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(54) BODY PART OF A BRUSH, A BRUSH, AND A METHOD FOR MAKING THE BODY PART OF A BRUSH

(57) The invention relates to the body part of a brush, particularly a cattle brush, which is partly or entirely conical, and on the outer surface (11) of which bristles (12) are to be fitted, and which body part (10) has an end part (13), in which there is an attachment arrangement (14) for the rotation shaft (34) of the brush (15). Light-enings (16) are arranged in the end part (13). In addition, the invention also relates to a brush and a method for making a brush.

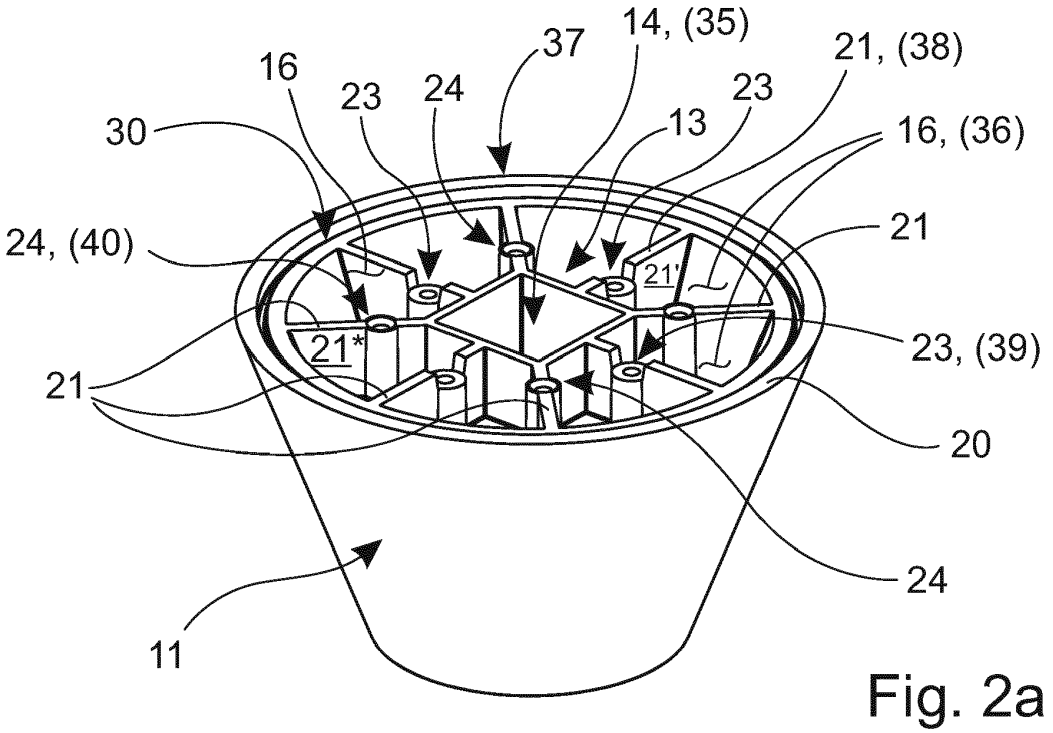

Fig. 2a

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Description

[0001] The invention relates to the body part of a brush, particularly a cattle brush, which is partly or entirely conical, and on the outer surface of which bristles are to be fitted, and which body part has an end part, in which there is an attachment arrangement for the rotation shaft of the brush. In addition, the invention also relates to a brush and to a method for making the body part of a brush.

[0002] Various kinds of cattle brush are known. One example of their applications is the automatic brushing of cattle in open-plan cowsheds. Brushing provides stimulation for domestic and production animals, improves their comfort and health and thus, for example, in the case of cattle, also improves their milk production. Brushing typically takes place when the animal arrives next to the brushing machine, which automatically begins to brush using the bristle parts. The bristle part is formed of bristles arranged in bristle tufts on the brush body. The brush body can include, for example, a conical part and a straight tube.

[0003] Conical brush parts are known, the conicalness of which is created by trimming the bristles to a suitable length in the axial direction of the body part. In these, the body part of the brush part is a straight cylindrical tube, which is fitted with bristles. The length of the bristles is arranged to change in the axial direction of the body part in order to achieve a conical shape for brush part. Thus the length of the bristles change in the axial direction of the body part. This leads to long bristles at the widest end of the cone. The bristles of different length make the brush part non-homogeneous in terms of the feeling of the hardness of the bristles. Because the longer bristles bend more than the short ones, they feel softer.

[0004] Cattle brushes are also known that are made, for example, in the case of the conical part, by extrusion. There are weaknesses in many ways when making the conical part by extrusion. For example, a large amount of manufacturing material is required and subsequently the conical part becomes very heavy. In addition, a further drawback in extrusion is the poor quality of the surface of the brush body. This leads to a need for post-machining the brush body, before the body can be fitted with bristles.

[0005] The present invention is intended to create a body part of a brush, particularly of a cattle brush, a brush, and a method for making the body part of a brush, by means of which an improved body part of a brush and thus also an improved brush is achieved. The characteristic features of the body part of a brush according to the invention are stated in the accompanying Claim 1, of the brush in Claim 13, and of the method in Claim 14.

[0006] There are lightenings in the end part of the body part, more generally in its inner part or core. In addition, the body part can be made, for example, by injection moulding. By means of the lightenings and manufacturing technique, less material is needed in the body part, so that it becomes lighter. Owing to the lighter construction, the energy consumption of the brushing machine is reduced. In addition, owing to injection moulding the body part has also less need of finishing.

[0007] According to one embodiment, preferably radial, fin-like structures are fitted between the lightenings, in order to support the end part on the periphery of the body part. An attachment arrangement is fitted to the structures for a second brush part and/or an end plate for closing the end part of the body part. The attachment arrangements can preferably alternate in the end part in the circumferential direction of the body part. The structures are arranged to attach to the preferably angular attachment arrangement of the rotation shaft of the brush part, in which there is an opening for the rotation shaft. The structures can then be attached to the corners of the opening and/or to the middle of the sides of the opening. In this way a construction that is advantageous in terms of the transmission of forces and of durability is achieved.

[0008] According to one embodiment, the attachment arrangements include attachment points in the axial direction of the body part, fitted to the end part. Of these the attachment points, arranged for the bristle part that is arranged to be joined to the body part, are fitted to these parts of the structure belonging to the end part that join to the middle of the sides of the opening. The attachment points arranged for the end plate are, for their part, fitted to these parts of the structure belonging to the end part, which connect to the corners of the opening. By means of such an arrangement, the body part's strain resistance further improves.

