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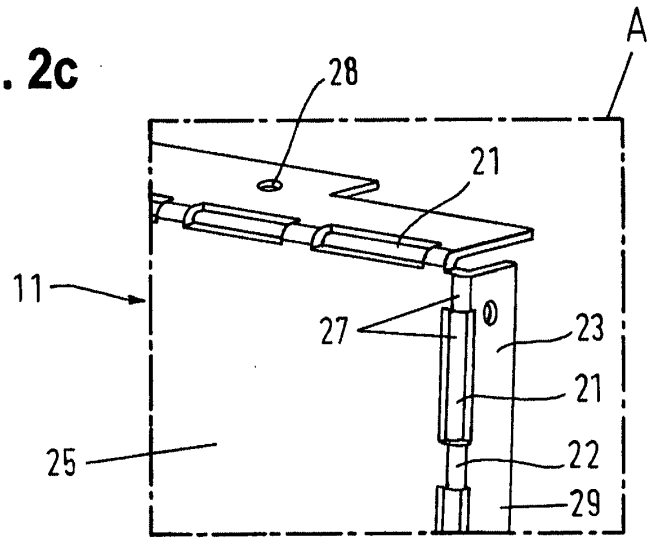
Amended claims in accordance with Rule 137(2) EPC.

(54) FAN PLATE FOR AN AIR CONDITIONING DEVICE

(57) A plate for an air conditioning device, the plate being a fan plate for supporting one or more fans or a bell mouth plate having a hole for permitting air to pass therethrough to an adjacent fan, the plate comprising:
a first region including a hole for permitting air to pass the fan;
a second region being a heat transfer inhibiting region comprising a plurality of perforations and a plurality of bridges separating the perforations, the heat transfer inhibiting region substantially surrounding the first region; and a third region for attachment of the plate to a housing of the air conditioning device;
wherein the second region is located between the first region and the third region, the second region being configured to inhibit the transfer of heat between the first region and the third region. Where the plate is a fan plate for supporting a fan, the first region is configured to be attached to the fan.

Fig. 2c



EP 3 153 783 A1

Description

[0001] The present invention relates to fan plates of air conditioning devices. Air conditioning devices generally include an indoor unit and an outdoor unit. The outdoor unit may be split into a heat exchanger unit and a compressor unit, and in certain circumstances it may be desirable to locate the heat exchanger unit in an indoor space. The heat exchanger unit generally comprises a housing, a heat exchanger located within the housing, one or more fans and a fan plate. Fan plates are designed to support one or more fans and include a hole for permitting air to pass the attached fan. An example of a known fan plate is shown in Figures 1A and 1B.

[0002] Figure 1a shows a prior art fan plate 1 having a main hole 3 therein for allowing air to pass to the fan. The fan plate 1 also has smaller holes 4 for attaching a fan to the fan plate. As can be seen in Figure 1b, a fan 5 is attached to the fan plate 1 via brackets 7. The fan plate is mounted onto the interior of the housing 9, and a heat exchanger (not shown) is positioned within the housing 9 upstream of the fan 5. In use, the air flows in the direction indicated by the arrow d, past the heat exchanger, through the hole 3 and passes the fan 5.

[0003] Where the housing 9 is provided indoors, air from outdoors may be directed through the housing and past the heat exchanger in the direction of the arrow d towards and through the fan 5. In winter, the indoor air surrounding the housing may be warm and relatively humid, whilst the outdoor air is cold. In use, the fan continually draws in cold air from outdoors which makes contact with the fan plate, thereby cooling the fan plate. As the fan plate is connected to the housing 9, the area of the housing adjacent to the fan plate is also cooled. Due to the humid indoor air contacting the cold outer surface of the housing, condensation is formed on the exterior of the housing in the region where the fan plate is connected. This condensation is undesirable as it is unsightly and can cause problems such as rusting and can also drip on to other items indoors, causing damage.

[0004] The present invention seeks to alleviate the above-mentioned problems by reducing the amount of condensation formed during operation of the air conditioner. The appended claims define the invention.

[0005] According to the present invention in one embodiment thereof, there is provided a fan plate for supporting one or more fans of an air conditioning device having at least one fan, the fan plate comprising:

a first region to which the fan is attached and including a hole for permitting air to pass the fan;
a second region being a heat transfer inhibiting region comprising a plurality of perforations and a plurality of bridges separating the perforations, the heat transfer inhibiting region substantially surrounding the first region;
and a third region for attachment of the fan plate to a housing of the air conditioning device;
wherein the second region is located between the first region and the third region, the second region being configured to inhibit the transfer of heat between the first region and the third region.

