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(54) **Sound-damping device for air vents or for breather pipes in rooms of buildings**

(57) Sound-damping device for air vents or for breather pipes in rooms of buildings, **characterized in that** it comprises:

- a frame (1, 6) designed to be fixed onto the end opening of a ventilation or breather pipe (T) in a manner suitably centred relative to the latter;
- a covering element or cap (8) designed to be arranged on the said fixing frame (1, 6) and having a width suitably greater than the diameter of the opening of the said pipe (T) and situated at a distance from the latter so as to allow a sufficient amount of air to pass through;
- at least one sound-absorbing means (7) which is arranged between said fixing frame (1, 6) and said cap (8) and which, in combination with these components, reduces and eliminates the incident and reflected sound waves which otherwise would reach the room of the building provided with said ventilation or breather pipe (T).

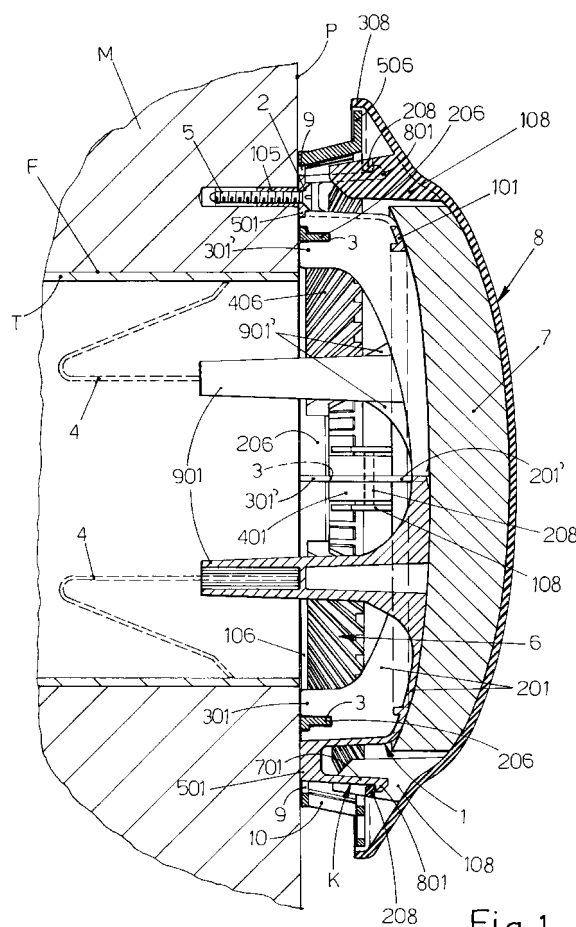


Fig. 1

Description

[0001] The invention relates to a sound-damping device to be fitted onto the inner and/or outer end of ventilation or breather pipes for rooms in buildings.

[0002] Rooms in buildings which are intended for use as a living room or kitchen must be ventilated by means of air vents consisting of through-holes formed in the walls inside which usually a pipe with a diameter of corresponding size - normally about 100-150 mm - is then inserted; grilles intended to provide an aesthetic closure for the holes are then mounted on the opposite ends of the said pipe in order to prevent the entry of insects or foreign bodies blown in by the wind, prevent rain penetrating from the outside and at the same time allow a sufficient air flow so that the air is continually renewed inside the room to be ventilated.

[0003] The ventilation grilles of the known type, while they perform in an excellent manner the rain-barrier, air filtration and ventilation functions, are unable to reduce and dampen noise from the outside which is particularly disturbing when the building is situated close to a road or to other sources generating noise which on occasions may reach very high levels.

[0004] The invention concerns a sound-damping device to be mounted on the outer or inner end of a common ventilation pipe, including pipes which are already installed, which has the characteristic features described in the accompanying Claim 1 and the claims dependent thereon and which is based on the following proposed solution: the end of the ventilation pipe or the wall in the building where the said pipe opens out is fitted with a fixing frame which is designed so as to accommodate, mounted thereon, a covering cap which has a width greater than the diameter of the said ventilation pipe and which is situated at an adequate distance from the latter and so that the projection of said pipe lies within said cap and is sufficiently centred therewith. A sound-absorbing means is housed between the cap and the said fixing frame and, in combination with the said cap, ensures a reduction in the noise from the outside and at the same time allows a sufficient amount of the air to pass through the ventilation pipe. According to a preferred embodiment, a safety grille, which allows a large air through-flow and prevents the entry of insects, is associated in a protected position with the sound-damping device as described above. The invention envisages a sound-damping device with the aforementioned characteristics, having the feature that it may be periodically disassembled by means of easy operations in order to perform cleaning of the said grille part and the internal sound-absorbing means.