[0009] According to one embodiment, space for a second bristle part is arranged in the body part. The wall arranged to delimit the space includes shapes protruding from the wall, in order to eliminate gaps between the periphery of the body part of the second bristle part to be joined to the body part and the inner circumference of the space formed in the body part. The shapes can eliminate the need to finish the body part, which in turn simplifies its manufacture. Other features characteristic of the invention are stated in the accompanying Claims and additional advantages achieved are itemized in the description portion.

[0010] In the following, the invention, which is not restricted to the embodiments described in the following, is described in greater detail with reference to the accompanying figures, in which

Figure 1 shows a simplified schematic image of one example of the cattle brush,
Figures 2a and 2b show angled side views of examples of the body parts of the cattle brush seen from its first end,

Figures 3a and 3b	show examples of the body parts of the cattle brush, seen from the side in cross-section,
Figures 4a and 4b	show examples of the body parts of the cattle brush, seen from the other end,
Figure 5	shows an angled side view of the end plate of the body part of the cattle brush,
Figure 6	shows an angled side view of the body part of the cattle brush seen from the other end,
Figures 7a and 7b	show an example of the shapes inside the body part, for example, to eliminate gaps, and
Figure 8	shows an example of the use of the cattle brush in a brushing machine.

[0011] Figure 1 shows a simplified schematic image of one brush, now more particularly a cattle brush 15, in which a conical body part 10 according to the invention, is applied. Figure 8, for its part, shows brushes 15, relating to one application, attached to a brushing machine 100. As an example of the invention, the cattle brush 15 shown is formed of one or more bristle parts 18, 19. The bristle parts 18, 19 are formed of a body part 10, 17 and bristles 12 fitted to the peripheries, i.e. the outer surfaces of the body parts 10, 17. The cattle brush 15 and/or its bristle parts 18, 19 can be replaceably attached to a rotation shaft (shown in Figure 8 by the reference number 34) fitted to the brushing machine 100. On the rotation shaft 34, the cattle brush 15 formed of one or more bristle parts 18, 19 is rotated around it circumferentially, i.e. around its central axis. The rotation takes place with the aid of an electric motor 101, for example, through a gearbox.

[0012] Figures 2a and 2b with reference numbers show angled side views of various examples of the body parts 10 of the bristle part 18 of the cattle brush 15, seen from the first end. Figures 3a and 3b for their part show side views of the body part 10 of the cattle brush 15 shown in Figures 2a and 2b, seen in cross-section. Figure 3b also shows the bristle arrangement 12 and the placing inside the body part 10 of the body part 17 of the second brush part 19. Figures 4a and 4b show the body part 10 seen from the second end. Here the structures of the inner parts and end part 13 are shown with broken lines. The body part 10 of the bristle part 18 of the cattle brush 15, to which the present invention for example relates, now has a conical jacket 20. The jacket 20 can be partly or entirely conical. If the body part 10 is a straight cylindrical tube over part of its length, one can then speak of its partial conicalness. The outer surface 11 of the jacket 20 of the body part 10 can be covered with bristles 12. On the conical body part 10 the bristles 12 are of the same length over the whole axial length of the bristle part 18 and thus also their stiffness is the same. The softness of the bristle part 18 then does not change in the axial direction of the bristle part 18.

[0013] The body part 10 has also an end part 13, which can also be called the inner part, hub, or core of the body part 10. The end part 13 closes the body part 10 over a large surface area, thus stiffening the jacket part 20. In the end part 13 there is, for example, an attachment arrangement 14 for the rotation shaft 34 of the cattle brush 15, which in addition increases the rigidity of the body part 10. Now the attachment arrangement 14 of the rotation shaft 34 is, for example, shaped as a square or rectangle, i.e. is a rectangular, more generally, angular through opening 35 in the end part 13. In addition, the end part 13 also permits a second, for example, cylindrically shaped brush part 19 to be attached to the first brush part 18, for example, to its body part 17.

[0014] One or more lightenings 16 are arranged in the end part 13 belonging to the body part 10. Now the lightenings 16 are places in the end part 13, in which there is no end-part 13 material at all. Thus they are empty of the manufacturing material of the rest of the end part 13, i.e. they form, for example, axial hollows or recesses 36 in the end part 13. The end part 13 can then be said to form a non-homogeneous material distribution, because there are places in it in which there is manufacturing material, and places where there is not.

[0015] Between the lightenings 16, structures 21 remain that support the end part 13 on the periphery 37 of the body part 10. The structures 21 are now ribs 38. In addition, the ribs 38 are now radially in the end part 13. The ribs 38 are now connected to the square attachment arrangement 14 of the cattle brush's 15 rotation shaft 34. The connection can take place, for example, to the corners of the rectangular, more generally angular opening 35 arranged for the rotation shaft 34 and/or, for example, to the middle of the sides of the rectangular, more generally angular opening 35. The ribs 38 extend to the bottom of the hollows 38, where they join the bottom structure 42 of the end part 13. Thus the lightenings 16 are in the area of the end part 13 that lies between the opening 35 arranged for the rotation shaft 34 and the periphery 37 of the body part 10. By means of the lightenings 16, i.e. now the hollows 38, savings are made in the manufacturing material of the body part 10 and thus the weight of the body part 10 and the entire brush part 18 is also lightened. This has an effect, for example, on the energy consumption of the brushing machine 100.

[0016] In the embodiment of Figure 2a, the attachment arrangement of the end plate 22 closing the end part 13 of the body part 10 and also of the second bristle part 19 arranged to connect to the cylindrical body part 17, more generally to the body part 10, is now arranged in connection with the end part 13, more particularly with the support structures 21 fitted to it, that is now the radial ribs 38. Of these, the attachment of the tubular body part 17, more generally the bristle part 19, takes place, for example, with screws using the attachment arrangement shown by the reference number 23 (Figure 2a), in which there are now holes 39 for screws. For its part, the end plate 22 is attached to the attachment arrangement shown by the reference number 24, in which there are also holes 40 for screws. The holes 39, 40 of the attachment arrangements 23, 24 alternate in the structure 21 in the circumferential direction of the body part 10. In addition, the attachment points 23 of the brush part 19 can be countersunk slightly under the edge of the rib-like structures

21. In order to create the countersinking, there is a cut in the structures 21 at the location of the holes 39.

[0017] More generally, the attachment arrangements 23, 24 can be said to include the attachment points 39, 40 arranged in the structure 21 and being in the axial direction of the body part 10. The attachment points 39 arranged for the second bristle part 19 can be, for example, holes. The attachment points 40 arranged for the end plate 22 can be, for example, drill holes. Of the attachment points the attachment points 39 arranged for the brush part 19 to be fitted to the body part 10 are arranged in these parts 21' of the structure 21 that connect to the middles of the sides of the opening 35. The attachment points 40 arranged for the end plate 22 are, in turn, arranged in these parts 21* of the structure 21, that connect to the corners of the opening 35. In this way an optimal structure is achieved, in terms of the loading resistance of the end part 13.

