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(54) **Clothes drying machine provided with additive dispensing means**

(57) Clothes drying machine comprising a drum rotating about its own axis, a plurality of clothes lifting ribs that arranged radially along the inner surface of the cylindrical sidewall of said drum and comprise respective means adapted to receive or contain solid or liquid substances that are filled in prior to starting a drying cycle. These containing means are comprised of respective reservoirs provided with respective filling orifices that are

accessible from the outside of the drum, and are further provided with respective calibrated perforations adapted to enable the substances contained in the respective reservoirs to be let out and dispersed into the drum, or removable rib portions adapted to fixedly hold individually interchangeable treatment plates that are placed each time within said rib portions.

**EP 1 690 974 A1**

## Description

**[0001]** The present invention refers to an improved kind of clothes drying machine, preferably of the type intended for use in households, provided with more effective means to disperse solid or liquid substances in the items being dried in the drum of the machine.

**[0002]** It is a widely known fact that, during a drying process being performed in a clothes drying machine of the above-cited kind, it is often desirable for certain substances to be introduced in the rotating drum in view of producing on the clothes being dried a number of different effects, which may generally be summarized as follows:

- water: the introduction of small amounts of water, which is easily and quickly caused to vaporize within the drum, enables excessively dry clothes to be moistened so as to make them fit for ironing; moreover, if the water is not introduced in its liquid state, but rather in the form of a finely dispersed spray or aerosol, such as this is described for example in the European patent application No. 04 100490.4 and in EP 1 431 443, the effect is achieved that the clothes being loaded in the drum are practically submitted to a "refreshing" action, which is neither a washing process nor a drying process, but rather a process that goes very near to a light ironing treatment, with the advantage that such treatment is performed in a fully automatic manner, without any waste of time by the user, and that the clothes being treated in this way are ready for use, i.e. can be worn immediately thereupon;
- scents: the desire to have the clothes perfumed during the drying process - and not only during the drying process, for the matter - is widely known, so that it shall not be dealt with here any further.

**[0003]** There are a variety of ways in which said effects can be obtained. Some of the more typical ones among these methods are described for example in the US patent publications Nos. 3,180,037 and 2002/0069465. These methods are based on the common fact that the substances to be added into the drying drum are either injected into the drum by means of appropriate injectors actuated by respective pumping devices, or are made available with the aid of atomisation means, e.g. of the ultrasound generating kind, which generate an aerosol effect directly within the drum.

**[0004]** Such embodiments are generally very effective in enabling the required purpose to be reached. However, they also involve rather complicated constructions, owing to the presence of some operating parts, such as pumps, atomizers, ultrasonic generators, vaporizers, and the like, so that they ultimately turn out as being excessively expensive in view of adding a function that is not really essential one in the use of a clothes drying machine.

**[0005]** It would therefore be desirable, and it is actually

a main object of the present invention, to provide a clothes drying machine that is adapted to enable the clothes to undergo a treatment cycle that includes the addition of substances of various kind, both in the liquid and in the gaseous state, into the drum containing the clothes to be dried, wherein such feature does not imply any significant complication in the construction of the drying machine and, above all, does not imply any significant increase in costs; moreover, the addition of such feature shall not put any penalty on other performance aspects or functions of the machine, and shall further be capable of being used and operated in a fully simple and reliable manner as far as the user is concerned.

**[0006]** According to the present invention, these aims, along with further ones that shall be described further on, are reached in a clothes drying machine incorporating the features as recited in the appended claims. Anyway, features and advantages of the present invention will be more readily understood from the description that is given below by way of nonlimiting example with reference to the accompanying drawings, in which:

- Figure 1 is a cross-sectional view of the drum of a prior-art clothes drying machine, as viewed in a direction orthogonal to the axis of the same drum;
- Figure 2 is a an outer perspective view of a portion of a clothes lifting rib of a drying machine drum according to the present invention;
- Figure 2/1 is a same view of a portion of a clothes lifting rib as the one shown in Figure 2, but in a different operating state;
- Figures 2A and 2B are a symbolical cross-sectional view along the axis X of the drum of the clothes lifting rib shown in Figure 2 and a symbolical cross-sectional view of the same rib as viewed along a section line orthogonal to said axis "X" of the drum, respectively;
- Figure 3 is an outer perspective view of a second embodiment of a clothes lifting rib of a drying machine drum according to the present invention;
- Figures 3A and 3B are two perspective exploded views of two respective assembly states of the rib shown in Figure 3;
- Figure 4 is a view of the clothes lifting rib shown in Figure 3, as installed in the drum;
- Figure 5 is a view of the rib of Figure 4, as shown with an inventive device separated therefrom.

**[0007]** In a clothes drying machine according to a generally known prior-art embodiment there are provided a rotating drum 1 holding the clothes to be dried, to which

a conduit (not shown) is associated for the circulation of the drying air.

**[0008]** Inside this drum 1 there are arranged a plurality of clothes lifting ribs 2, the purpose of which is largely known in the art.

**[0009]** According to the present invention, the substances due to be diffused in the drum during a drying process are filled in advance in appropriate containing means that are provided inside said ribs, appropriate passages being also provided to enable said substances to be diffused from said containing means into the internal volume of the drum during the drying and/or treatment process.

**[0010]** With reference to Figures 2, 2A and 2B, and assuming the case that the above-mentioned substances are in a liquid state, the rib 2 is internally provided with an inner reservoir 3, to which access can be gained from the outside through a filling orifice 4 closable by means of such largely known means 5 as a screw cap, a snap-on cap or the like.

**[0011]** In this particular embodiment, the above-mentioned reservoir is represented in the form of an elongated prismatic cavity that is entirely contained in the rib; in order to enable the substances contained in said reservoir to be transferred therefrom for diffusion outside the walls of the same rib, i.e. in the interior of the drum, the rib is provided with appropriate calibrated perforations 16 that are so arranged and sized as to ensure that both said filling orifice 4 and said perforations 16 are immediately debouching into the interior of the drum.

**[0012]** In an improved embodiment, said internal reservoir 3 is provided as an integral construction with the respective rib.

**[0013]** At this point, the way in which the above-described inventive device operates is fully apparent: in fact, prior to starting a drying cycle, all a user has to do is to reach the rib containing the reservoir that he/she wishes to fill, remove the related cap 5 to open the filling orifice, fill the liquid substance into the reservoir, and put on again the cap to close the filling orifice.