[0005] Further characteristic features of the invention and the advantages arising therefrom will emerge more clearly from the following description of a preferred embodiment thereof, illustrated in the figures of the accompanying sheets of drawings, in which:

- Fig. 1 shows the sound-damping device installed in position, viewed laterally and partially sectioned along a vertical centre plane;
- Fig. 2 shows an exploded prospective view, from below, of the sound-damping device and its various components;
- Fig. 3 shows a perspective view, from above, of the mounted fixing frame of the sound-damping device according to the invention.

[0006] In Figure 1, F indicates that the ventilation through-hole which is formed in the wall or masonry M of the building and T denotes the plastic pipe which is inserted with minimum play inside the said hole F and which forms the air through-flow duct. P denotes an outer or inner wall of the masonry M on which the sound-damping device according to the invention must be mounted. The device in question comprises a frame 1 made by means of plastic injection-moulding with a ring 101 - for example circular and with a ribbed profile - having a diameter preferably greater than that of the ventilation pipe T and reinforced by a pair of diametral and mutually perpendicular struts 201, 201' which are arched and curved inwards, the first of said struts having a grooved and ribbed profile, with the cavity directed downwards, while the other strut is flat and is arranged edgewise. The said struts have a heightwise dimension which increases gradually towards the ring 101 and downwards so as to form end feet 301, 301' which are perpendicular to the ring 101, situated underneath the latter, with the same height and connected to flat lugs 401 which are situated outside the ring and which complete said feet and provide the latter with a greater flexural strength. The end of said lugs 401 have, integrally formed with their middle part, base pieces 501 which have a bottom surface in the form of a circle segment, with the centre of curvature on the centre of the ring 101 and with rounded ends, and which have an intermediate reinforcing rib 601 integral with an inner side section of a flexible lug 701 which is parallel to the lug 401 and provided at the end with an engaging tooth 801, which tapers upwards and is directed with one side inclined outwards. 2 denotes flared eyelets of the base-pieces 501, while 3 denotes slits which are formed in the bottom side of the feet 301, 301' (see below).

[0007] The inner wall of the grooved-profile strut 201 has, integral therewith in a symmetrical arrangement and with respective stabilization ribs 901', frustoconical columns 901 which are perpendicular to the ideal plane in which the ring 101 lies, hollow, have a height substantially twice that of the feet 301, 301' and are designed blind with a bottom section of their cavity which has longitudinal grooves such as to be able to insert therein, with friction, and therefore fix, the ends of flat springs 4 which are folded in a V shape and are similar to the springs currently used for fixing some grilles of the known type onto the ends of the ventilation ducts T.

[0008] From Figure 1 it can be seen that, during installation of the device, the frame 1 is arranged with the base-

pieces 501 in contact with the wall P so that the ring 101 is at a suitable distance from the opening of the pipe T, parallel to the latter and sufficiently centred with this pipe. The frame 1 may be fixed in position with the springs 4 pre-inserted inside the columns 901 and then inserted elastically inside the pipe T, as shown in Figure 1 in broken lines, or may be fixed onto the wall P using plugs 105 and associated screws 5 which pass through the eyelets 2 of at least two opposite base pieces 501 of the same frame 1, as shown in the same Figure 1 in continuous lines.

[0009] The frame 1 is designed to hold in position all the other components of the device which, in addition to the frame itself 1, comprise: a protective grille 6, for preventing the entry of insects and other foreign bodies; at least one disc-shaped pad 7 with sound-absorbing functions; and a covering cap 8, all of which with the feature that these components may be removed if necessary in order to perform periodic maintenance thereof.