[0018] In the embodiment of Figure 2b, an attachment arrangement 24 for the end plate 22 is not included, instead there is only an attachment arrangement 23 for the tubular body part 17. The end plate 22 is intended to close the end part 13. By means of the end plate 22, a smooth and thus also safe surface is obtained for the end of the body part 10, even though there would be recesses 36 acting as lightenings 16 in it. In addition, the end part 13 equipped with lightenings 16 does not collect dirt, as it is equipped with an end plate 22.

[0019] Figure 5 shows one example of the end plate 22 of the body part 10 of the cattle brush 15, seen at an angle from the side. The end plate 22 is a circular piece 25, in which there are holes 26 for screws to attach it to points 24 made for them in the body part 10. In addition, in the end plate 22 is an opening 27 for the rotation shaft 34 of the brushing machine or its attachment. On the circumference 28 of the end plate 22 there can be a lip 29 protruding towards the body part in the axial direction of the body part 10. There is a groove 30 or recess arranged in the end of the body part 10 on its outer periphery 37 for the lip 29. Be means of the lip 29 and groove 30 sealing of the end plate 22 to the body part 10 is achieved. Between the lip 29 and the groove 30 there can also be a seal.

[0020] The invention also relates to a brush. At least one bristle part 18 of a brush, particularly a cattle brush 15, or even more particularly the body part 10 of a bristle part 18 is according to the above description. Figure 1 shows a cattle brush 15, in which there is only a single conical bristle part 18. It is then at one end of a bristle part 19 with a tubular body part 17. It should, however, be noted that at both ends of the bristle part 19 with a tubular body part 17 there can be a partly or entirely conical bristle part 18, such as can be, for example, in the brushing machine 100 shown in Figure 8.

[0021] The invention also further relates to a method for making a conical body part 10 of a brush, particularly of a cattle brush 15, from a moulding material. The body part 10 is now made surprisingly using the injection-moulding technique. Less plastic material or similar can then be used to make the body part 10. The body part 10 then becomes lighter. One important addition advantage relating to injection moulding is that after injection moulding the body part 10 can be used as such, without finishing machining (for example, lathe work to smooth the outer surface 11 of the body part 10), to make the bristle part 18. This saves much time. The body part 10 can be fitted with bristles 12, for example, by drilling holes for the bristles 12 in the jacket's 20 periphery. A bunch of bristles 12 can then be shot into one hole. Figure 3b shows the orientation of the bristles 12 on the periphery 11 of the body part 10. The bristles 12 are now perpendicular to the brushing machine's rotation shaft 34 and thus also to the tubular straight body part 17. The end plate 22 can also be made by injection moulding.

[0022] Figure 6 shows an angled side view of the body part 10 of the bristle part 18 of the cattle brush 15, seen from its second end. From this side, the bristle part 19 with a tubular body part 17 with enters the conical bristle part 18. For this purpose there is a space 31, which can be conical, in the body part 10. For example for reasons of moulding technique the diameter of the space 31 can be greater on the side of its opening than on the bottom, where the space 31 is delimited by the base structure 42 belonging to the end part 13. However, the body 17 of the cylindrical bristle part 18 can extend to the base structure 42 of the space 31. It will then sit firmly in the body part 10 and can be secured to the end part 13 with screws.

[0023] There can be shapes 41 protruding from the wall 33 on the inner surface of the jacket 20, i.e. on the conical wall 33 delimiting the space 31. Figures 7a and 7b show examples relating to these. The shapes 41 can be used, for example, to eliminate gaps of the second bristle part 19 to be attached to the body part 10, for example, between the periphery of the cylindrical body part 17 and the inner face of the space 31 formed in the conical body part 10. The shapes 41 can be axially and/or radially in the body part 10. The shapes 41 thus for their part also permit easy and simple manufacture of the body part 10 using injection moulding, without extensive final machining.

[0024] On the inner wall 33 of the space 31, there can be, for example, eight ridges, protrusions, or similar shapes 41 at intervals of, for example, 45 degrees. The ridges can be in the axial direction of the body part 10. The shapes now have a triangular cross-section. The height of the ridges or similar shapes 41 can also change in the axial direction of the space 31. The height of the ridges then diminishes towards the bottom 32 of the space 31. Thanks to the shapes 41, highly precise tolerances are not required between the cylindrical body 17 fitted into the space 31 and the diameter of the inner wall 33 of the space 31. This simplifies the manufacture of both. When the cylindrical body 17 is pressed in place by forcing in the space 31, the shapes 41 give way and are squashed by the pressure caused by the cylindrical body 17. Thus the body part 10 of the conical part does not split. At the same time, the outer diameter of the cylindrical body 17 does not need such great dimensional precision to fit it tightly and rigidly inside the body part 10 of the conical

part. In addition the cylindrical body 17 is also well centred in the space 31, thanks to the shapes 41 arranged there.

[0025] Another way to implement the fitting of the tubular body part 17 to the space 31 arranged for it in the conical part is to turn the space 31 to correspond to the diameter of the body part 17 (and/or the turning of the tubular body part 17 to have a conical outer surface).

[0026] One example of the relative dimensions of the body part 10 is: axial length: 122, axial length of end part 13: 40, depth of lightening hollows 36: 35. The lightening hollows 36 can be have a depth of, for example, 50 - 95% (in the example, about 87%) of the total thickness of the end part 13 and/or 10 - 40% (in the example, about 28%) of the total length of the body part 10. The material of the body part 10 is, for example, plastic.

[0027] Figures 3a, 3b, 4a, and 4b show the body parts 10 of Figures 2a and 2b equipped with broken lines illustrating their internal structures. Figures 3a and 3b also show the lightening hollows 36 marked with the reference number 16. The lightening hollows in the area of the edge of the body part 10 can extend inside the jacket 20. Thus the lightening hollows then extend even below the base structure 42, i.e. inside the jacket part delimiting the space 31 (between the wall 33 and the outer surface 11, Figure 6).

[0028] It should be understood that the above description and the accompanying figures are only intended to illustrate the present invention. The invention is thus not restricted to only the embodiments described above or defined in the Claims, instead many different variations and adaptations of the invention, which are possible within the scope of the inventive idea defined in the accompanying Claims, will be obvious to one skilled in the art.

Claims

1. A body part of a brush, particularly a cattle brush, which is partly or entirely conical, and on the outer surface (11) of which bristles (12) are to be fitted, and which body part (10) has an end part (13), in which there is an attachment arrangement (14) for the rotation shaft (34) of the brush (15), **characterized in that** lightenings (16) are arranged in the end part (13).