**[0014]** As the then started drying cycle progresses, the liquid substance so filled in the proper reservoir is able to be automatically ejected therefrom in a gradual manner for diffusion among the clothes being dried in the drum, since the drum is kept rotating continuously during the same process and, as a result, each time that the rib reaches up to its upper position, the same rib turns practically upside down, thereby enabling a small amount of the liquid substance contained therein to be immediately and spontaneously ejected therefrom, so as to achieve the desired effect.

**[0015]** A further advantage of the present invention can at this point be equally appreciated; in the case that just plain water is in fact filled in said reservoirs in the ribs of the drum, as soon as this water is ejected from the reservoir and enters the interior of the drum, it is practically caused to immediately evaporate by the high temperature of the drying air circulating through the drum, thereby

bringing about the same conditions as described in the afore-cited European patent application No. 04 100490.4, or in EP 1 431 443, in which the substances to be added into the drum are either atomized (aerosol) or injected by means of appropriate pumping means and associated injectors. It can however be readily appreciated that this same effect is reached in a by far simpler and low-cost manner with an arrangement according to the present invention.

**[0016]** On the other hand, since the substances to be desirably added into the drum during drying may also be in a gaseous state, as this may for example be the case when certain kinds of scents, moth-killing preparations or the like are used, the use of a reservoir of the kind described above would of course turn out as being quite impractical as far as both filling and mode of operation are concerned.

**[0017]** In view of overcoming this drawback, following improved embodiment of the present invention is therefore provided: with reference to Figures 3, 3A, 3B, 4 and 5, use is made of a properly prepared solid element that is impregnated, or treated in some other way, with the desired substance selected for diffusion in the drum during the drying process.

**[0018]** In this connection, widely known in the art are for example small plastic plates that, either during or after injection moulding, are impregnated with substances of various kind, e.g. scents based on various perfuming essences, insecticides, protective agents, and the like.

**[0019]** Other kinds of substances may of course be used as well, such as solid perfumers or the like, as they are again widely known in the art and are for example normally used to deodorize the interior of vehicles, bathrooms, scarcely aerated spaces, and the like.

**[0020]** To enable these small plates, slabs or sticks to be introduced and positioned for use, the rib 2 is made up by two distinct and complementary portions. The first portion 22 consists of a rib of a usual, known type in the shape of a prism, but in which there is provided in a removable manner a separate second portion 23 lying flush with a contiguous length of the inner edge 24 that faces the axis of the drum. This second portion 23 is made in such a manner as to be selectively removable from said first portion 22 and, conversely, capable of being fitted in an appropriate and corresponding accommodation 28 provided in said first portion 22. In this way, when the second portion is fitted in the first portion of the rib, the latter takes the usual form of a complete rib as known from the prior art.

**[0021]** For said small plate 25 to be applied, it will therefore only take to remove said second portion 23 of the rib, apply said small plate 25 thereto, preferably therein-side, as shown in Figure 5, and fit again said second portion in the appropriate accommodation 28 in the first portion 22.

**[0022]** In this way, upon completion of the above procedure, the rib itself takes again the form and shape of a fully conventional clothes lifting rib, as shown in Figure

4, and the drying and/or treatment cycle can be started.

[0023] Furthermore, said second portion 23 shall be obviously provided with proper apertures 26 enabling the interior of the receptacle accommodating the plate 25 to communicate with the interior of the drum, so as to ensure that the scents, fragrances or other exhalations issuing spontaneously from said plate 25 are able to freely and immediately diffuse into the drum so as to impregnate the clothes contained in said drum for drying.

[0024] The substances, which said plate 25 is imbued with, tend therefore to sublime and/or evaporate, due also to the effect of the high temperature prevailing inside the drum, thereby creating an atmosphere within the drum that ultimately affects the clothes being dried, thereby impregnating them.

[0025] As far as the application of said plates or sticks in said second rib portion 23 is concerned, as well as for locking in place and releasing said second rib portion 23 in and from the respective first portion 22, use can simply be made of the usual means as they are largely known as such in the art, preferably of elastic snap-fit elements 27 of the kind shown in Figures 3A and 3B.

are adapted to be fitted, by means of appropriate locking means, in a corresponding accommodation (28) provided in the body of the respective lifting rib (22), so that the latter comes to be substantially uniform in its cross-section relative to a plane extending orthogonally to the axis of the drum.

5. Clothes drying machine according to claim 4, **characterized in that** said locking means are comprised of elastically releasable snap-fit elements.

6. Clothes drying machine according to any of the preceding claims 3 to 5, **characterized in that** said second rib portions (23) are provided with a plurality of through-apertures (26) enabling the internal volume of said portions to communicate with the interior of said drum.

## Claims

1. Clothes drying machine comprising an essentially cylindrical drum

(1) capable of rotating about its own axis (X) and containing the clothes to be dried, a plurality of clothes lifting ribs (2) arranged radially along the inner surface of the cylindrical sidewall of said drum, **characterized in that** at least one of said clothes lifting ribs comprises internally respective containing means adapted to receive or contain solid or liquid substances that are filled in prior to starting a drying cycle.

2. Clothes drying machine according to claim 1, **characterized in that** said containing means are comprised of respective reservoirs (3) provided with respective filling orifices (4) that are accessible from the outside of the drum and are provided with respective calibrated perforations (16) adapted to enable the substances contained in the respective reservoirs to be let out and dispersed into the drum.