[0010] In the solution shown in the drawings, the protective grille 6 must be installed in position together with the frame 1 and is designed to be arranged coaxially underneath this frame and rest directly on the wall P of the masonry M so that, should it be required to remove the grille, the frame 1 must also be removed. It is understood, however, that the scope of the invention also includes the constructional variant, not shown, where the grille 6 may be mounted on top of the frame 1 and, therefore, after the latter has been fixed onto the wall P, and may be kept in position by means of a snap-fit or snap-engagement with the said frame or simply by means of the retaining action exerted by the cap 8 when secured to the said frame 1, as explained further below.

[0011] In the example shown in Figures 1 and 2, the grille 6 has a frustoconical shape and is positioned together with the smaller-diameter ring 106 so as to rest on the wall P, aligned with the slits 3 in the feet 301, 301' of the frame 1, opposite which the said ring 106 has reliefs 206 which engage inside the slits 3, ensuring fastening together and necessary centring of the parts 1 and 6. The said reliefs 206 form the inner wall of four seats 306 which are angularly equidistant from each other and externally project from the meshed surface 406 of the grille in question, these seats being provided on the bottom with an opening 9 for receiving the base pieces 501 of the frame 1 and being provided on the outer lateral surface, which also has a meshed configuration, with a window 10 which is situated opposite the flexible hook-like lugs 701, 801 of the frame 1 (see below). When the device is mounted in position, as shown in Figure 1, the said lugs 701, 801 project with a sufficient length from the ideal plane which contains the larger-diameter ring 506 of the grille 6, also made by means of injection moulding of a suitable plastic.

[0012] The disk-shaped pad 7 is made of any suitable sound-absorbing material, such as that commercially available under the trade name Edilfiber®. This component is installed using the cap 8 which is also made by

means of injection moulding of a suitable plastic and which has round flat shape, with an external diameter suitably greater than that of the larger-diameter ring 506 of the grille 6, which is suitably curved and outwardly convex and which has on its inner surface, in an angularly equidistant arrangement and partly projecting, four pairs of fins 108 which are interconnected by respective cross-pieces 208 and are such that they may be inserted inside the seats 306 of the grille 6.

[0013] The pad 7 is arranged inside the cap 8 and with its circumference rests substantially against the pairs of fins 108 of the said cap. When the cap 8 is mounted in position, with the pairs of fins 108 which enter into the seats 306 of the grille 6, the pad 7 rests on the ring 101 and on the convex struts 201, 201' of the frame 1 and flexes and adapts also to the inner curvature of the said cap 8, creating a small elastic resistance to the applicational thrust of this component 8 on the frame 1. When the cap 8 is pushed onto the frame 1 and onto the grille 6 associated with it, the cross-pieces 208 of the pairs of fins 108 of the said cap co-operate with the externally inclined profile of the teeth 801, cause flexing of the lugs 701 and engage with the bottom part of the said teeth 801, as shown in Figure 1. When the cap 8 is fixed in position, its perimetral edge 308 circumscribes with minimum play the ring 506 of the grille 6 and also performs the function of a drip channel.

[0014] As indicated by the arrow K in Figure 1, by inserting a finger or a tool through the openings 10 in the grille 6, it is possible at any time to bend inwardly the lugs 701 and disengage the associated teeth 801 from the cross-pieces 208 of the cap 8 which may thus be removed in order to perform periodic cleaning of the sound-absorbing pad 7 and also cleaning on the inside of the grille 6.

[0015] The device as described functions in the manner now described. The sound waves which strike the wall P and which act on the cap 8 are partly reflected by this component which performs a proper shield function and are partly dampened by the combined action of the said cap and the underlying sound-absorbing pad 7, so that there is a considerable reduction in the noise passing through the ventilation pipe T, also because the sound barrier formed by the parts 7, 8 has a diameter which is suitably greater than that of the said pipe T and amply extends all the way around the projection of this ventilation pipe. Also, the sound waves reflected against and by the wall P, as well as those parallel to this wall, when they pass beyond the frustoconical grille 6 which is splayed towards the pad 7, strike against the inner surface of this pad and are dampened or neutralized significantly by the latter, with a significant overall reduction in the noise which otherwise would reach the room in the building in which the said ventilation pipe T is installed.