2. The body part according to Claim 1, **characterized in that** the lightenings (16) are hollows and/or recesses (36) arranged in the end part (13).

3. The body part according to Claim 1 or 2, **characterized in that** structures (21) are arranged between the lightenings (16), to support the end part (13) on the periphery (37) of the body part (10).

4. The body part according to Claim 3, **characterized in that** the structures (21) are radially in the end part (13) and are preferably fin-like.

5. The body part according to Claim 3 or 4, **characterized in that** the attachment arrangement (14) of the rotation shaft (34) of the brush (15) is angular, in which there is an opening (35) for the rotation shaft (34) and the structures (21) are arranged to attach to the corners of the opening (35) and/or in the middle of the sides of the opening (35).

6. The body part according to any of Claims 1 - 5, **characterized in that** an attachment arrangement (23, 24) is fitted to the end part (13) to the second bristle part (19) and/or the end plate (22), to close the end part (13) of the body part (10), which preferably alternate in the end part (13), in the circumferential direction of the body part (10).

7. The body part according to Claim 6, **characterized in that** the attachment arrangements (23, 24) includes attachment points (39, 40) being in the axial direction of the body part (10) fitted to the end part (13), of which

   - the attachment points (39) arranged for the bristle part (19) arranged to be attached to the body part (10) are arranged in these parts (21') of the structure (21) belonging to the end part (13), which are joined to the middle of the sides of the opening (35),
   - the attachment points (40) fitted for the end plate (22) are arranged in these parts (21*) of the structure (21) belonging to the end part (13), which are joined to the corners of the opening (35).

8. The body part according to any of Claims 1 - 7, **characterized in that**

   - the end plate (22) includes an axially protruding lip (29) arranged on its periphery (28),
   - the end of the body part (10) includes a groove (30) or recess for sealing the end plate (22) to the body part (10) .

9. The body part according to any of Claims 1 - 8, **characterized in that** a space (31) for a second bristle part (19) is

arranged in the body part (10).

10. The body part according to Claim 9, **characterized in that** the wall (33) arranged to delimit the space (31) includes shapes (41) protruding from the wall (33), in order to eliminate gaps between the outer periphery of the body part (17) of the second bristle part (19) to be attached to the body part (10) and the inner periphery of the space (31) formed in the body part (10).

11. The body part according to Claim 10, **characterized in that** the shapes (41) to eliminate gaps are in the axial and/or radial direction of the body part (10).

12. The body part according to Claim 10 or 11, **characterized in that** the shapes (41) to eliminate gaps include ridges, protrusions, or similar arranged in the inner wall (33) of the space (31), which are axial to the body part (10) and the height of which is preferably arranged to change in the axial direction of the space (31).

13. A brush, particularly a cattle brush, which is formed of one or more body parts (10, 17), and bristles (12) fitted to the body part (10, 17), **characterized in that** the body part (10) of at least one brush (15) is according to any of Claims 1 - 12.

14. A method for making the partly or entirely conical body part (10) of a brush, particularly a cattle brush, from a moulding material, **characterized in that** the body part is made using the injection-moulding technique.