[0006] In a further embodiment, a bell mouth plate of an air conditioning device is provided, the bell mouth plate having a hole for permitting air to pass therethrough to an adjacent fan, the bell mouth plate comprising:

a first region including the hole for permitting air to pass the fan;
a second region being a heat transfer inhibiting region comprising a plurality of perforations and a plurality of bridges separating the perforations, the heat transfer inhibiting region substantially surrounding the first region;
and a third region for attachment of the bell mouth plate to a housing of the air conditioning device;
wherein the second region is located between the first region and the third region, the second region being configured to inhibit the transfer of heat between the first region and the third region.

[0007] Whilst a fan plate is designed to support one or more fans, the fan(s) being attached to the fan plate by brackets, bolts, mounting belts or other known elements, the bell mouth plate is not designed to support a fan, but rather the fan is placed adjacent to the bell mouth plate in alignment with the hole in the bell mouth plate, and the fan is attached to the housing directly. The bell mouth plate is attached, in a manner similar to a fan plate, to the housing. Any known means of securely connecting the fan plate or bell mouth plate to the housing may be used. The invention is applicable to both fan plates and bell mouth plates, and the features of the invention, as presented in the dependent claims and in the description, may be applied to both fan plates and bell mouth plates.

[0008] The present invention provides that the plate has three distinct regions. These regions may be formed from the same or from different materials. These regions may be formed as two or more separate elements that are subsequently connected together, or may alternatively be formed as an integral plate unit.

[0009] The first region includes the main hole and, in the case of a fan plate, the area to which the fan is going to be/is attached. The third region is configured to permit attachment of the plate to the housing, whilst the second region is located between the first and the third regions and is configured to inhibit the transfer of heat between the first and third regions.

[0010] By inhibiting the transfer of heat between the first and third regions, the first region where the plate is in direct contact with the cold outdoor air and which, as a result, becomes cold, and the third region which is not in direct contact with the cold outdoor air are, at least to an extent, thermally isolated from each other. This permits the third region to remain at a warmer temperature

than the first region, and thereby allows the housing, which is connected to the plate, to also maintain a warmer temperature. In this manner, the amount of condensation formed on the exterior of the housing is reduced.

[0011] The second region comprises a plurality of perforations and a plurality of bridges separating the perforations. This reduces the contact area between the first and third regions and results in a more complex heat transfer path, reducing the heat transfer between the first and third regions. Preferably the total surface area of the perforations of the second region is greater than or equal to the total surface area of the bridges of the second region. More preferably, the total surface area of the perforations of the second region is substantially greater than the total surface area of the bridges of the second region. More preferably, the total surface area of the perforations of the second region is at least twice the total surface area of the bridges of the second region. More preferably, the total surface area of the bridges of the second region is at least three times the total surface area of the bridges of the second region.

[0012] The perforations may be of any suitable shape, including but not limited to rectangular, square, circular, oval, triangular or a combination of shapes. The perforations may be of substantially equal size. The perforations may be substantially equidistantly spaced from each other.

[0013] The second region may extend substantially around the periphery of the plate. The third region may form at least part of the periphery of the plate.

[0014] Preferably, the third region comprises a flange configured to permit attachment of the plate to the housing of the air conditioning device. The flange may extend in a direction substantially perpendicular to the plate, to permit easy connection of the flange, and thereby the plate, to the housing.

[0015] Advantageously, the plate further comprises a thermal insulation material. The thermal insulation material preferably extends substantially around the periphery of the first region of the plate. The thermal insulation material is preferably provided on the first region of the plate, and may be provided on a part of or all of the first region of the plate. The thermal insulation material may further be provided on the second region, on the third region or on both the second and third regions of the plate. The thermal insulation material further assists in inhibiting the transfer of heat between the first region and the third region and hence the housing. Where the second region is relatively large with respect to the first region of the plate and/or has a high ratio of surface area of perforations to surface area of bridges, it may be desirable to cover some or all of the second region with the thermal insulating material. This reduces air bypass whereby the cold outdoor air flows through the perforations instead of the fan.

[0016] The plate advantageously comprises a front surface which faces the air flow and a rear surface. The thermal insulation material may be provided on one or both of these surfaces.

[0017] The present invention further provides a heat source unit or a utilization unit of an air conditioning device comprising: a housing, a heat exchanger, a fan and a fan plate or a bell mouth plate as described above.

[0018] The present invention further provides an air conditioning device comprising a housing, a heat exchanger, a fan and a fan plate or a bell mouth plate as described above. The fan may be a conventional fan or may alternatively be a turbofan.

[0019] The present invention will now be described by way of example only and with reference to the accompanying drawings, of which:

Figure 2a shows a plan view of a fan plate of an air conditioning device in accordance with one embodiment of the present invention. Figure 2b shows an isometric view of the fan plate of figure 2a. Figure 2c shows in more detail a part of the fan plate as shown in the isometric view of figure 2b.