[0016] It is understood that the description refers to a preferred embodiment of the invention which may be subject to numerous constructional variations and modifications consisting, for example, in the fact that the grille 6

and/or the frame 1 may be formed integrally, at the bottom thereof, with a tubular inlet having a diameter such as to be able to be inserted inside or outside a ventilation or breather pipe T which is arranged horizontally and inset as shown in Figure 1 or arranged vertically and freely in the air, such as the exhaust ducts of suction hoods for kitchens or bathrooms. Should the sound-damping device be designed to act as an exhaust unit, the frame 1 could have a simplified structure, without the said columns 901, without the external fixing base-pieces 501, formed as one piece with the grille 6, or with the possibility of fixing to the latter by means of engagement, with screws, by welding or using any other suitable solution.

Claims

1. Sound-damping device for air vents or for breather pipes in rooms of buildings, **characterized in that** it comprises:

- a frame (1, 6) designed to be fixed onto the end opening of a ventilation or breather pipe (T) in a manner suitably centred relative to the latter;
- a covering element or cap (8) designed to be arranged on the said fixing frame (1, 6) and having a width suitably greater than the diameter of the opening of the said pipe (T) and situated at a distance from the latter so as to allow a sufficient amount of air to pass through;
- at least one sound-absorbing means (7) which is arranged between said fixing frame (1, 6) and said cap (8) and which, in combination with these components, reduces and eliminates incident and reflected sound waves which otherwise would reach the room of the building provided with said pipe (T).

2. Sound-damping device according to Claim 1, in which the said fixing frame (1) comprises at least one ring (101) with a diameter suitably greater than that of the opening of the ventilation pipe (T), reinforced by radial or diametral struts (201, 201') and provided perimetally with three or more feet (301, 301') which are angularly equidistant from each other and rest on the masonry wall (P) in which the said ventilation opening (T) opens out, so as to keep the said ring (101) suitably spaced from this opening and parallel thereto, the frame (1) thus composed being provided with one or more means (501, 2, 901, 4) for being able to be fixed inside the said ventilation opening (T) or in the masonry wall (P) in which the said ventilation opening (T) opens out.

3. Sound-damping device according to one or more of the preceding claims, in which the said fixing frame (1) is provided perimetally with three or more flexible lugs (701) with hook-shaped teeth (801) at the ends,

which are directed outwards and with which inner peripheral fins (108, 208) of the covering cap (8) may be snap-engaged, inside which cap a sufficiently elastic, yielding and porous pad (7) made of any suitable sound-absorbing material is positioned, said pad being gripped between the inner surface of the said cap (8) and said strutted ring (101, 201, 201') of the said fixing frame (1).

4. Sound-damping device according to the preceding claims, **characterized in that** it comprises a grille-like or meshed element (6) for preventing the entry of insects or other foreign bodies, with an outwardly diverging, preferably frustoconical, annular shape which circumscribes the said fixing frame (1), which is integral with or may be integrally fixed to this frame using any suitable solution, which with its bottom base (106) rests on or is situated at a short distance from the wall (P) in which the opening of the ventilation pipe (T) opens out and which with its upper base (506) cooperates internally and with minimum play with the perimetral sloping edge (308) of the said covering cap (8) so as to intercept the entire air flow which passes through the said ventilation pipe, without excessively braking this flow.

5. Sound-damping device according to one or more of the preceding claims, in which the said cap (8) has an outwardly complex shape and the underlying sound-absorbing pad (7) is pressed snugly against the inner surface of the said cap by a suitable outwardly convex form of the strutted ring (101, 201, 201') of the fixing frame (1), all of which so that the sound waves which strike the said cap (8) are partly reflected by this component and are partly dampened by the combined action of the said cap and the underlying sound-absorbing pad (7), while the sound waves reflected against and by the wall (P) in which the ventilation pipe (T) opens out and those parallel to this wall, when they pass beyond the frustoconical grille (6), strike against the inner surface of the said pad (7) and are significantly dampened or eliminated by the latter, with a consequent significant overall reduction in the noise which otherwise would reach the room in the building provided with the said ventilation pipe (T).