15. A body part of a brush, particularly a cattle brush, which is obtainable using the method according to Claim 14.

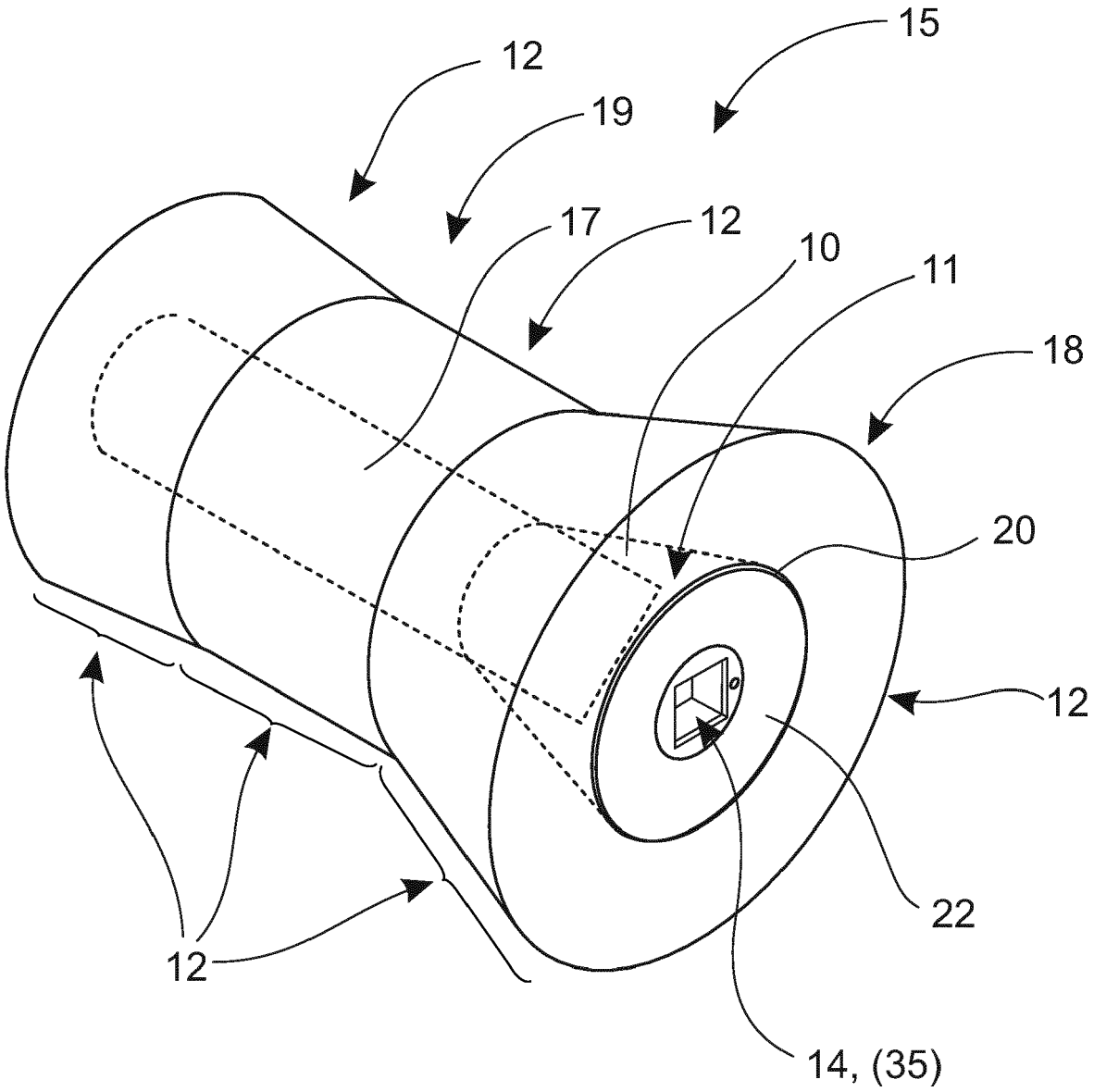

Fig. 1

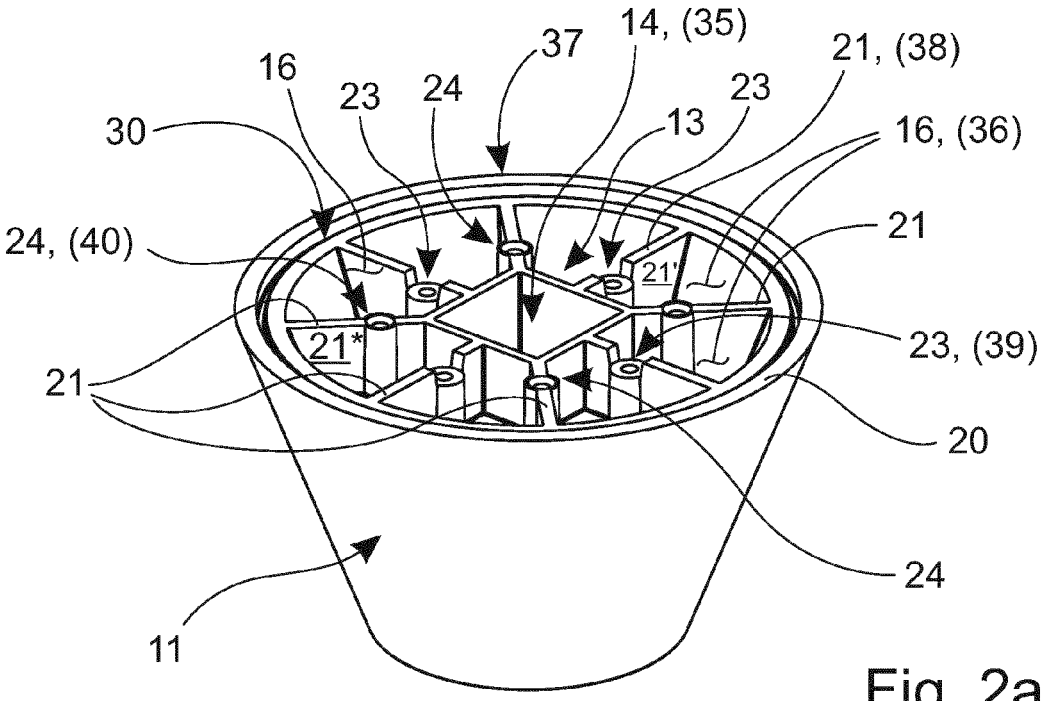

Fig. 2a