3. Clothes drying machine according to claim 1, **characterized in that** said containing means are comprised of second rib portions (23) adapted to fixedly hold respective treatment plates (25) that are individually interchangeable within respective first rib portions (22).-

4. Clothes drying machine according to claim 3, **characterized in that** said second rib portions (23) are in the shape of a portion of a clothes lifting rib and

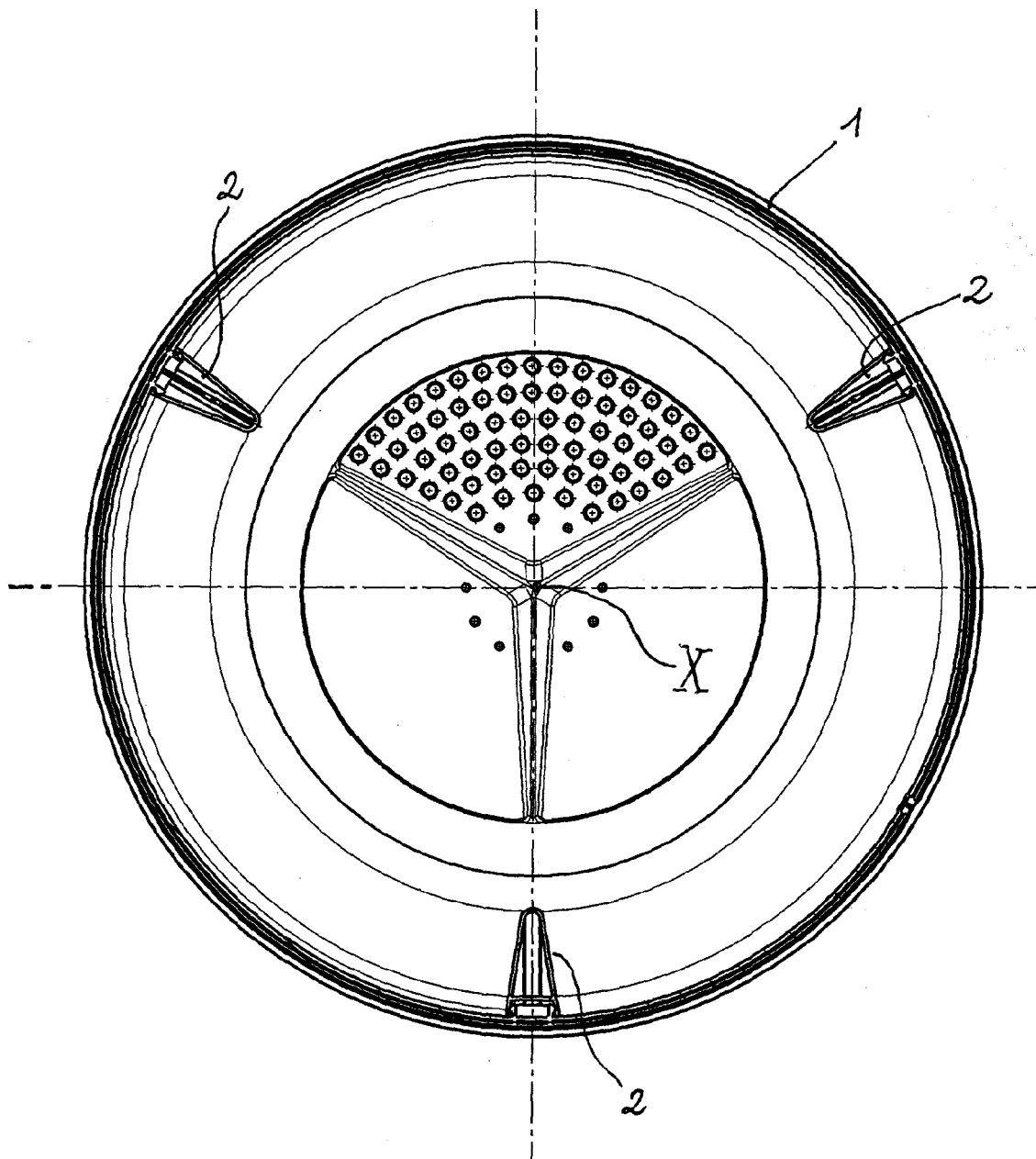


FIG. 1

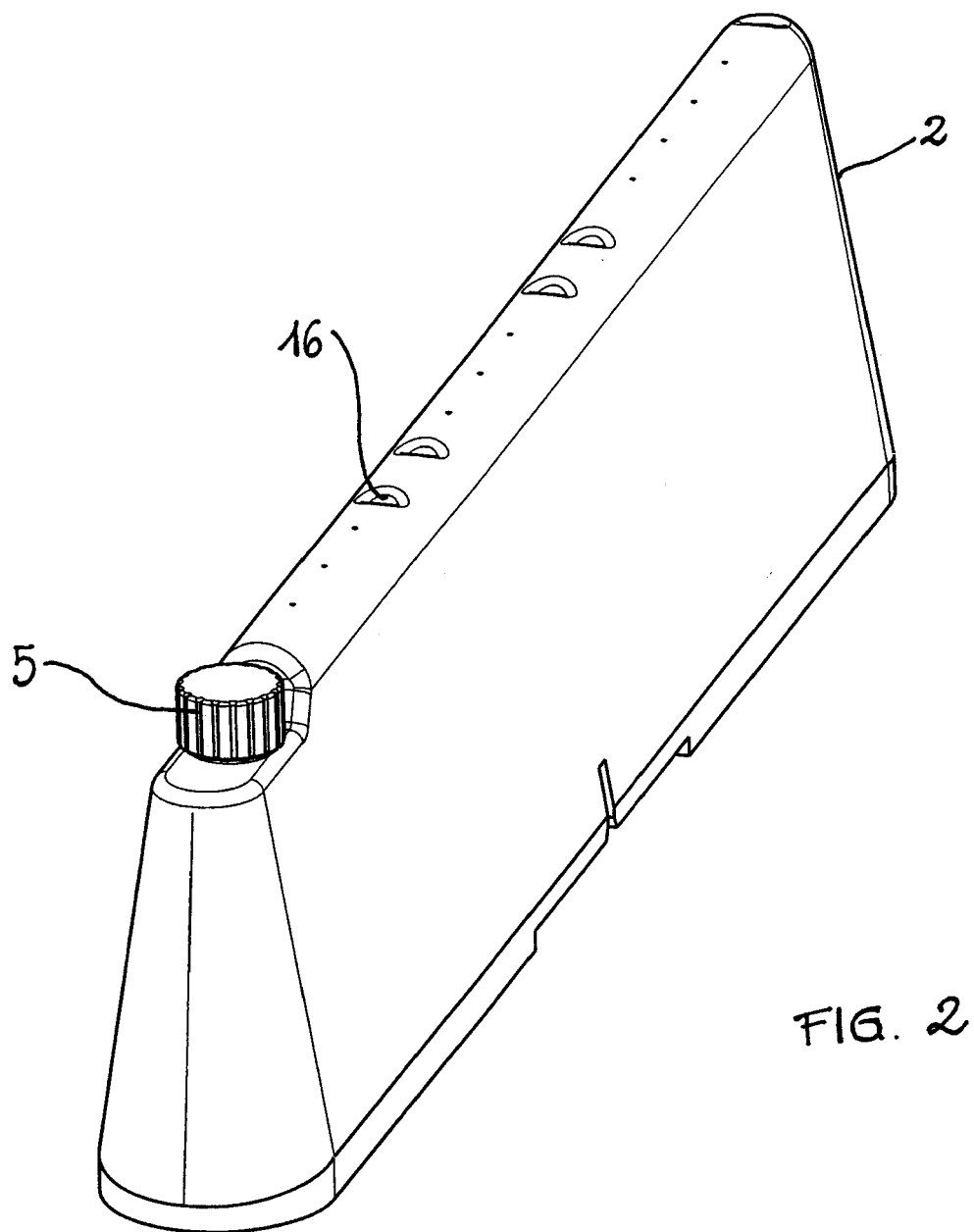


FIG. 2

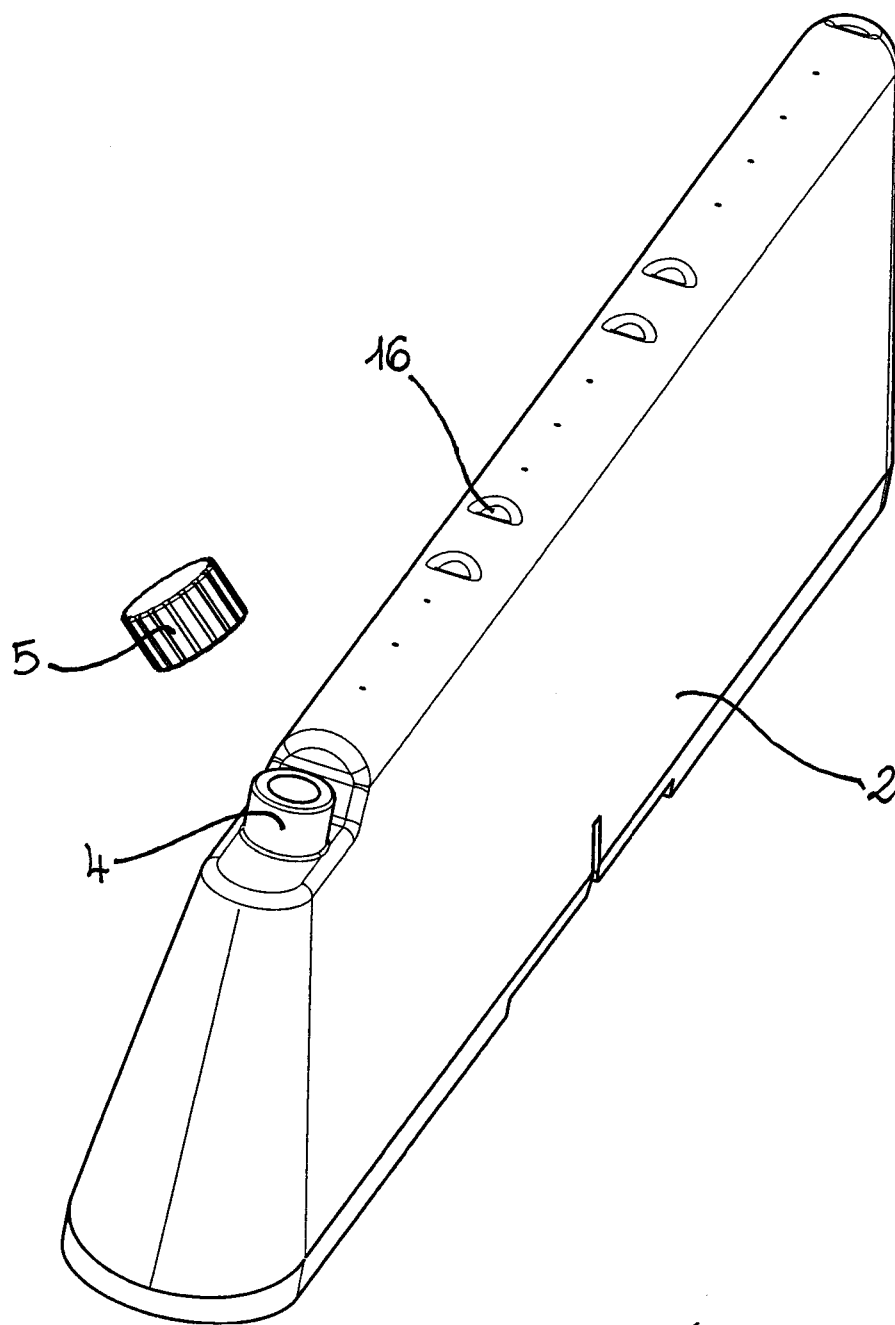