Figure 3 shows the fan plate of figures 2a-2c and an associated fan installed in a housing of an air conditioning device.

Figure 4a shows a plan view of a bell mouth plate of an air conditioning device in accordance with an alternative embodiment of the present invention. Figure 4b shows the bell mouth plate of figure 1a and an associated fan installed in a housing of an air conditioning device. Figure 4c shows an alternative way of installing the fan.

Figure 5 shows a fan plate formed from three separate parts, the fan plate being installed in a housing of an air conditioning device.

Figure 6 shows a plan view of a further fan plate in accordance with the present invention.

Figure 7a shows a plan view of a further fan plate in accordance with the present invention. Figure 7b shows a plan view of another fan plate in accordance with the present invention. Figure 7c is a schematic drawing of the fan plate of figure 7a or alternatively the fan plate of figure 7b, the fan plate being installed in a housing of an air conditioning device.

[0020] The fan(s) used in these examples and in accordance with the present invention may be conventional fans or alternatively may be turbofans.

[0021] Figure 2a shows a front surface 18 of a fan plate 11 configured to be used with two fans. The front surface 18 faces the air flow. The fan plate has two main holes 13 extending from the front surface 18 to the rear surface (not shown) of the fan plate 11 for allowing air to pass through each main hole 13 to its associated fan. The fan plate also has smaller holes 14 for attaching the two fans

to the fan plate 11 by brackets, bolts or other suitable means. The fan plate 11 has, near to its periphery, a plurality of perforations 21. The perforations extend from the front surface 18 of the fan plate to its rear surface. Bridges 22 are present between the perforations. In this example the bridges 22 are formed from the same material as the rest of the fan plate and are formed integrally therewith, although in other examples the bridges may be formed from one or more separate parts. The total surface area of the perforations in this example is considerably greater than the total surface area of the bridges.

[0022] As can be seen in figure 2b, the fan plate 11 comprises three regions, namely a first region 25, a second region 27 and a third region 29. In this example, the fan plate is formed as an integral unit although in alternative examples the fan plate may be formed from two or more individual parts joined together. The first region 25 surrounds the holes 13 in the fan plate 11 and includes the holes 14 for attaching the fan to the fan plate. The second region 27 is the heat transfer inhibiting region and includes the perforations and bridges. The second region 27 substantially surrounds the first region 25. The third region 29 forms at least part of the periphery of the plate and includes a flange 23 which is formed at such an angle as to allow it to contact and be attached to a housing of the air conditioning device. The flange 23 may include one or more holes 28 to allow the flange to be bolted to the housing. Alternatively the flange 23 may be attached to the housing by other means such as welding.

[0023] Figure 2c shows an enlarged portion of the fan plate 11 shown in figure 2b and denoted by the dotted line "A". The perforations 21 are located in the second region 27 of the fan plate, and surround the first region 25, separating the first region 25 from the third region 29.

[0024] Figure 3 shows the fan plate 11 mounted in a housing 19 of an air conditioning device. In this example, the fan plate 11 is attached to the housing 19 by means of bolts passing through the holes 28 formed in the flange 23 and corresponding holes formed in the housing 19. In other examples, a different means of attachment, for example welding, may be used instead. The flange 23 is formed integrally with the rest of the fan plate 11 and forms the periphery of the fan plate 11. The flange 23 is located in the third region 29 of the fan plate 11. A fan 15 including a motor 16 is mounted on the fan plate 11 by means of fan mounting bolts 17. The fan mounting bolts 17 pass through the holes 14 which are located in the first region 25 of the fan plate 11. The first region 25 of the fan plate 11 surrounds a main hole 13 through which air passes in the direction of the arrow d to reach the fan 15. The second region 27 of the fan plate 11 is located between the first region 25 and the third region 29 and includes the perforations 21 and bridges 22 as shown in figures 2a - 2c.

[0025] Figures 4a - 4c show a different embodiment of the invention. In this example, the fan plate is not a conventional fan plate being a plate to which the fan is mounted, but is instead a bell mouth plate which has a similar structure to the fan plate 11 described above, except that the fan 15 is not mounted to the bell mouth plate. Instead, the fan 15 is mounted to the housing 19 of the air conditioning device directly.

[0026] Figure 4a shows a bell mouth plate 12 having two through holes 13 formed therein, the holes 13 being for allowing air to pass therethrough to their respective fans 15. Like the fan plate 11, the bell mouth plate 12 comprises three regions: a first region 25 surrounding the hole 13, a third region 29 being located at the periphery of the plate and being configured for attachment to the housing 19 of the air conditioning device, and a second region 27 being located between the first and third regions and comprising perforations 21 and bridges 22 located between the perforations 21. The bell mouth plate 12 does not require attachment holes 14 in the first region 25 as the fans 15 is not attached to the bell mouth plate 12.