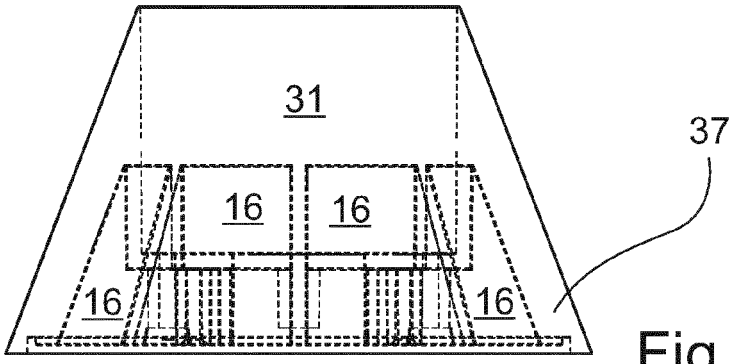

Fig. 3a

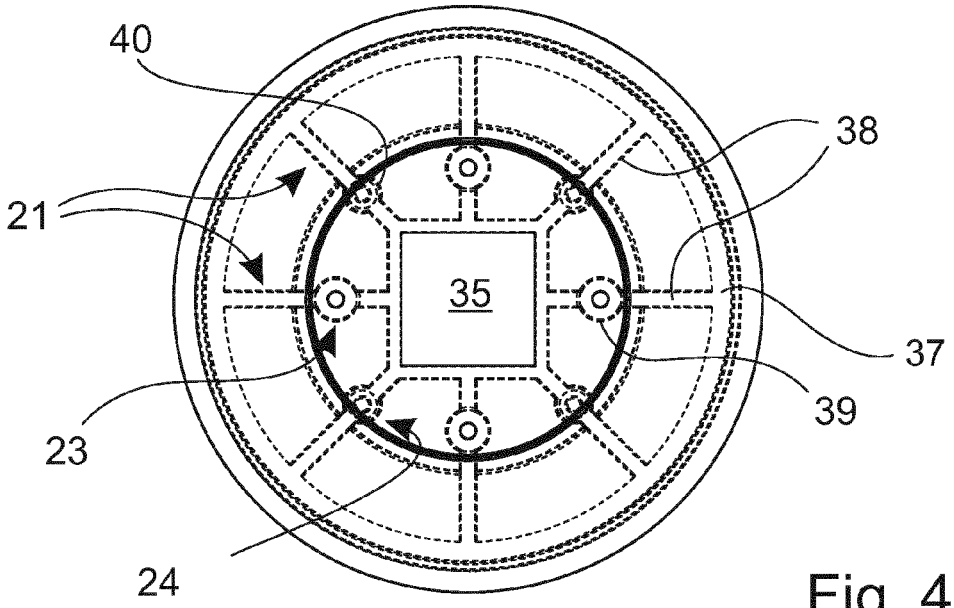

Fig. 4a

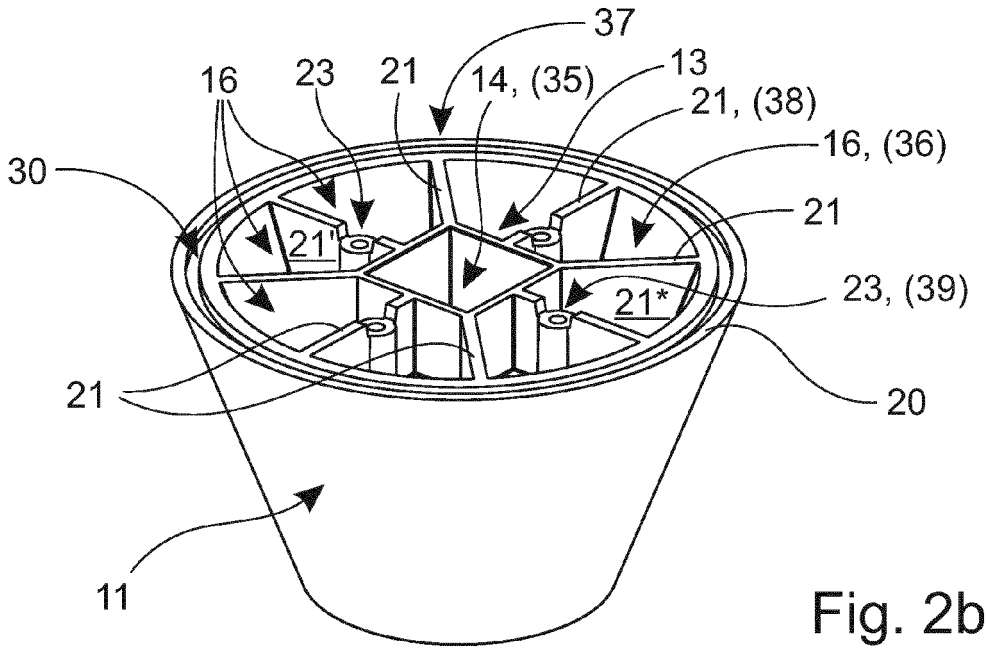

Fig. 2b

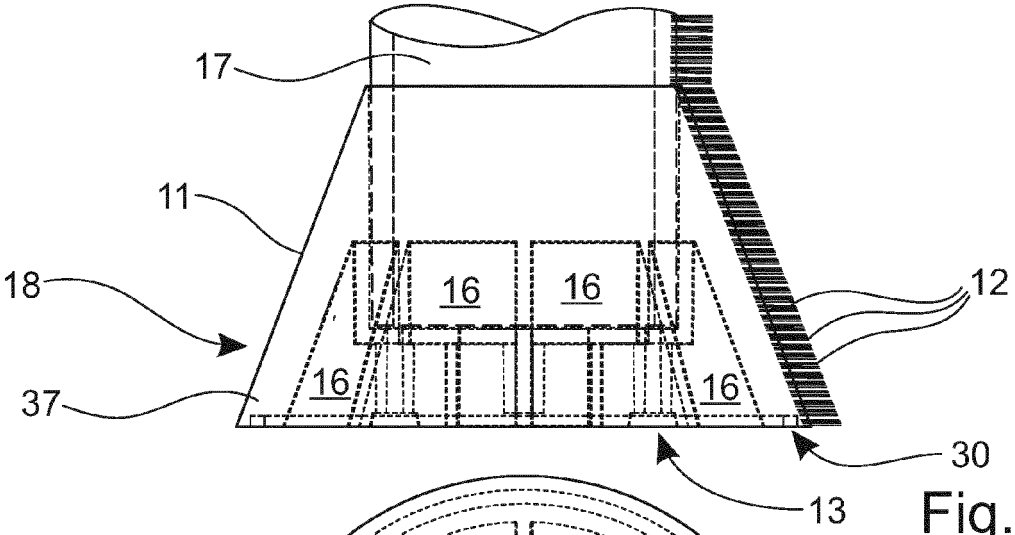

Fig. 3b

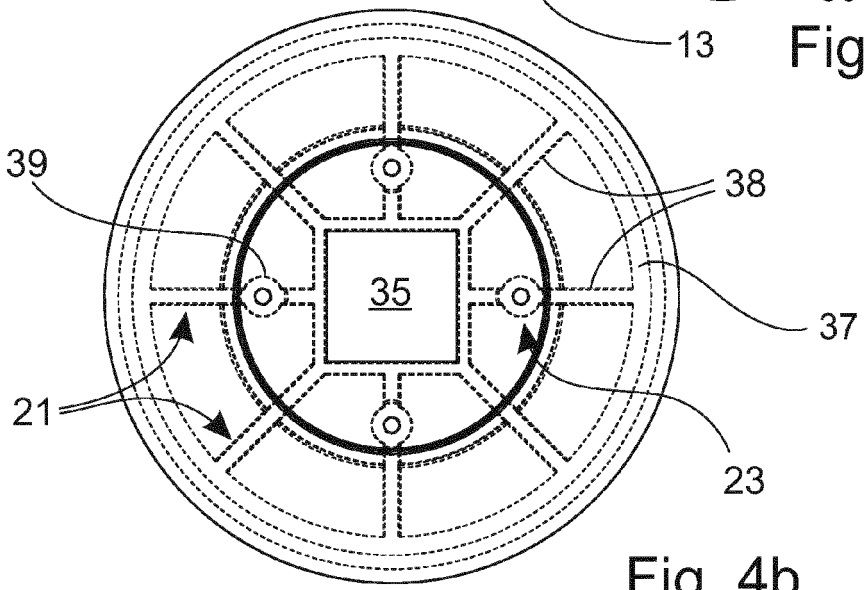

