to 1.9GHZ, preferably equal to 1.8GHZ, concentrating the electromagnetic field inside the detecting channel 4, and therefore increasing the merit factor of the detector 1 and the sensitivity of the measurement of the features of the product 2.

Therefore, it is possible to obtain a detector 1 with compact dimensions at a predetermined resonance frequency, which can easily be installed without problems caused by bulkiness in the machines of the tobacco field.

Along the path for conveying the product 2 in the detecting channel 4, for example during conveying of the cigarette 3 in the conveying channel 4, it is possible to detect the properties of the capsule 2 present in the cigarette 3.

Thanks to the presence of a passage section of the detecting channel 4 which is smaller between the central zones 606, than the remaining zones 607, the measuring sensitivity is increased, movement of the product 2 towards the detector 1 being promoted as far as possible in the central zone 606.

Moreover, the presence of the field concentrator 902a, or 902b, allows the creation of concentrated field zones, positioned along the conveying path of each capsule 2 which increases the measuring sensitivity even more, allowing an increase in the merit factor of the detector 1.

Despite being composite, the dielectric structure which comprises the first component 601 and the second component 602 is sturdy and simple to make, thereby rendering the detector 1 itself inexpensive.

CLAIMS

1. An electromagnetic detector (1) for detecting one or more properties of a product (2), for example of a capsule in a rod-shaped article (3) of the tobacco field or of a semi-finished product of the tobacco field intended to be wrapped, which comprises a detecting channel (4) which is the seat of an electromagnetic field and is open on three sides to allow the product (2) to be conveyed through the detector (1) along a conveying line (D); wherein the electromagnetic detector (1) comprises: a hollow body (5), which is made of conductive material and has an interruption configured to define the detecting channel (4), and a dielectric structure (601, 602), housed in the body (5) and made of non-conductive material, which is configured to at least partly cover the detecting channel (4); the electromagnetic detector (1) being characterised in that the dielectric structure (601, 602) comprises at least one first component (601) having a first dielectric permittivity and at least one second component (602) having a second dielectric permittivity, the first dielectric permittivity and the second dielectric permittivity being different from each other, wherein preferably the first dielectric permittivity is less than the second dielectric permittivity.

2. The electromagnetic detector (1) according to claim 1, wherein the first component (601) comprises an outer part (603), which is configured to at least partly cover the detecting channel (4) and has two lateral panels (603a; 603b) which are opposite each other and a back panel (603c) which delimits a back of the detecting channel (4), and an inner part (604), which is contained inside the body (5); and wherein the second component (602) is entirely contained inside the body (5), and in particular is contained in the inner part (604) of the first component (601).

3. The electromagnetic detector (1) according to claim 2, wherein the inner part (604) of the first component (601) comprises two separating elements (604a; 604b) which extend transversally, in particular perpendicularly, starting from the respective lateral panel (603a; 603b) and are positioned on opposite sides of the detecting channel (4).

4. The electromagnetic detector (1) according to claim 3, wherein the second component (602) comprises at least one pair of blocks (602a; 602b) and each separating element (604a; 604b) comprises a respective seat (605a; 605b), configured to house a respective block (602a; 602b); wherein each block (602a; 602b) is separate and distinct from the other block (602b; 602a); or wherein each block (602a; 602b) is joined to the other block (602b; 602a) by means of a connecting portion configured to connect the two blocks (602b; 602a) to each other.

5. The electromagnetic detector (1) according to one of claims 2 to 4, wherein at least one of the two lateral panels (603a; 603b) has a central zone (606), which projects further into the detecting channel (4) than a remaining zone (607), which surrounds the central zone (606), in such a way that a passage section of the detecting channel (4) at the central zone (606) is smaller than the passage section of the detecting channel (4) at the remaining zone (607).

6. The electromagnetic detector (1) according to one of claims 2 to 5, and comprising at least one field concentrator (902a; 902b), associated with one of the two lateral panels (603a; 603b), which has at least one final end positioned along a path for conveying the product (2) in the detecting channel along the conveying line (D), the field concentrator (902a; 902b) being configured to concentrate the electromagnetic field at said final end.

7. The electromagnetic detector (1) according to claim 6, when it is dependent on claim 5, wherein the field concentrator (902a; 902b) is made of a conductive material and is housed in the lateral panel (603a; 603b); wherein the field concentrator (902a; 902b) has an elongate shape, for example is shaped like a strip, and is positioned transversally, in particular perpendicularly to the conveying line (D); and wherein optionally the field concentrator (902a; 902b) is housed in the central zone (606) of the lateral panel (603a; 603b); and wherein optionally wherein the field concentrator (902a; 902b) extends for an entire thickness of the lateral panel (603a; 603b) until it makes contact with the second component (602).

8. The electromagnetic detector (1) according to one of the preceding claims, wherein the body (5) has a rear wall (501) and a front wall (502), interrupted by the detecting channel (4), which are opposite each other and are parallel to each other, and comprises two housings (503a; 503b) which extend from the rear wall (501); wherein the detecting channel (4) extends along a longitudinal axis (X), parallel to the conveying line (D); and wherein the electromagnetic detector (1) has a first transversal axis (Y), in particular perpendicular, to the longitudinal axis (X) which is also perpendicular to the rear wall (501), and a second transversal axis (Z), in particular perpendicular, both to the longitudinal axis (X) of the detecting channel (4) and to the first transversal axis (Y); and wherein the first component (601) comprises an inner part (604), positioned inside the body (5), which is configured to divide a cavity delimited by the body (5) into an emission cavity (505), comprising a source of emission (701) for creating the electromagnetic field, and into a reception cavity (506), comprising a source of reception (702) for receiving an electromagnetic field altered by the presence of the product (2) in the detecting channel (4).