FIG. 2/1

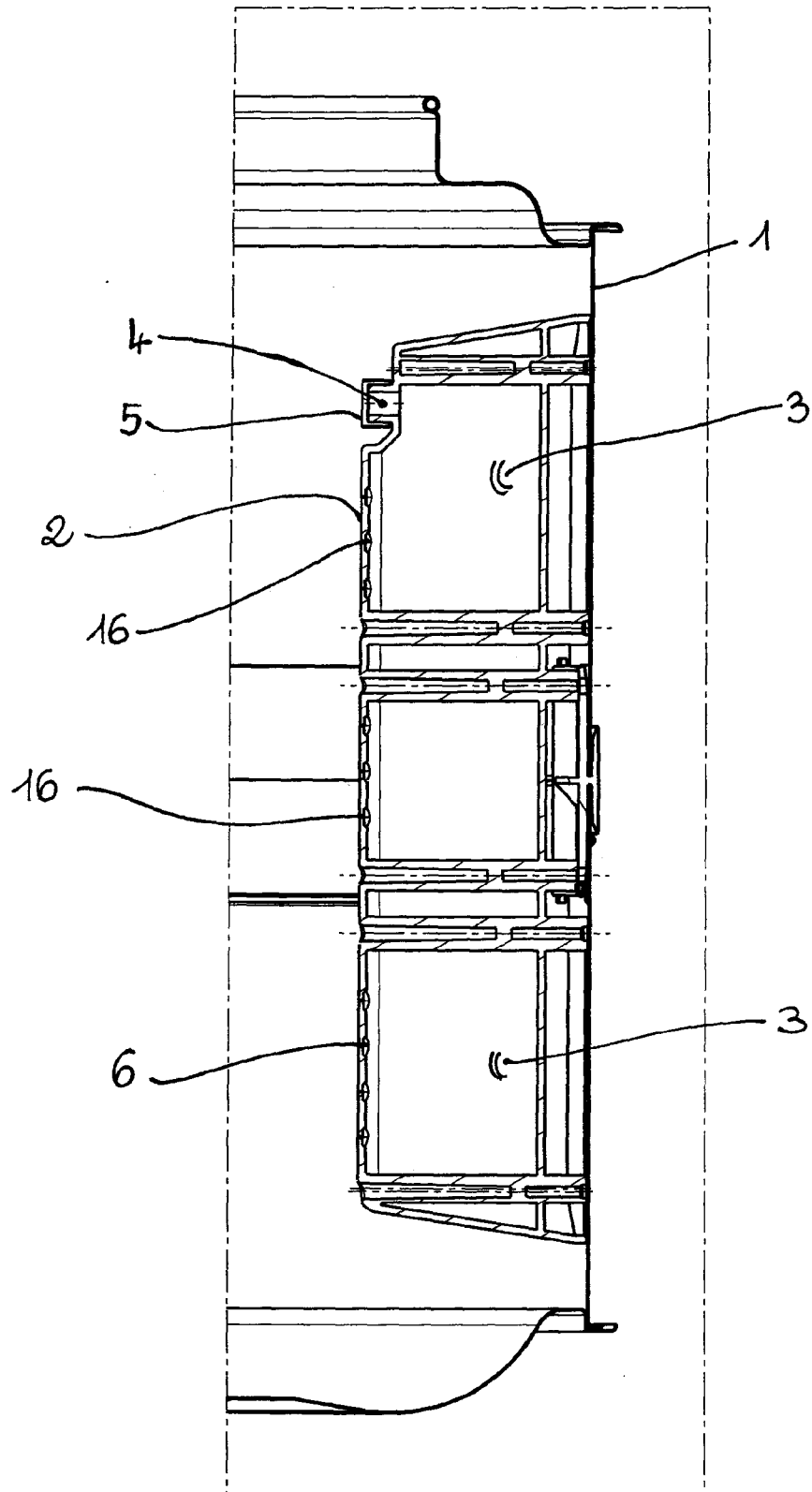


FIG. 2A



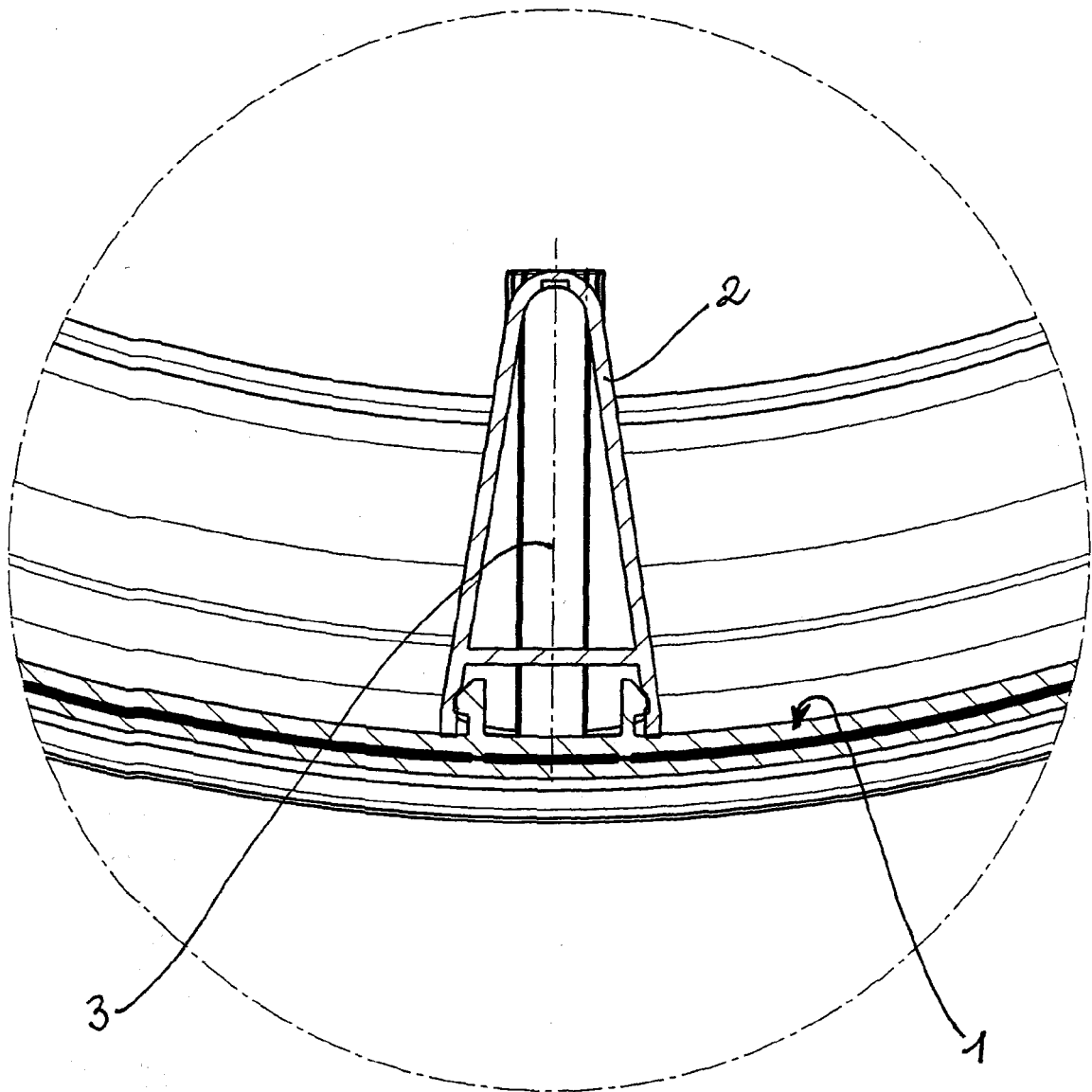


FIG. 2B

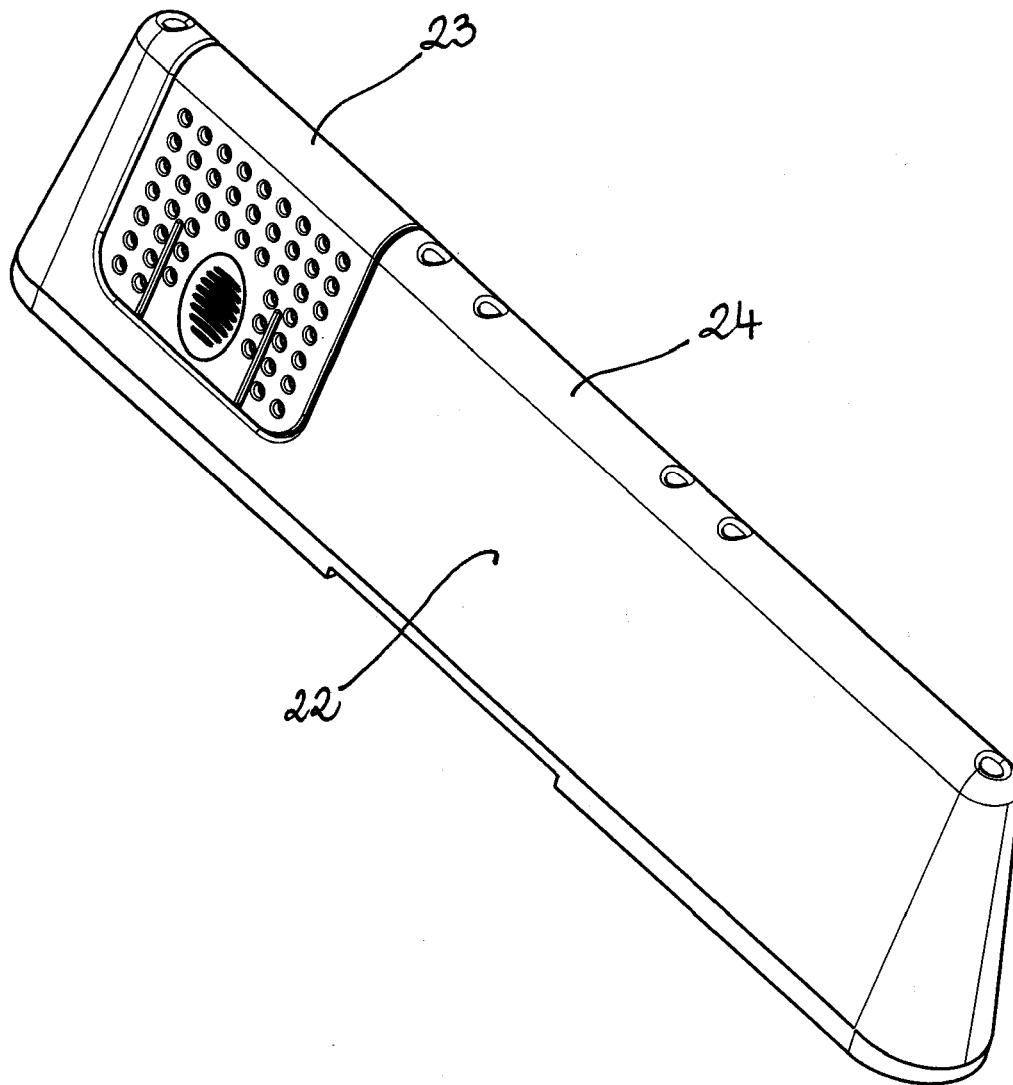
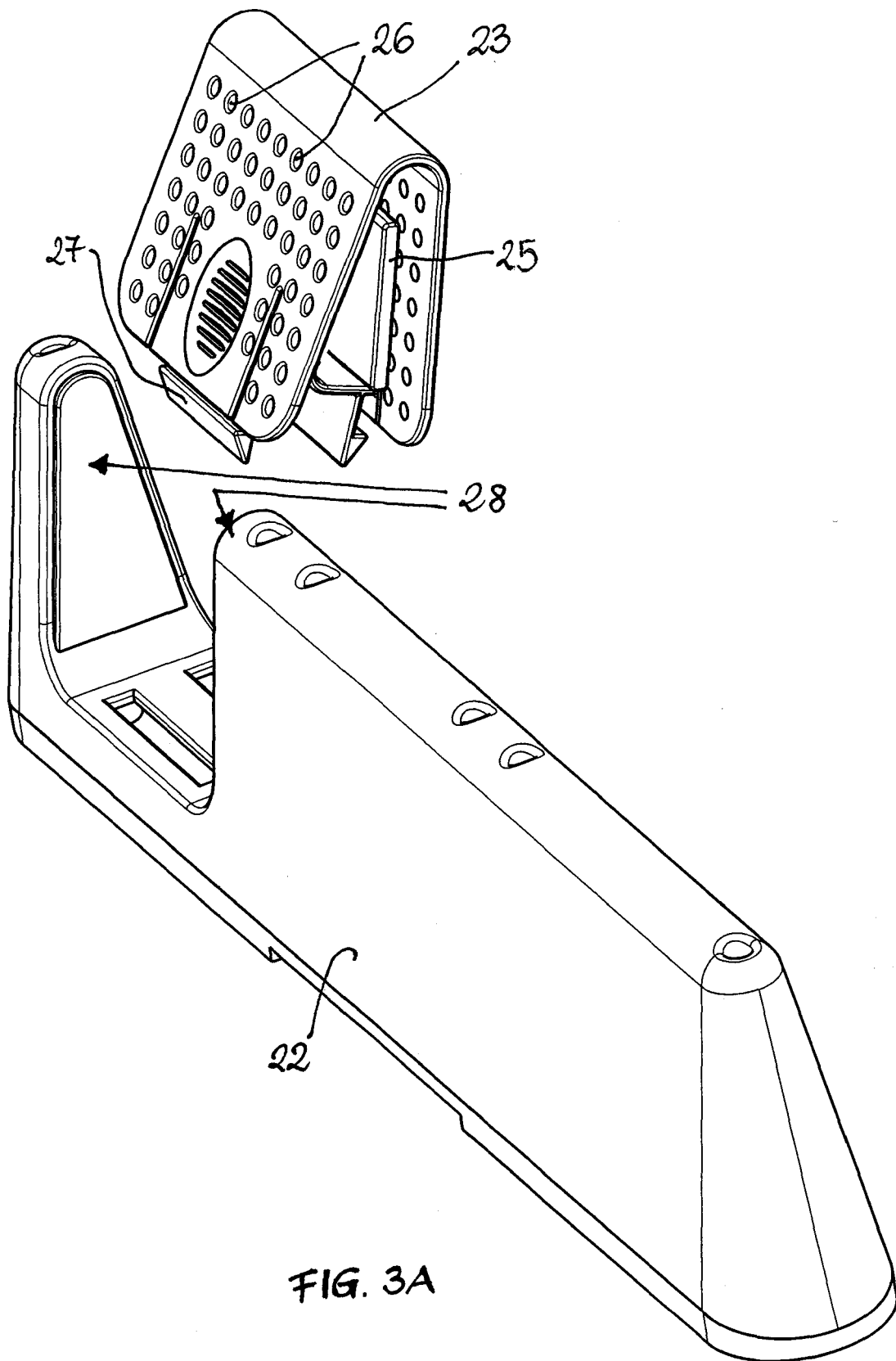