Fig. 4b

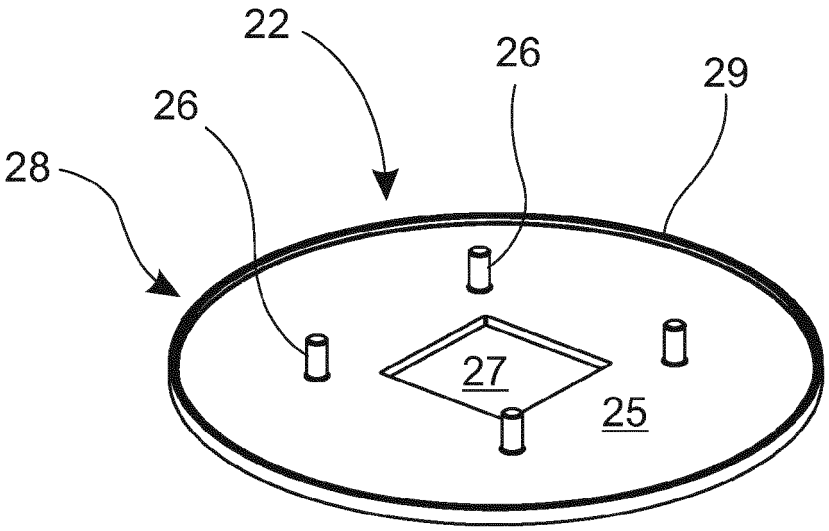

Fig. 5

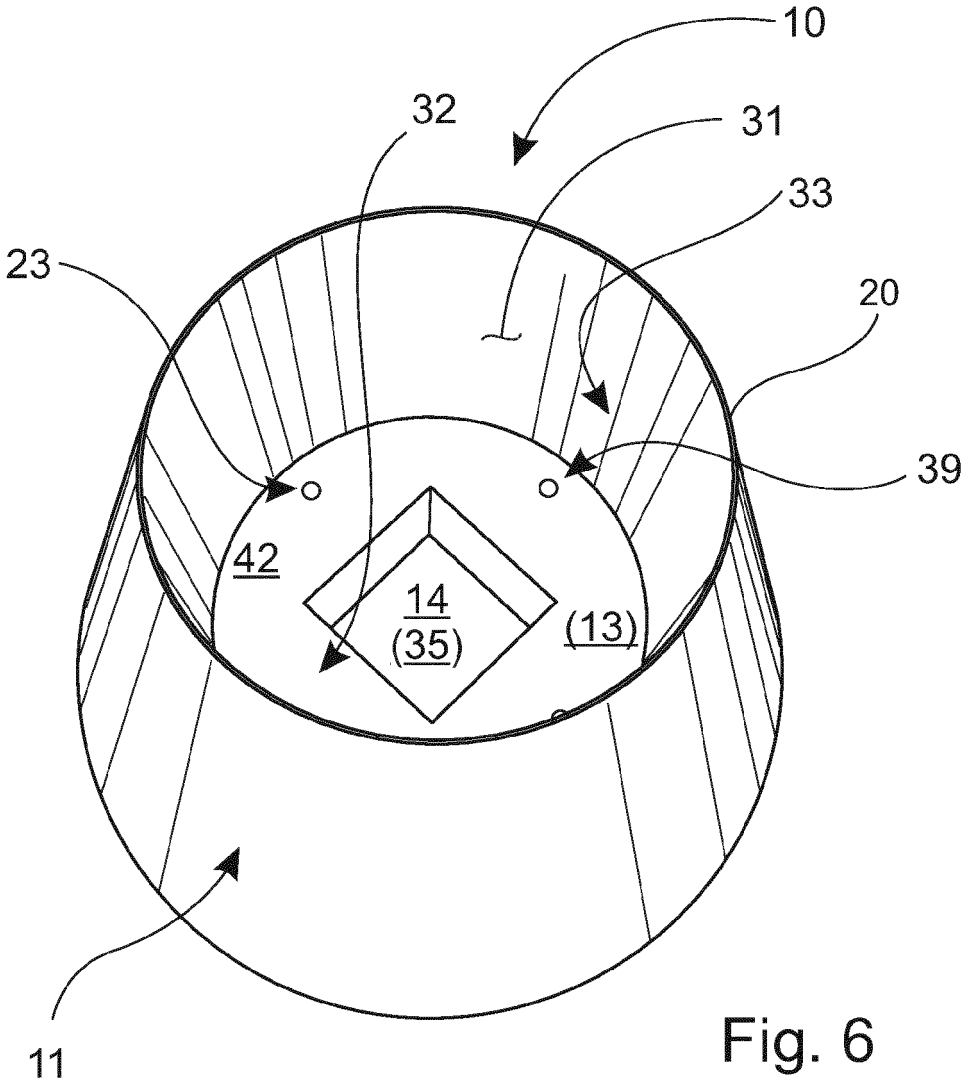

Fig. 6

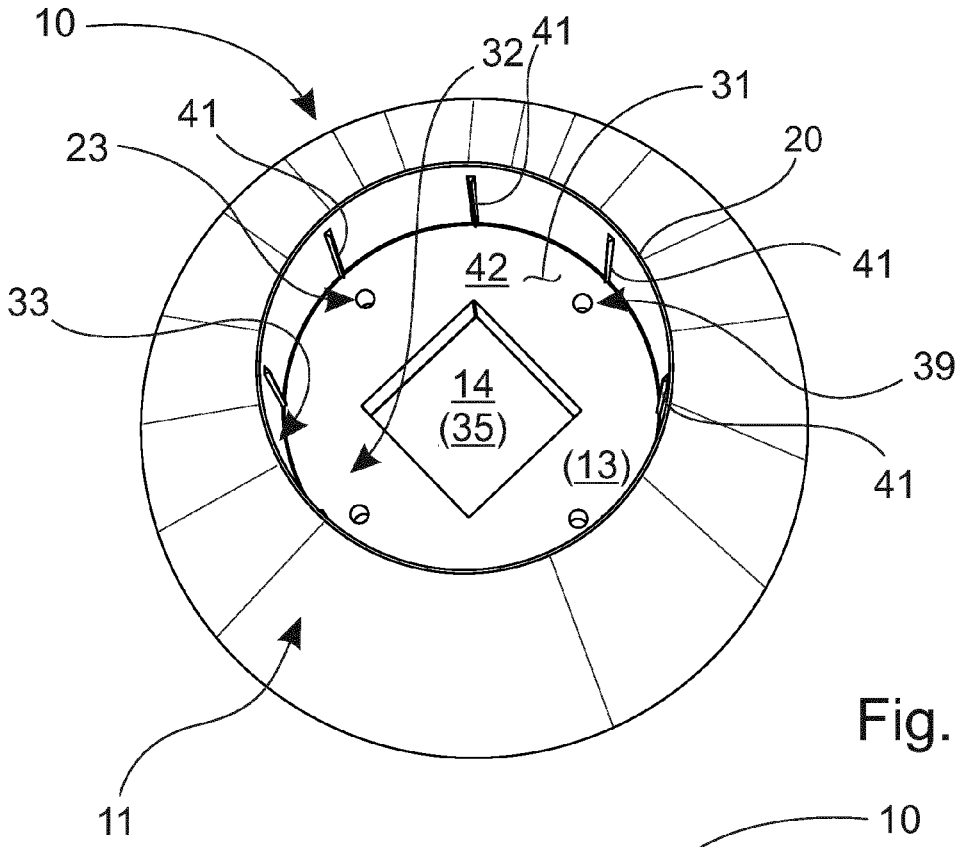
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Fig. 7a