9. The electromagnetic detector (1) according to claim 8, wherein the first component (601) comprises an outer part (603), which is configured to at least partly cover the detecting channel (4) and has two lateral panels (603a; 603b) which are opposite each other and a back panel (603c) which delimits a back of the detecting channel (4), and an inner part (604), which is contained inside the body (5); wherein the inner part (604) comprises two separating elements (604a; 604b) which extend transversally, in particular perpendicularly, starting from the respective lateral panel (603a, 603b) and are positioned on opposite sides of the detecting channel (4); each separating element (604a, 604b) being contained in a respective housing (503a; 503b).

10. The electromagnetic detector (1) according to claim 9, wherein each separating element (604a; 604b) extends, along a line parallel to the first transversal axis (Y), from the rear wall (501) to the front wall (502) to divide

the cavity into the emission cavity (505) and into the reception cavity (506).

11. The electromagnetic detector (1) according to claim 9, or 10, wherein the body (5) has the shape of a parallelepiped and comprises at least two lateral walls (507) which are parallel to each other, opposite each other and "C"-shaped, and two end walls (508) which are opposite each other, wherein each separating element (604a; 604b) extends, along a line parallel to the second transversal axis (Z), from the respective lateral panel (603a; 603b) to the respective end wall (508).

12. The electromagnetic detector (1) according to one of claims 8 to 11, wherein the source of emission (701) and the source of reception (702) are fixed to the rear wall (501) in a diametrically opposed position relative to a plane of symmetry perpendicular to the longitudinal axis (X) of the detecting channel (4).

13. The electromagnetic detector (1) according to one of claims 8 to 12, and comprising at least one temperature sensor (801a), which is fixed to the rear wall (501) and is positioned in the body (5) to measure the temperature of a housing (503a; 503b); or comprising two temperature sensors (801a; 801b), which are fixed to the rear wall (501), and positioned in the body (5) to measure the temperature of respective housings (503a; 503b).

14. The electromagnetic detector (1) according to claim 13, when it is dependent on claim 10, wherein the temperature sensor (801a) is positioned in a position diametrically opposed to the source of emission (701) and to the source of reception (702), or wherein the temperature sensors (801a; 801b) are positioned in a position diametrically opposed to the source of emission (701) and to the source of reception (702).

15. The electromagnetic detector (1) according to one of claims 8 to 14, and comprising a heating device (802) fixed to the rear wall (501) to heat the body (5) to a preset operating temperature T.

16. The electromagnetic detector (1) according to one of the preceding claims, and comprising at least one mode selector, which is made of a conductive material and is fixed to the body (5) to eliminate unwanted

modes of resonance of the electromagnetic field; wherein the mode selector is shaped like a bar and is positioned parallel to the conveying line (D) of the detecting channel (4).

17. The electromagnetic detector (1) according to claim 16, when it is dependent on one of claims 8 to 13, wherein each housing (503a; 503b) comprises a respective mode selector (901a; 901b) which is configured to pass through the emission cavity (505), the inner part (604) of the first component (601), and the reception cavity (506), each mode selector (901a; 901b) also passing through the respective second component (602), the latter being entirely contained in the inner part (604) of the first component (601).

18. The electromagnetic detector (1) according to claim 17, when it is dependent on claim 9, wherein the second component (602) comprises a pair of blocks (602a; 602b) and each separating element (604a; 604b) comprises a respective seat (605a; 605b), configured to house a respective block (602a; 602b); each mode selector (901a; 901b) passing through the respective separating element (604a; 604b) and the block housed in it (602a; 602b).

19. The electromagnetic detector (1) according to one of the preceding claims, wherein the electromagnetic detector (1) is a microwave resonator operating at resonance frequency greater than or equal to 100 MHz and less than or equal to 3 GHz, preferably greater than or equal to 100MHZ and less than or equal to 2GHZ, even more preferably greater than or equal to 1GHZ and less than or equal to 1.9GHZ, preferably equal to 1.8GHZ; wherein the electromagnetic field has an electric field oriented parallel to a conveying plane in which the conveying line (D) for the product (2) lies.

20. The electromagnetic detector (1) according to one of the preceding claims, wherein the first component (601) is made of a first dielectric material and the second component (602) is made of a second dielectric material, in such a way that the first dielectric permittivity is less than the second dielectric permittivity; wherein the first dielectric material is an inert

material and may be a material of the plastic type, which may be selected in the group consisting of: high density polyethylene (abbreviated as HDPE); polystyrene (abbreviated as PS); Polytetrafluoroethylene (a polymer belonging to the class of perfluorocarbons, abbreviated as PFC known through its trade name Teflon™), and if necessary any combination of them; and wherein the second dielectric material may be selected in the group consisting of: ceramic material (for example aluminium oxide Al2O3, or alumina, barium titanate BaTO3); crystalline material (for example aluminium oxide Al2O3 in the mineral form as corundum, or sapphire); and if necessary any combination of them.

21. The electromagnetic detector (1) according to one of the preceding claims, wherein the dielectric structure comprises the first component (601), which is made of a first dielectric material, the second component (602) and a plurality of further components which are different from each other, made of respective dielectric materials, wherein the second component (602) and the plurality of further components is entirely contained in the body (5).

22. The electromagnetic detector according to claim 21, wherein the first component (601) comprises an outer part (603) at least partly covering the detecting channel (4) and an inner part (604), which is contained inside the body (5); and wherein the second component (602) and the plurality of further components is entirely contained in the inner part (604) of the first component (601).