6. Sound-damping device according to the preceding claims, **characterized in that**, according to a constructional form suitable for mounting on the end of breather pipes, the said fixing frame (1) or the said grille (6) has an annular inlet opening for engagement and fixing onto the said end of the breather pipes, while the covering cap (8) may have a structure such that its perimetral edge (308) projects by a greater amount so as to circumscribe fully and with play the said grille (6), in order to protect it better against rain.

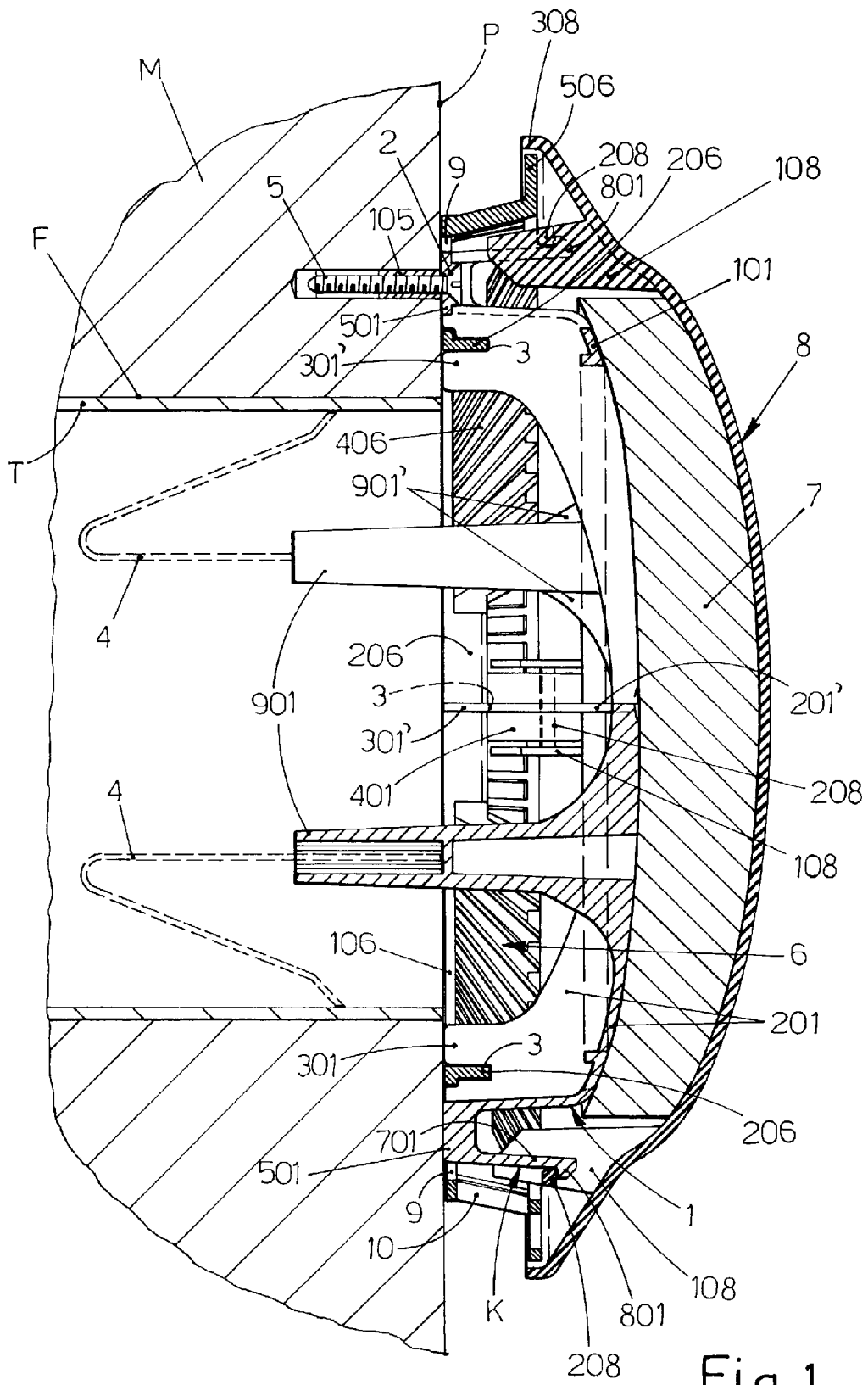
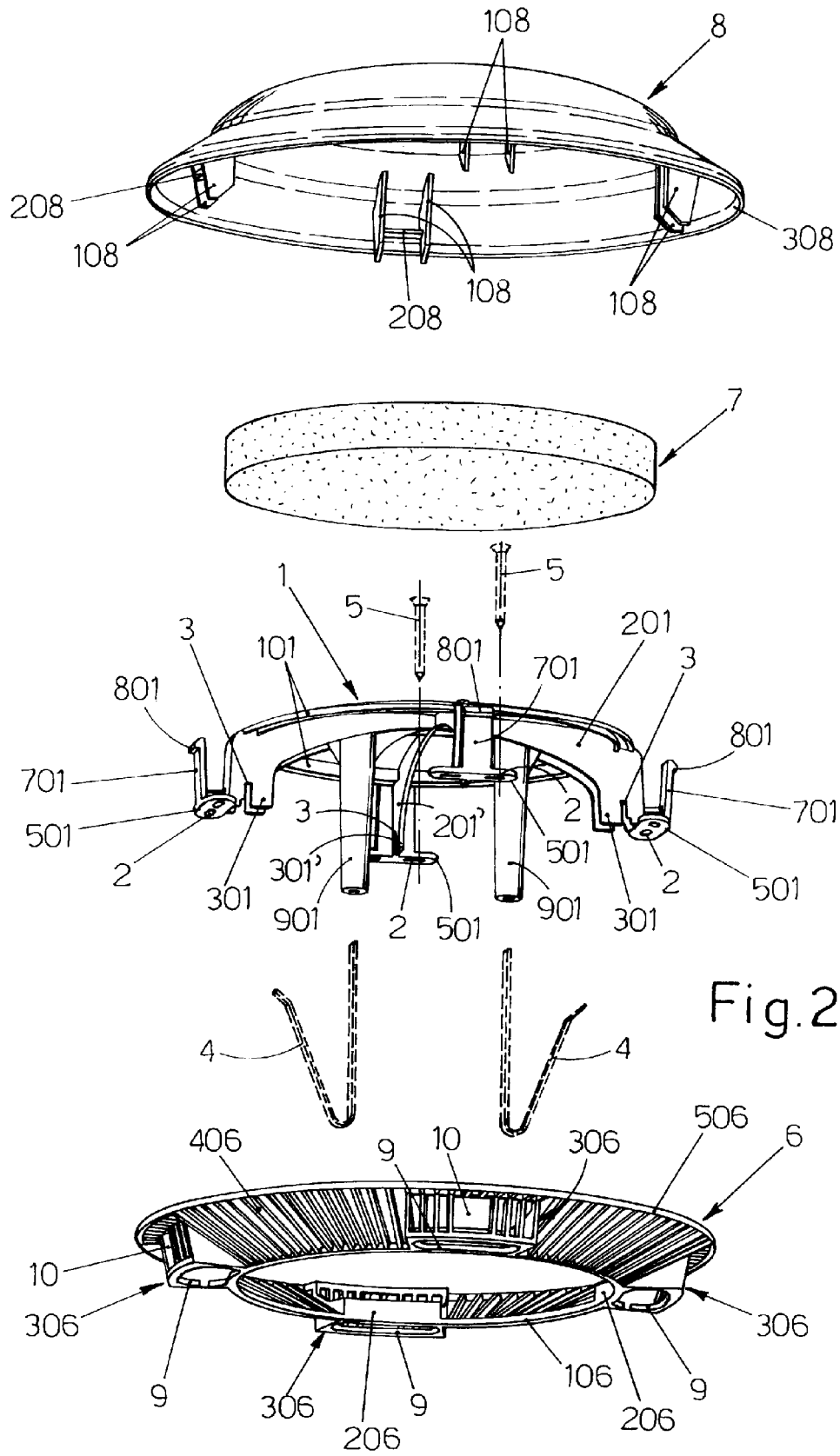