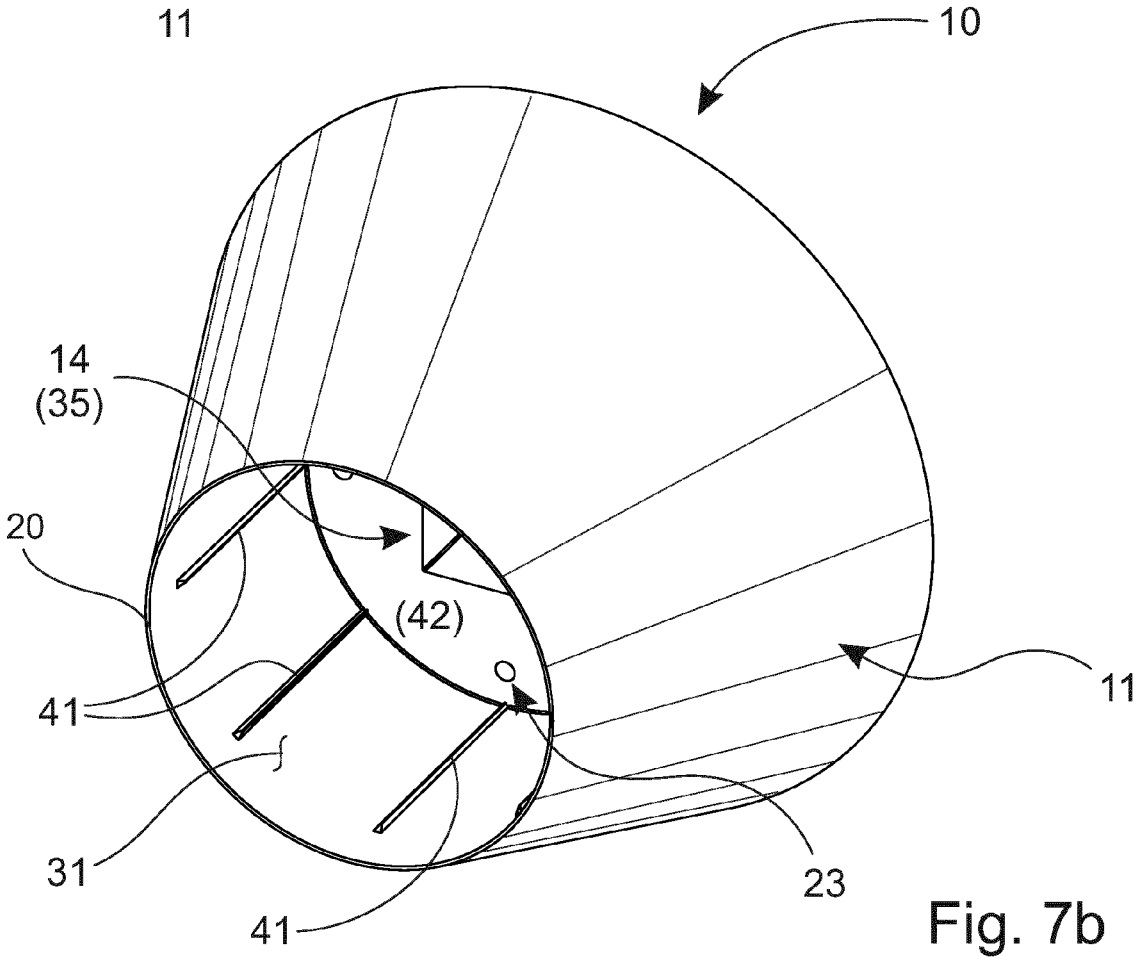
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Fig. 7b

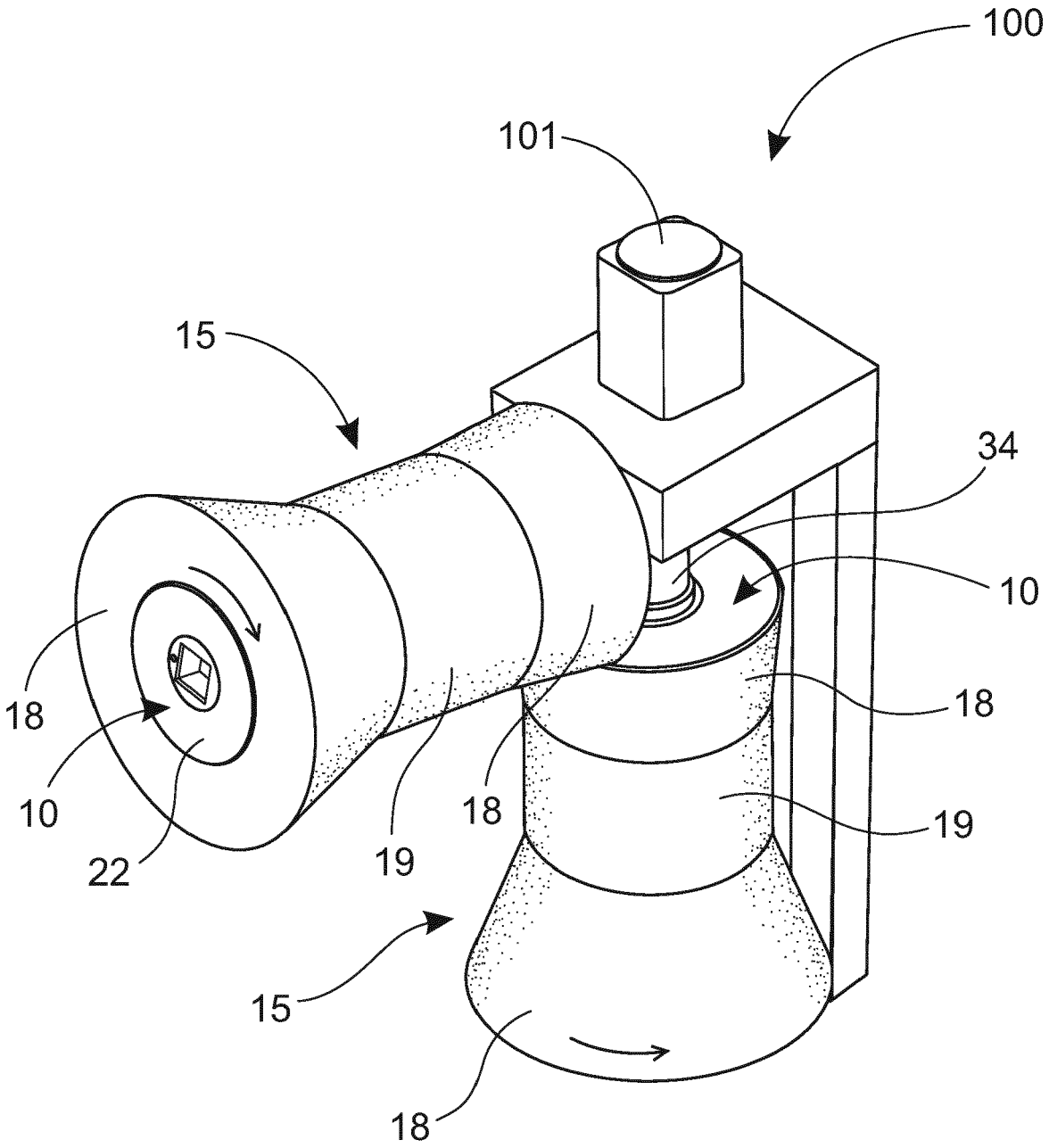

Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 18 16 1736

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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TECHNICAL FIELDS SEARCHED (IPC)

A46B
A01K
B60S

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	16 July 2018	Horrix, Doerte

CATEGORY OF CITED DOCUMENTS

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