23. The electromagnetic detector (1) according to one of the preceding claims, wherein the dielectric structure comprises the first component (601) and a plurality of other components which are different from each other, made of respective dielectric materials which are different from each other, the first component (601) and the plurality of other components being positioned partly covering the detecting channel (4).

24. The electromagnetic detector (1), according to claim 3, or according to one of claims 4 to 23, when they are dependent on claim 3, wherein the body (5) delimits a cavity and wherein the two separating elements (604a;

604b) are configured and positioned to divide said cavity into an emission cavity (505) and into a reception cavity (506).

25. An apparatus for detecting one or more properties of a product (2) of the tobacco field, wherein the product is a capsule included in a rod-shaped article (3), wherein the system comprising an electromagnetic detector (1) according to one of claims 1 to 24 and a conveying device provided with seats configured to retain respective articles (3) to be inspected and to convey said articles (3) one after another perpendicularly to a respective longitudinal axis of them, a stretch of each article (3) containing the product (2) projecting relative to the conveying device to pass through the detecting channel (4) in such a way that the electromagnetic detector (1) can detect the features of the product (2); wherein the electromagnetic field in the detecting channel (4) has an electric field oriented parallel to the longitudinal axis of the articles (3) conveyed.

Fig.1

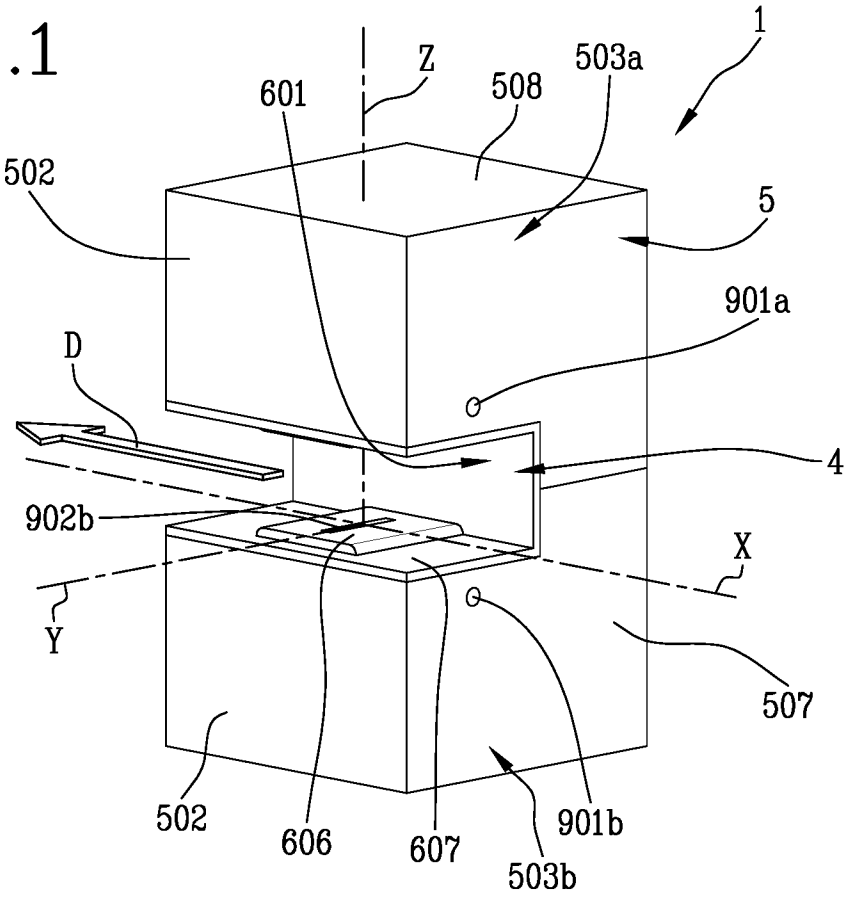

1
Z
601
508
503a
502
5
901a
D
4
902b
X
Y
507
502
606
607
901b