[0027] Figure 4b shows the bell mouth plate 12 attached to the housing 19 of the air conditioning device. The bell mouth plate 12 is located just upstream of the fans 15 and serves to guide the air into the fans 15. This is a similar arrangement to that shown in figure 2 except that the fans are not mounted on the bell mouth plate 12 but are instead attached to the housing 19 by means of the fan mounting bolts 17. Other means of attachment, such as adhesives or welding, could be used instead.

[0028] Figure 4c shows another example of an air conditioning device having a bell mouth plate 12. In this example, the arrangement is the same as that shown in figure 4b except that the fans are attached to a rear portion 19a of the housing 19 instead of to a side wall. Again, in this example fan mounting bolts 17 are used to attach the fans 15 to the housing, although other means of attachment could be used instead.

[0029] Both of these embodiments show the plate having three regions, the second region 27 being located between the first region 25 and the third region 29 and being configured to inhibit the transfer of heat between the first and third regions. By providing the second region 27 with perforations 21, the area available for heat conduction between the first region 25 and the third region 29 is limited to the bridges 22. By providing the second region 27 with a total surface area of perforations which is substantially greater than the total surface area of the bridges, the heat transfer between the first and third regions can be reduced. Whilst it is desirable to provide as great a ratio as possible between the surface area of the perforations and the surface area of the bridges, the bridges must still be strong enough to maintain the integrity of the plate, and, in the case of the fan plate 11, be strong enough to allow one or more fans 15 to be mounted to the first region 25 of the fan plate 11. The above examples show a fan plate 11/bell mouth plate 12 being formed integrally from a single sheet of material, however, the regions of the fan plate/bell mouth plate may be formed separately from the same or from different materials. Further, the respective regions may be formed from

material having different thicknesses.

[0030] Figure 5 shows a fan plate 31 having three regions each formed from a separate part and connected to each other, the fan plate 31 being attached to the housing 19 of an air conditioning device. The fan plate 31 has a first region 25 which surrounds a main hole 13 in the fan plate 31. A fan 15 is mounted onto the fan plate 31 in the manner described above with respect to the fan plate 11. The fan is mounted onto the first region 25 of the fan plate 31. The first region is formed from a first material which is able to bear the weight of the fan and remain rigid when impacted by air flow once the fan is switched on. Metals such as steel are suited for such use. The second region 27 comprises a plurality of perforations 21 and bridges 22 as described above. The second region can be made from the same material or a different material, and may have a different thickness to the first material. The second region is attached to the first region by any suitable means, for example, bolting, adhesion or welding. The third region 29 is located at the periphery of the plate 31 and includes the flanges 23 which are attached to the housing 19. The third region may be formed from the same material as the first and/or second materials, or may be a different material. The third region may be formed from a material having heat insulating properties, such as a resinous material, for example. The third region may have a different thickness to the first and/or second region. The third region is attached to the second region by any suitable means, for example, bolting, adhesion or welding. Although this example shows a fan plate 31, the idea of a plate having three regions formed from three separate parts connected together is also applicable to a bell mouth plate. Also, the plate may instead be formed of two parts, one part being the first and second regions and the other part being the third region, or alternatively one part being the second and third regions and the other part being the first region.

[0031] Figure 6 shows a further embodiment of the invention. In this example, the fan plate 11 is similar to that described in the above examples, except that the fan plate 11 further includes a layer of thermal insulation material 33. The thermal insulation material 33 is disposed around the periphery of the first region 25 and serves to further limit heat transfer between the first and third regions of the fan plate. Suitable thermal insulation materials may be, for example, plastic foams such as polyethylene (PE) foam, ethylene propylene diene monomer (EPDM) foam, polypropylene (PP) foam, or alternatively expanded polystyrene (EPS), expanded polypropylene (EPP) or felt material. Although in this example the thermal insulation material is shown as being disposed around the periphery of the first region, the thermal insulation material may further be disposed on most or all of the first region 25 of the fan plate 11 excluding the holes 13 and 14. The thermal insulation material 33 is preferably disposed on the fan plate 11 on the front surface 28 which faces the oncoming air flow. In this manner direct contact of the cold air on the front surface 28 of the fan plate 11 is avoided. The thermal insulation material 33 could also be provided on both the front surface 28 and the opposing rear surface. The thermal insulation material 33 may further be provided on part or all of the second region 27 and/or the third region 29 of the fan plate 11. Although a fan plate is shown in this example, it is equally applicable to a bell mouth plate. The plate may be an integrally formed plate or may alternatively be formed from two, three or more separate parts.