Fig.1



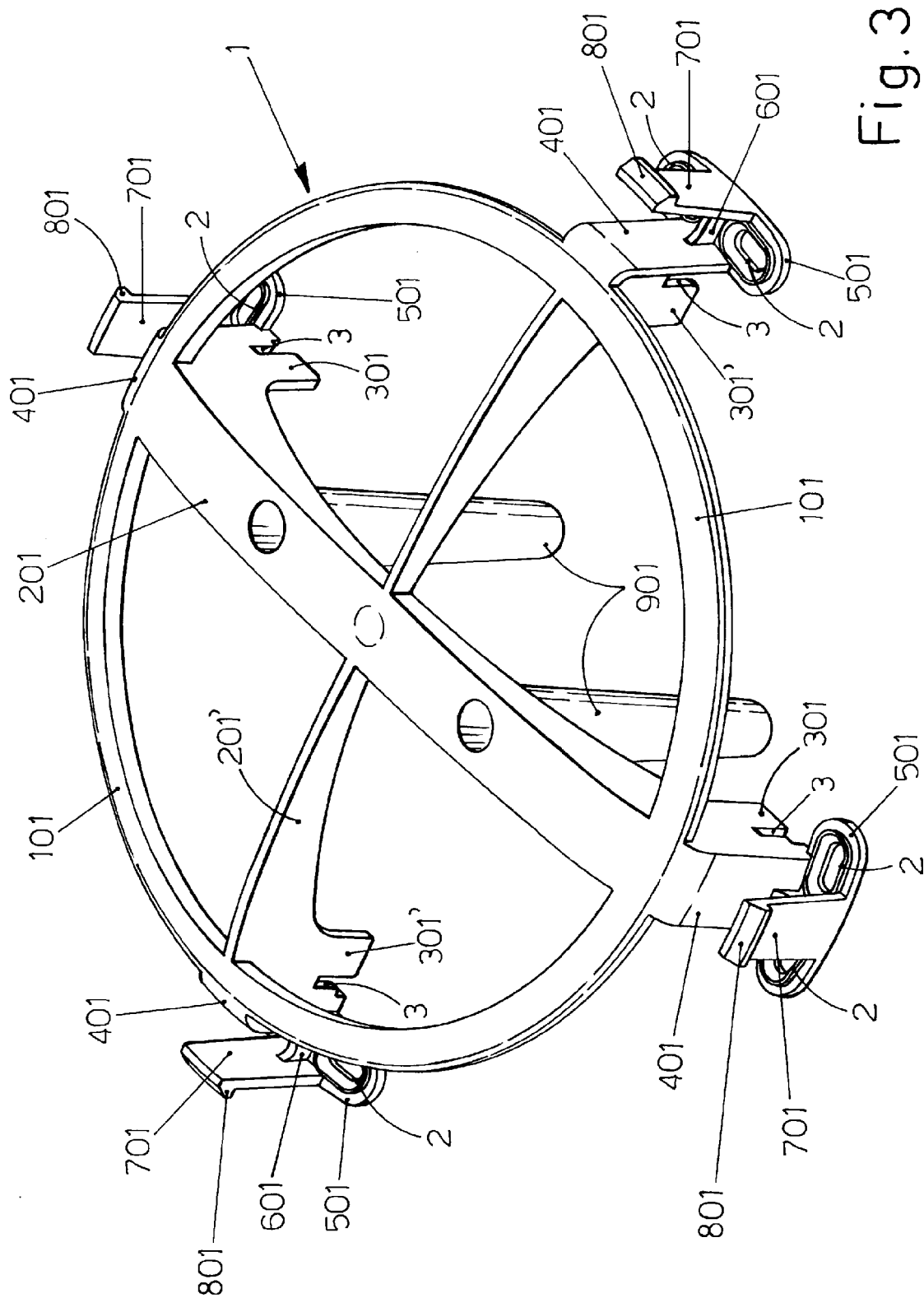


Fig. 3



EUROPEAN SEARCH REPORT

Application Number
EP 09 15 5271

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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 January 2010	Examiner Valenza, Davide
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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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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