503b

Fig.2

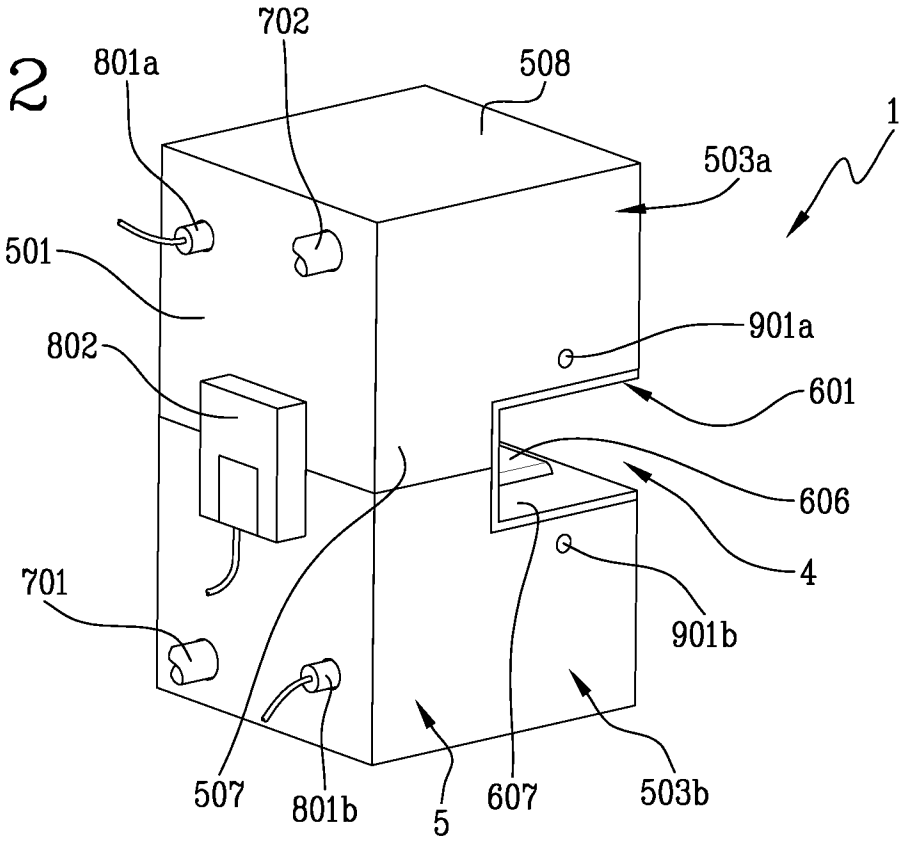

702
801a
508
1
503a
501
901a
802
601
606
4
701
901b
507
801b
5
607
503b

Fig.3

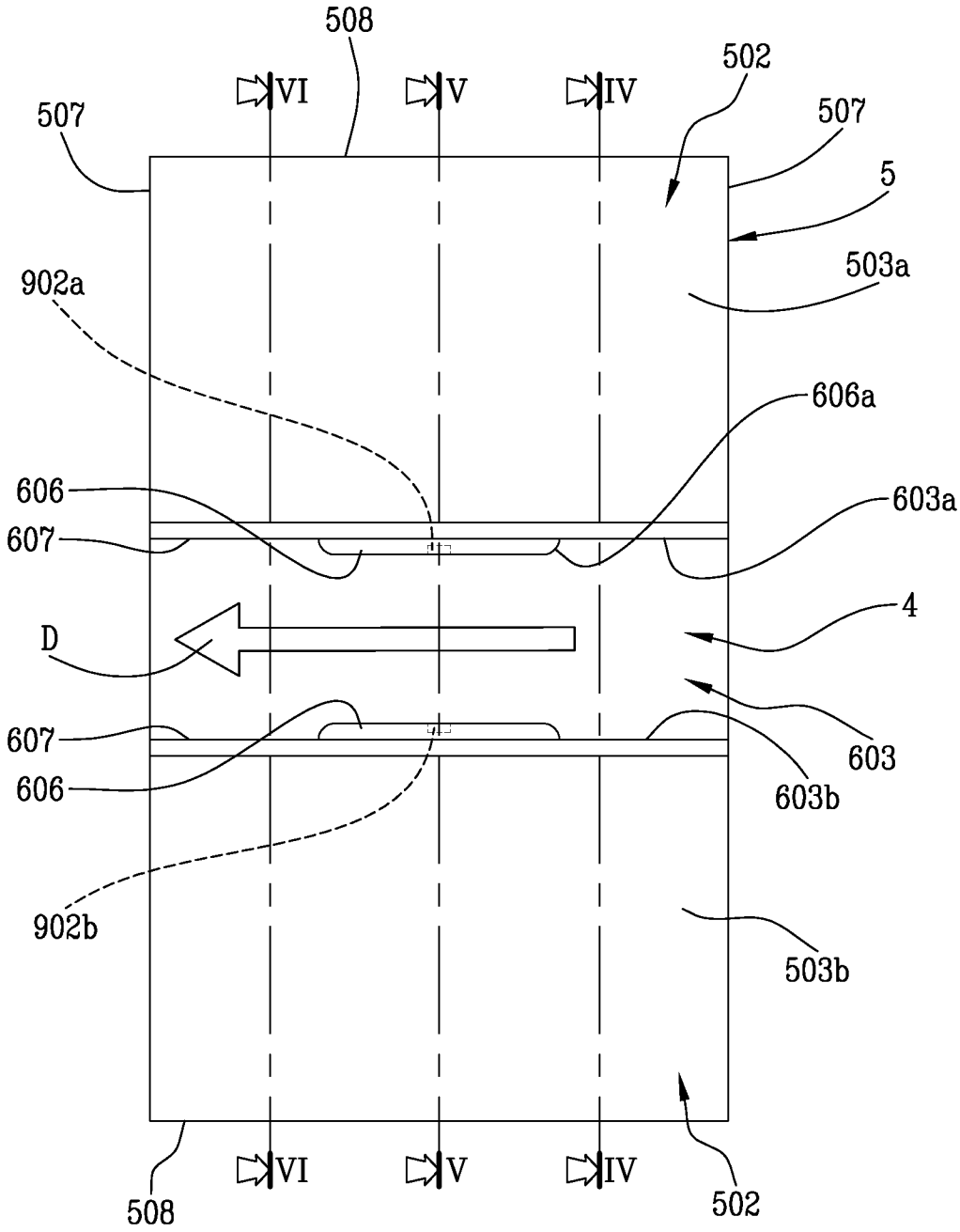

508
VI
V
IV
502
507
507
5
503a
902a
606a
606
603a
607
4
D
607
603
606
603b
902b
503b
508
VI
V
IV
502

Fig.4

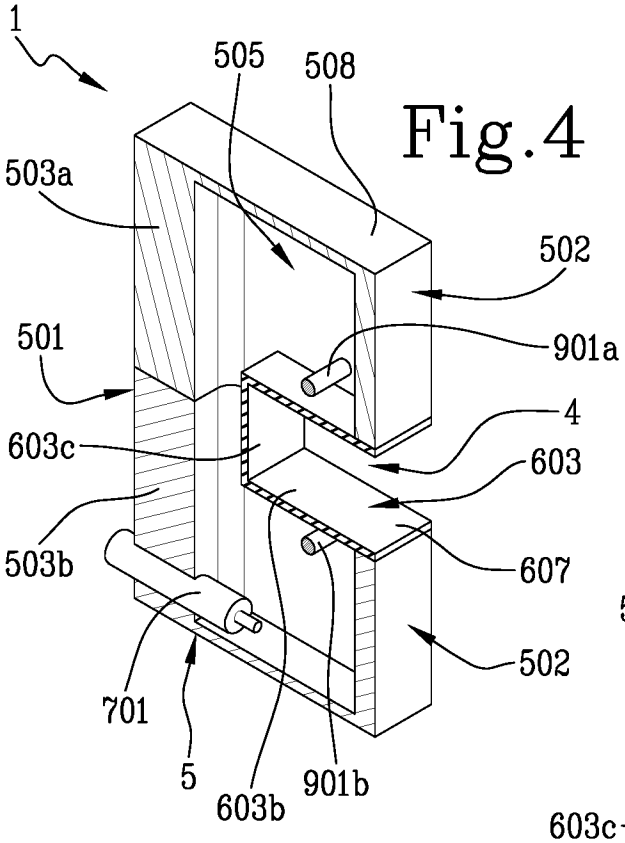


Fig.5

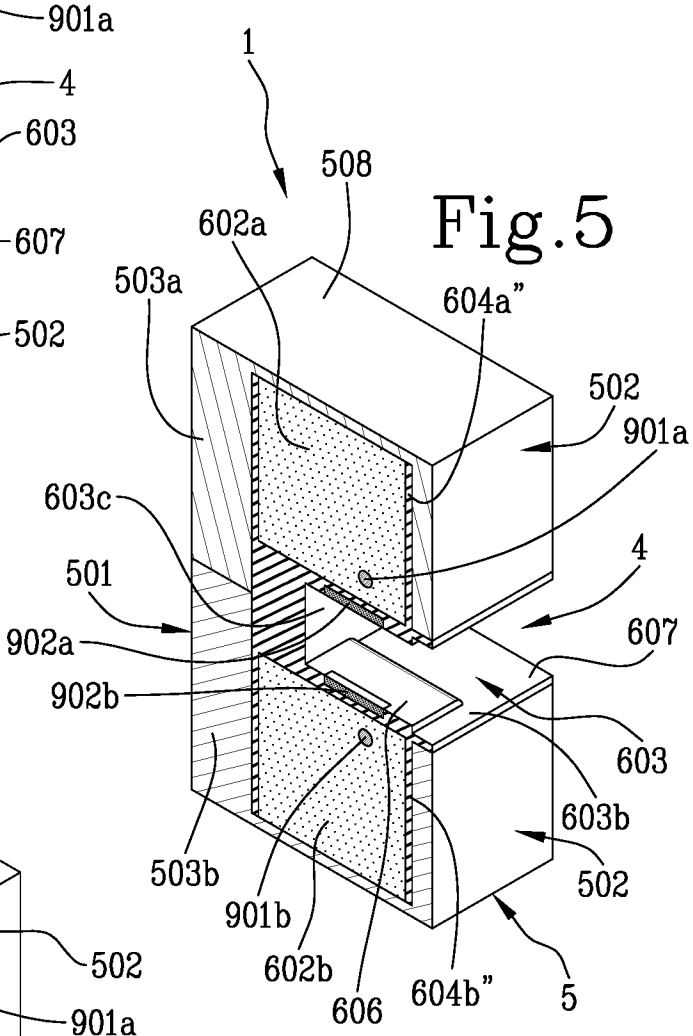


Fig.6

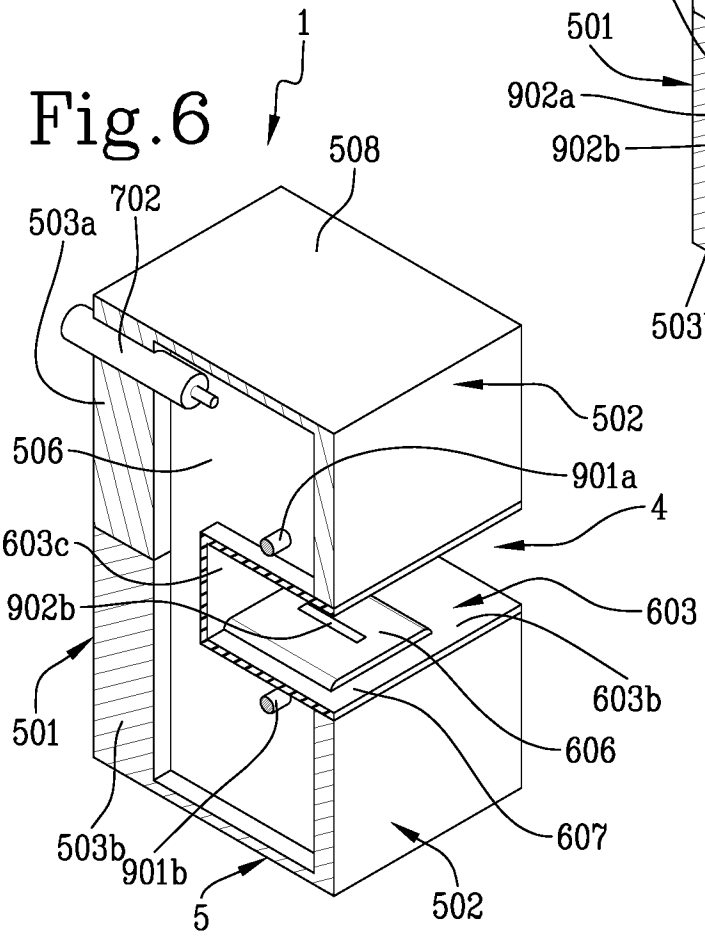
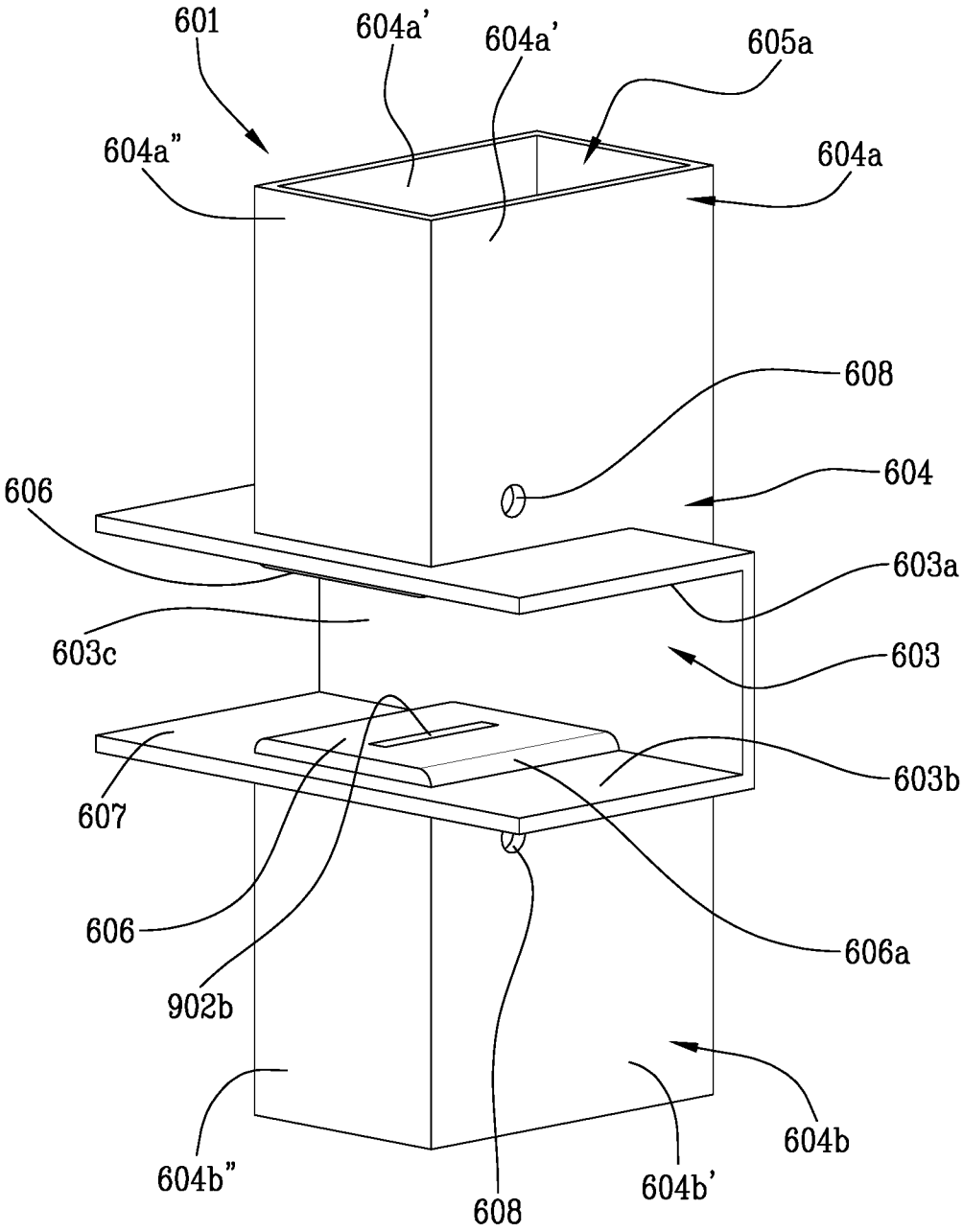


Fig.7


601
604a'
604a'
605a
604a"
604a
608
604
606
603a
603c
603
607
603b
606
606a
902b
604b"
608
604b'
604b