[0032] Figures 7a and 7b show alternative examples of fan plates having different arrangements of perforations and bridges in the second region 27. Both of these examples show a fan plate having a second region having a greater surface area than the fan plate 11 described above. In these examples, the second region 27 is enlarged to further inhibit heat transfer between the first and third regions of the fan plate. Figure 7a shows a fan plate having a smaller first region 25 and a larger second region 27 than in the previous examples, the second region comprising several rows of perforations 21 with bridges 22 between the perforations of a row and with bridges 22 between the rows of perforations.

[0033] Optionally, a thermal insulation material 33 is provided around the periphery of the first region 25 or additionally on other parts or indeed the whole of the first region 25 excluding the holes 13 and 14. In this example, the thermal insulation material is also provided on part of the second region 27. This has the advantage that air travelling in the direction of the arrow d towards the fan plate will not be able to pass through the perforations 21 instead of passing through the main holes 13 towards the fans 15, as the thermal insulation material 33 will prevent the air from passing through the perforations 21.

[0034] Figure 7b shows another example of a fan plate having a smaller first region 25 and a larger second region 27. In this example one row of perforations 21 are provided, however, the perforations are much larger than those described with respect to the fan plate 11 above. The total surface area of the perforations is much greater than that of the bridges, and the second region is relatively large, thereby further inhibiting heat transfer from the first region 25 to the second region 27. Again, thermal insulation material 33 may be provided around the periphery of the first region 25, may be further provided on other parts or indeed the whole of the first region 25 excluding the holes 13 and 14, and may optionally extend into part or all of the second region. Again, the provision of thermal insulation material 33 in the second region has the advantage that air travelling in the direction of the arrow d towards the fan plate will not be able to pass through the perforations 21 instead of passing through the main holes 13 towards the fans 15, as the thermal insulation material 33 will prevent the air from passing through the perforations 21. This ensures that the efficiency of the unit is maintained, even when numerous large perforations are provided in the fan plate.

[0035] Figure 7c shows a schematic diagram of a fan

plate having a larger second region 27 and a smaller first region 25, such as those described above in figures 7a and 7b. The third region of the fan plate is attached to the housing 19 in a manner similar to those described above. A fan 15 is attached to the fan plate using fan mounting bolts 17 and the attachment holes 14 in the first region of the fan plate as described above. A thermal insulation material 33 is provided on the front surface 28 of the fan plate to face the oncoming air flow. The thermal insulation material 33 extends around the periphery of the first region of the fan plate and covers the second region and part of the third region of the fan plate. In other examples, the thermal insulation material might cover more or indeed all of the first region of the fan plate excluding the holes 13 and 14. In further examples, the thermal insulation material might not cover any of the third region of the fan plate. In further examples, the thermal insulation material might be provided on both the front surface and the rear surface of the fan plate. Although in these examples the thermal insulation material is shown as extending completely around the periphery of the first region, gaps in the material may instead be provided. Although a fan plate is shown in this example, it is equally applicable to a bell mouth plate. The plate may be an integrally formed plate or may alternatively be formed from two, three or more separate parts.

[0036] The above examples show a fan plate or bell mouth plate having two main holes 13 for permitting air to pass therethrough and reach their associated respective fans 15. However, the invention is equally applicable to fan plates or bell mouth plates having three or more main holes 13, each main hole 13 having an associated fan 15, or alternatively a single main hole 13 with an associated fan 15.

Claims

1. A fan plate for supporting one or more fans of an air conditioning device having at least one fan, the fan plate comprising:

   a first region to which the fan is attached and including a hole for permitting air to pass the fan;
   a second region being a heat transfer inhibiting region comprising a plurality of perforations and a plurality of bridges separating the perforations, the heat transfer inhibiting region substantially surrounding the first region;
   and a third region for attachment of the fan plate to a housing of the air conditioning device;
   wherein the second region is located between the first region and the third region, the second region being configured to inhibit the transfer of heat between the first region and the third region.

2. A bell mouth plate of an air conditioning device, the bell mouth plate having a hole for permitting air to pass therethrough to an adjacent fan, the bell mouth plate comprising:

   a first region including the hole for permitting air to pass the fan;
   a second region being a heat transfer inhibiting region comprising a plurality of perforations and a plurality of bridges separating the perforations, the heat transfer inhibiting region substantially surrounding the first region;
   and a third region for attachment of the bell mouth plate to a housing of the air conditioning device;
   wherein the second region is located between the first region and the third region, the second region being configured to inhibit the transfer of heat between the first region and the third region.

3. A fan plate or bell mouth plate as claimed in claim 1 or claim 2, wherein the total surface area of the perforations of the second region is greater than or equal to the total surface area of the bridges of the second region.

4. A fan plate or bell mouth plate as claimed in any of the preceding claims, wherein the perforations are of substantially equal size and are substantially equidistantly spaced from each other.

5. A fan plate or bell mouth plate as claimed in any of the preceding claims, wherein the second region extends substantially around the periphery of the plate.