FIG. 3



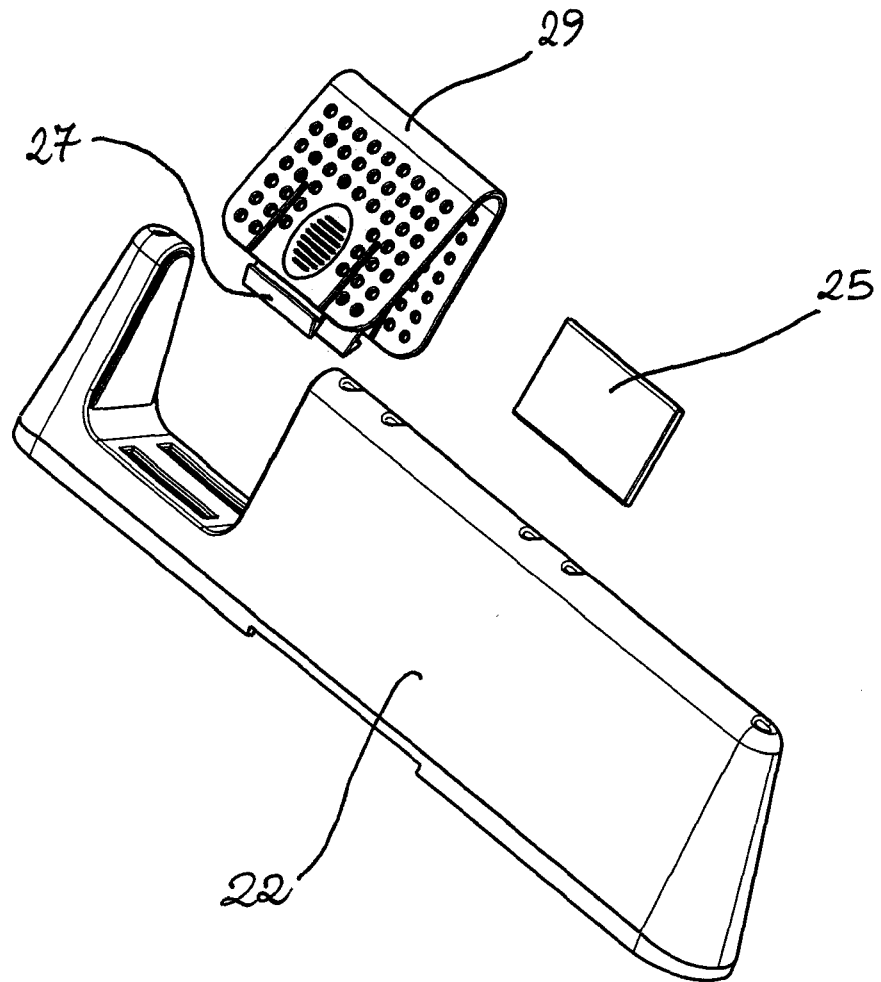


FIG. 3B

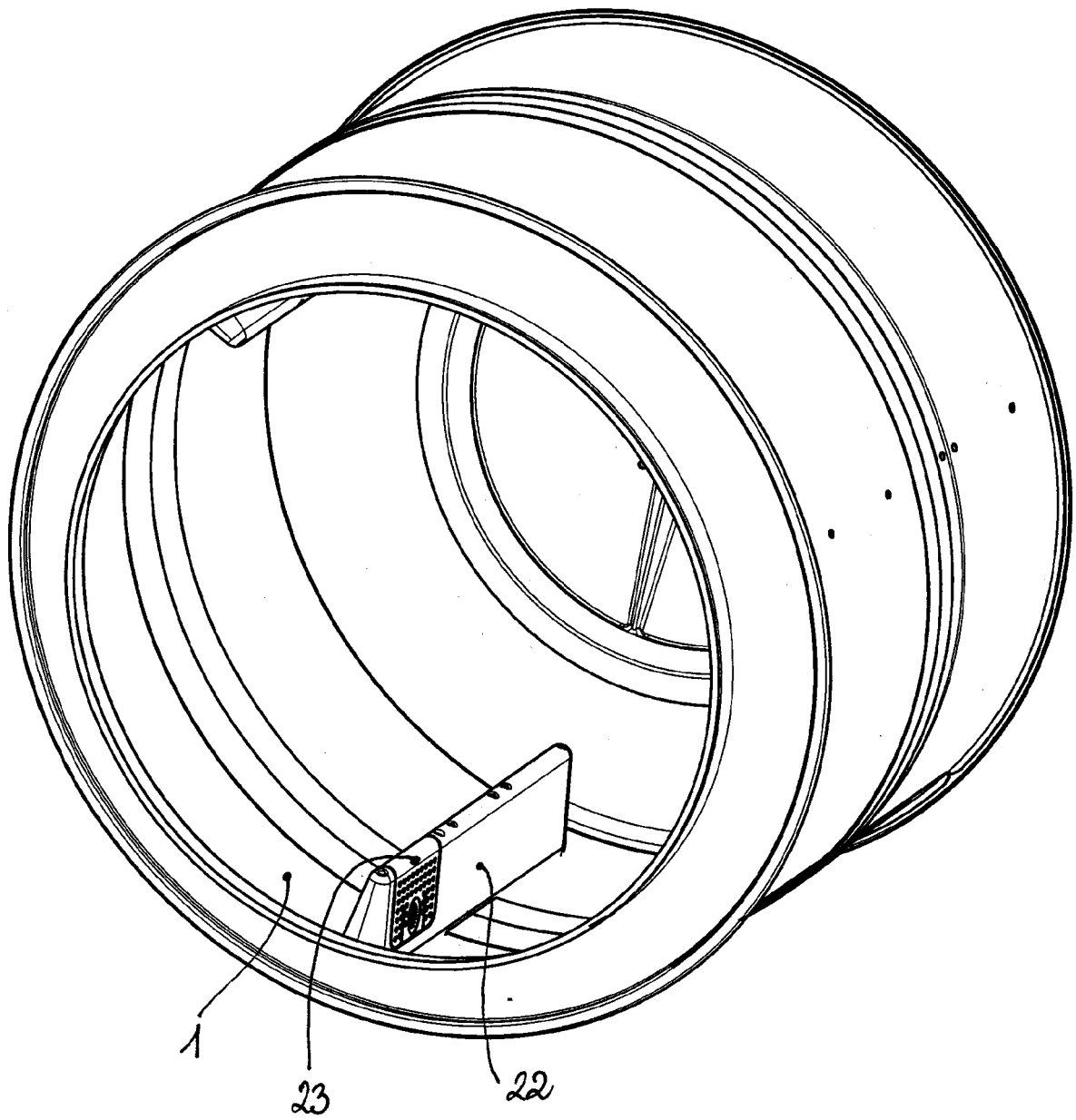


FIG. 4

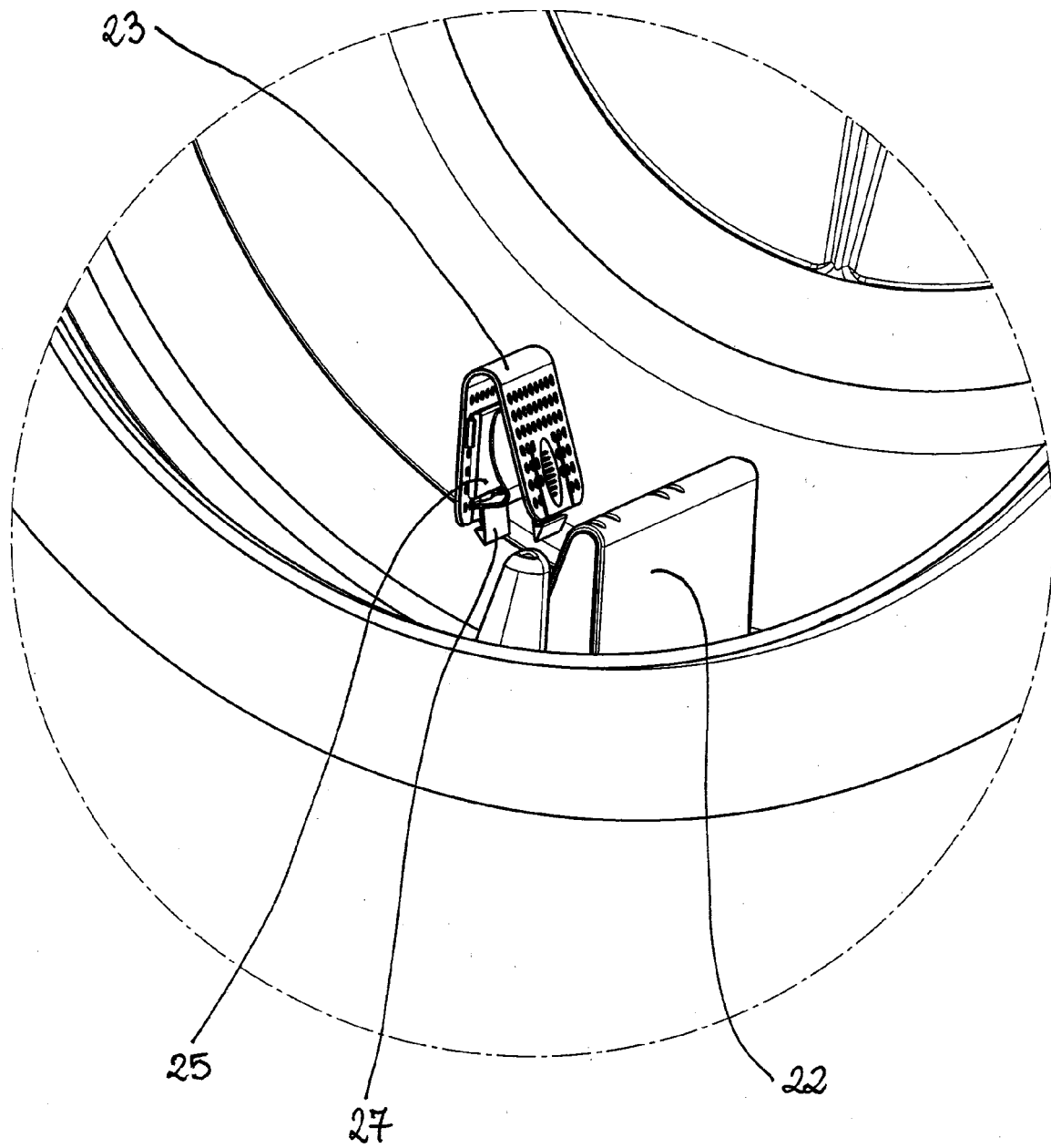


FIG. 5



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Application Number  
EP 05 10 0964

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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 July 2005	Examiner Debard, M
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 05 10 0964

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