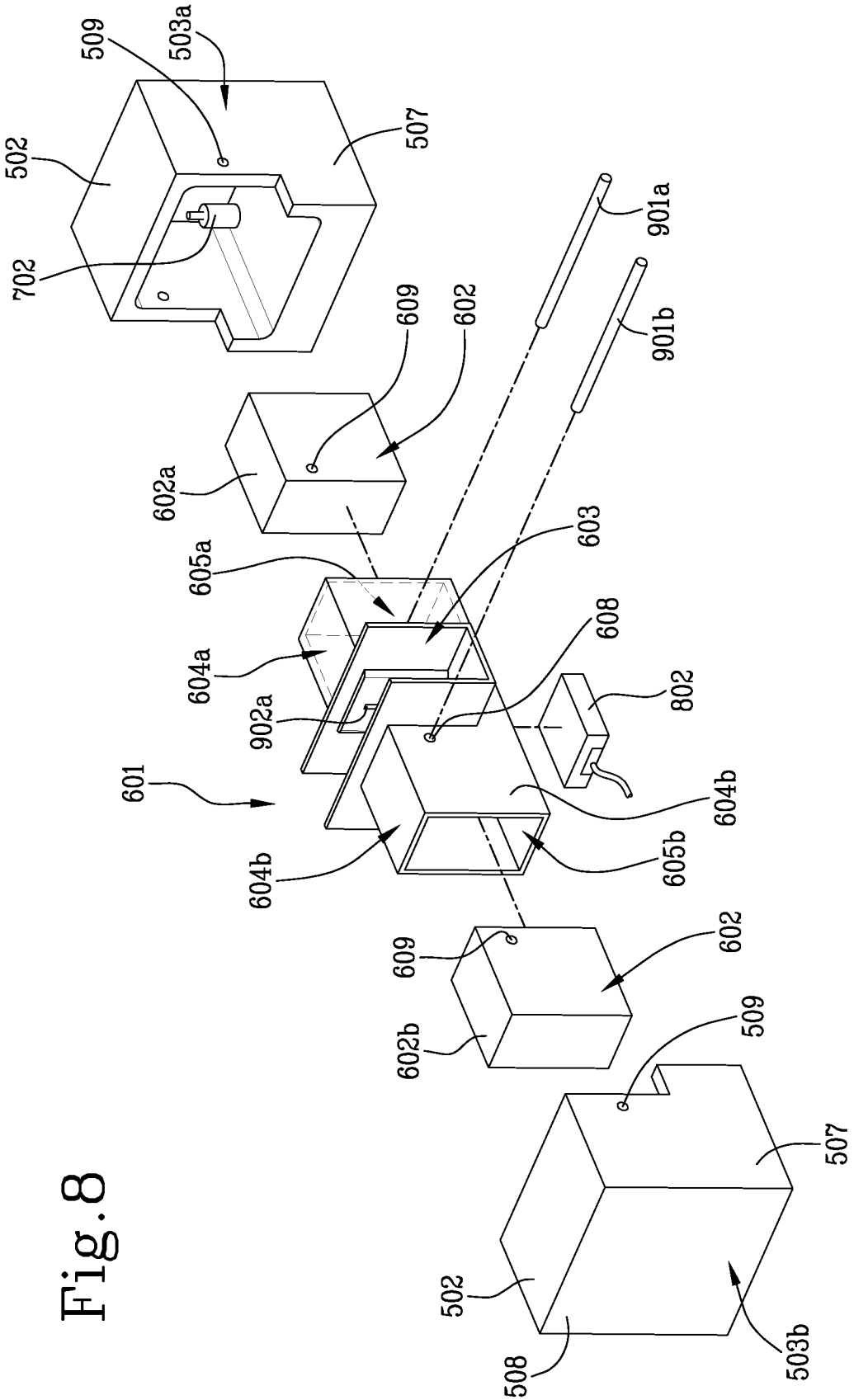
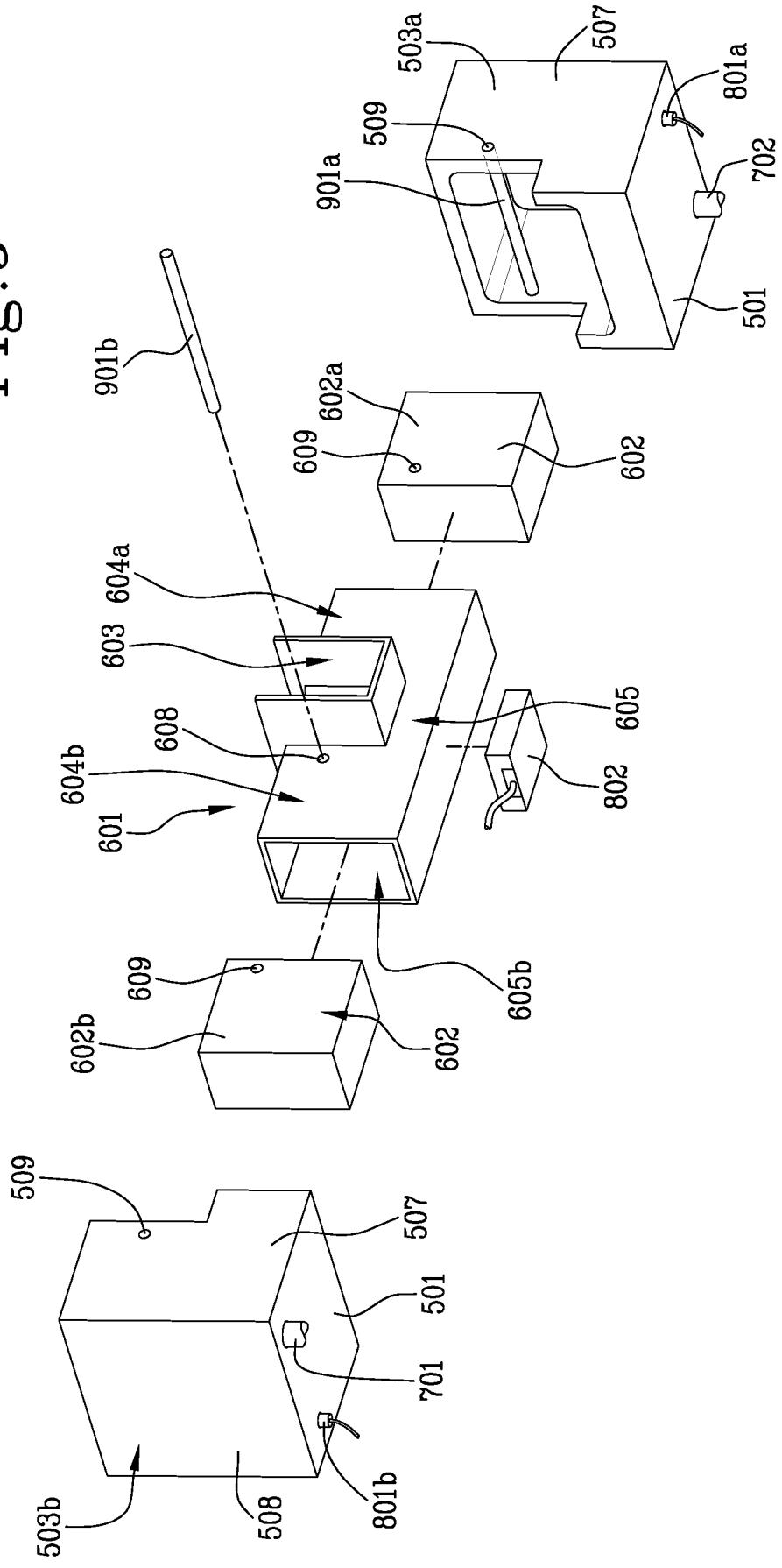