6. A fan plate or bell mouth plate as claimed in any of the preceding claims, wherein the third region forms at least part of the periphery of the plate, and wherein the third region comprises a flange configured to permit attachment of the plate to the housing of the air conditioning device.

7. A fan plate or bell mouth plate as claimed in any of the preceding claims, wherein the plate further comprises a thermal insulation material which extends substantially around the periphery of the first region of the plate.

8. A fan plate or bell mouth plate as claimed in claim 7, wherein the thermal insulation material is further provided on the second region, or on the third region, or on both the second and third regions of the plate.

9. A fan plate or bell mouth plate as claimed in claim 7 or claim 8 having a front surface and a rear surface, and wherein the thermal insulation material is provided on both surfaces of the plate.

10. An air conditioning device comprising a housing, a heat exchanger, a fan, and a fan plate or a bell mouth plate as claimed in any of the preceding claims.

11. The air conditioning device as claimed in claim 10 comprising a housing, a heat exchanger located within the housing and attached thereto, a fan and a fan plate or a bell mouth plate as claimed in any of the preceding claims, wherein the plate further comprises a thermal insulation material located on a front and/or a rear surface of the plate, the thermal insulation material substantially extending around the periphery of the first region of the plate and being provided in that portion of the plate which is adjacent to the housing of the air conditioning device.

Amended claims in accordance with Rule 137(2) EPC.

1. A fan plate (11, 31) for supporting one or more fans of an air conditioning device having at least one fan (15), the fan plate (11, 31) comprising:

a first region (25) to which the fan (15) is attached and including a hole (13) for permitting air to pass the fan (15) ;
a second region (27) being a heat transfer inhibiting region comprising a plurality of perforations (21) and a plurality of bridges (22) separating the perforations, the heat transfer inhibiting region substantially surrounding the first region (25);
and a third region (29) for attachment to the fan plate (11, 31) to a housing (19) of the air conditioning device;
wherein the second region (27) is located between the first region (25) and the third region (29), the second region being configured to inhibit the transfer of heat between the first region (25) and the third region (29).

2. A bell mouth plate (12) of an air conditioning device, the bell mouth plate (12) having a hole for permitting air to pass therethrough to an adjacent fan (15), the bell mouth plate (12) comprising:

a first region (25) including the hole (13) for permitting air to pass the fan (15);
a second region (27) being a heat transfer inhibiting region comprising a plurality of perforations (21) and a plurality of bridges separating the perforations, the heat transfer inhibiting region substantially surrounding the first region (27);
and a third region (29) for attachment of the bell mouth plate (12) to a housing (19) of the air conditioning device;
wherein the second region (27) is located between the first region (25) and the third region (29), the second region (27) being configured to inhibit the transfer of heat between the first region (25) and the third region (29).

3. A fan plate (11, 31) or bell mouth plate (12) as claimed in claim 1 or claim 2, wherein the total surface area of the perforations (21) of the second region (27) is greater than or equal to the total surface area of the bridges (22) of the second region (27).

4. A fan plate (11, 31) or bell mouth plate (12) as claimed in any of the preceding claims, wherein the perforations (21) are of substantially equal size and are substantially equidistantly spaced from each other.

5. A fan plate (11, 31) or bell mouth plate (12) as claimed in any of the preceding claims, wherein the second region (27) extends substantially around the periphery of the plate (11, 12, 31).

6. A fan plate (11, 31) or bell mouth plate (12) as claimed in any of the preceding claims, wherein the third region (29) forms at least part of the periphery of the plate (11, 12), and wherein the third region (29) comprises a flange (23) configured to permit attachment of the plate (11, 12, 31) to the housing (19) of the air conditioning device.

7. A fan plate (11, 31) or bell mouth plate (12) as claimed in any of the preceding claims, wherein the plate (11, 12, 31) further comprises a thermal insulation material (33) which extends substantially around the periphery of the first region (25) of the plate (11, 12, 31).

8. A fan plate (11, 31) or bell mouth plate (12) as claimed in claim 7, wherein the thermal insulation material (33) is further provided on the second region (27), or on the third region (29), or on both the second and third regions of the plate (11, 12, 31).

9. A fan plate (11, 31) or bell mouth plate (12) as claimed in claim 7 or claim 8 having a front surface (18) and a rear surface, and wherein the thermal insulation material (33) is provided on both surfaces of the plate (11, 12, 31).

10. An air conditioning device comprising a housing (19), a heat exchanger, a fan (15), and a fan plate (11, 31) or a bell mouth plate (12) as claimed in any of the preceding claims.