509
503a
502
507
702
901a
901b
609
602
602a
603
605a
604a
608
902a
802
601
604b
605b
604b
609
602
602b
509
507
502
503b
508

Fig.8

Fig.9


503a
507
801a
509
702
901a
501
901b
602a
609
602
604a
603
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802
604b
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501
701
503b
508
801b

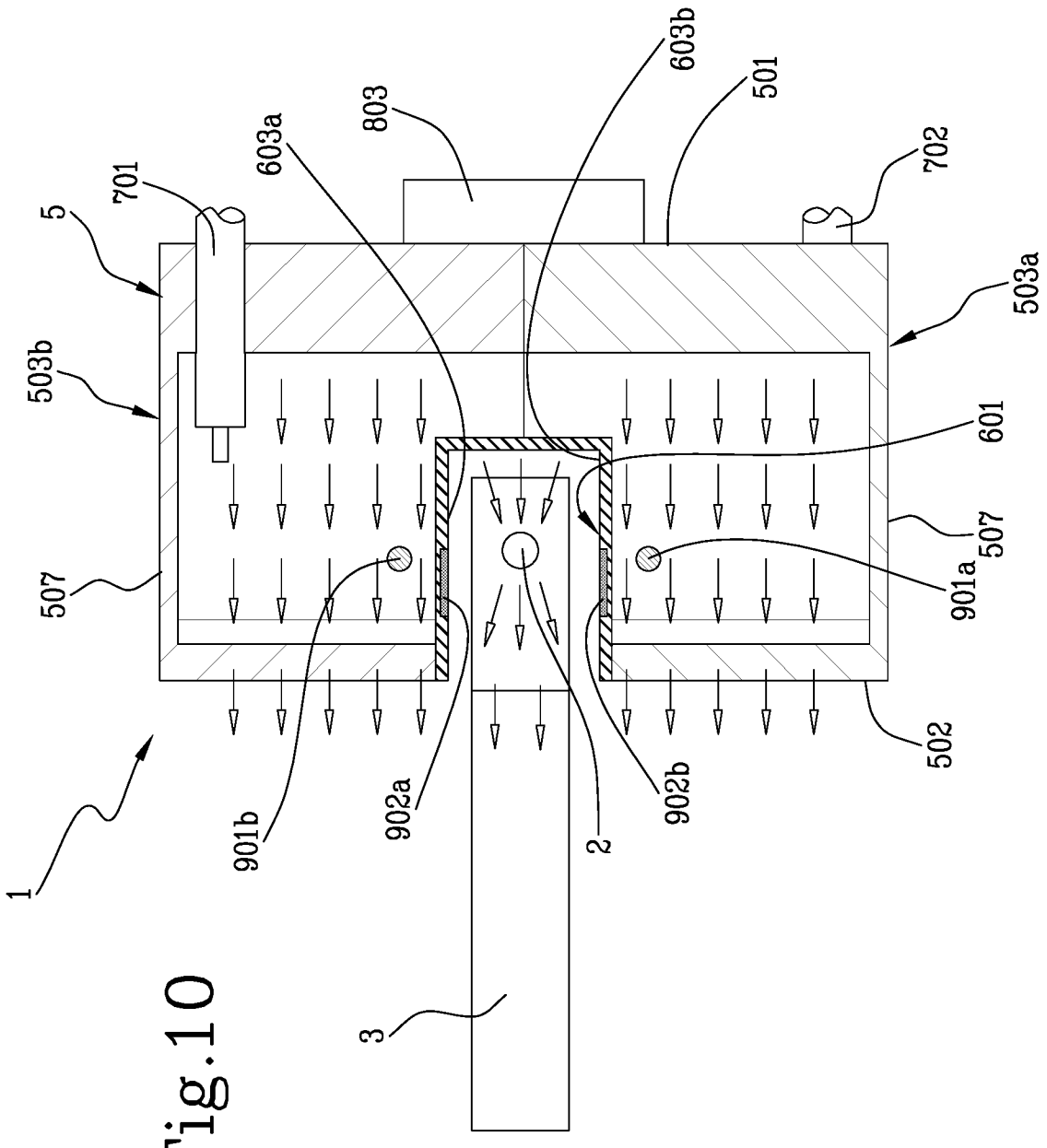

603b
501
803
603a
702
701
5
503a
503b
601
507
901a
507
502
1
901b
902a
2
902b
3

Fig.10

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2023/055227

A. CLASSIFICATION OF SUBJECT MATTER
INV. G01N22/04
ADD.

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)
G01N A24B A24C

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 2 965 640 A1 (HAUNI MASCHINENBAU AG [DE]) 13 January 2016 (2016-01-13) paragraphs [0029], [0062] - [0065], [0071] - [0076], [0086] figures 1,2,3,4,7	1-25
A	WO 2020/058868 A1 (GD SPA [IT]) 26 March 2020 (2020-03-26) page 9, line 26 - page 10, line 31 page 15, lines 2-21 page 24, lines 5-10 figures 1-9,12	1-25
A	US 6 417 676 B1 (SCHROEDER DIERK [DE] ET AL) 9 July 2002 (2002-07-09) abstract column 4, line 35 - column 5, line 24 figure 1	1-25

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[x] Further documents are listed in the continuation of Box C.

[x] See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
23 August 2023	30/08/2023

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Couteau, Olivier

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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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