11. The air conditioning device as claimed in claim 10 comprising a housing (19), a heat exchanger located within the housing and attached thereto, a fan (15)

and a fan plate (11, 31) or a bell mouth plate (12) as claimed in any of the preceding claims, wherein the plate (11, 12, 31) further comprises a thermal insulation material (33) located on a front (18) and/or a rear surface of the plate (11, 12, 31), the thermal insulation material (33) substantially extending around the periphery of the first region (25) of the plate (11, 12, 31) and being provided in that portion of the plate which is adjacent to the housing (19) of the air conditioning device.

Fig. 1a

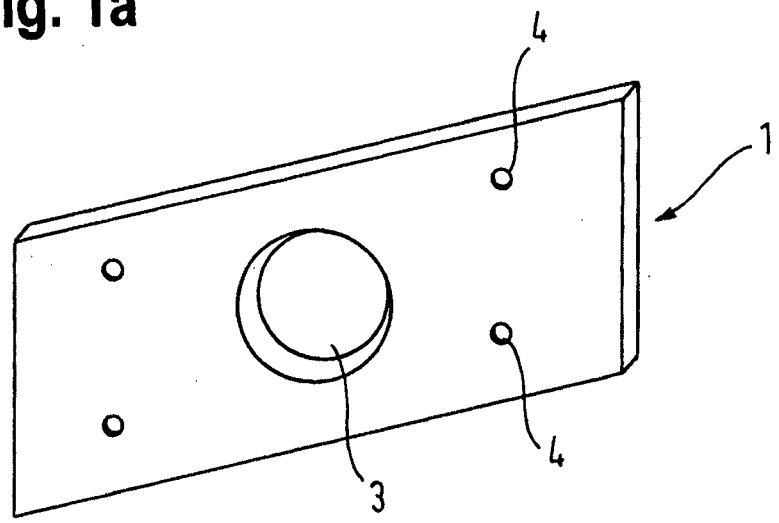


Fig.1b

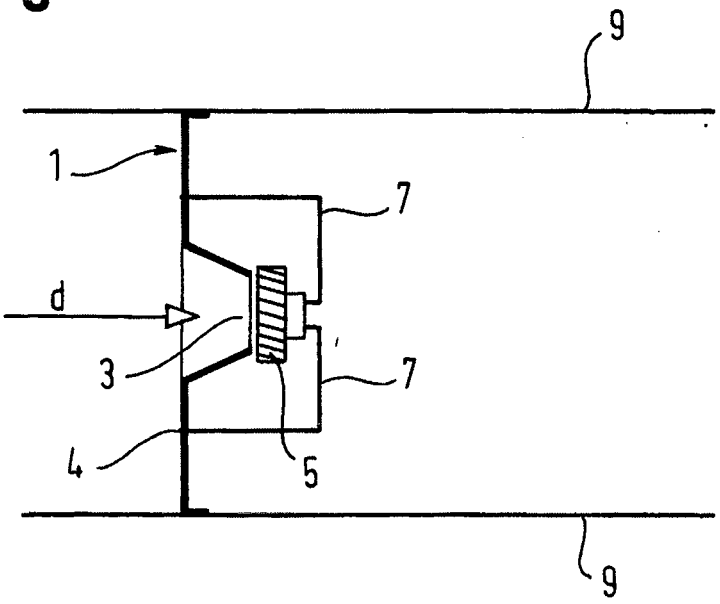


Fig. 2a

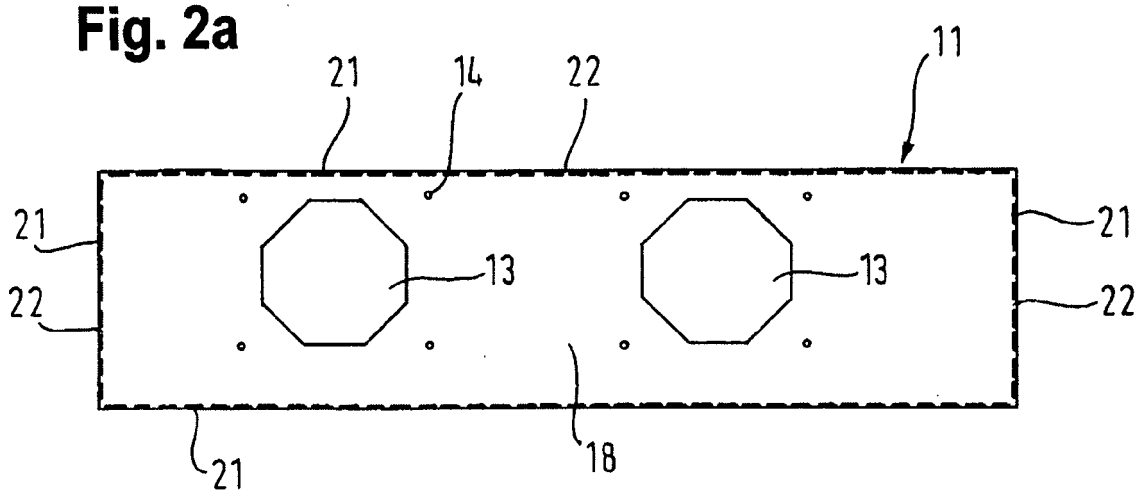


Fig. 2b

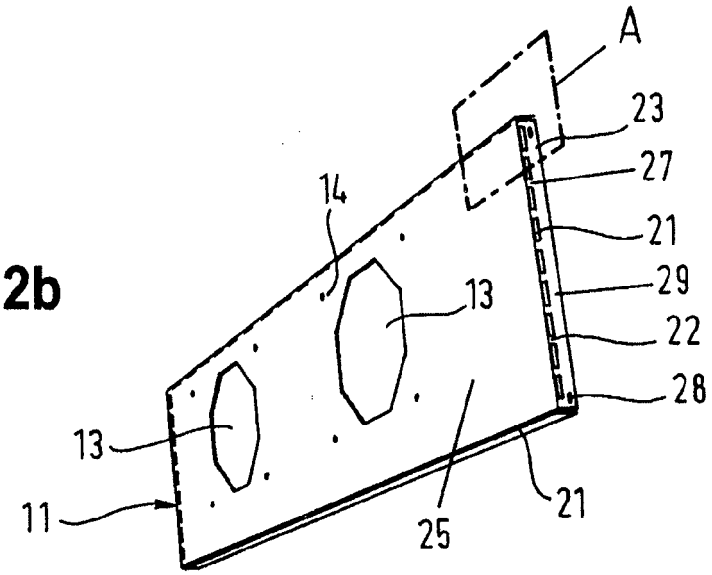


Fig. 2c

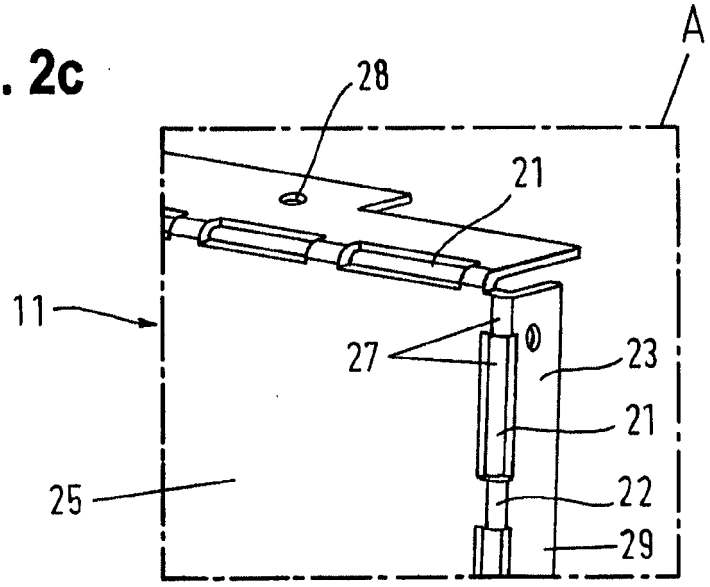


Fig. 3

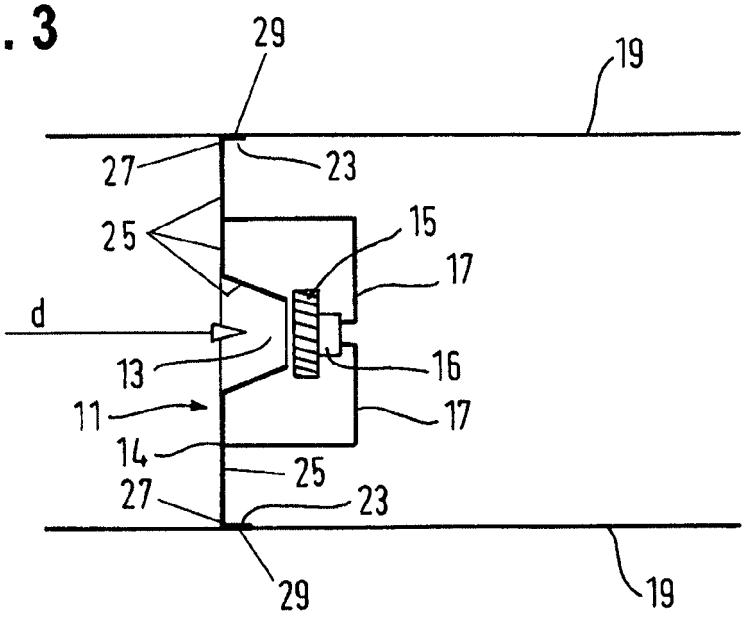


Fig. 4a

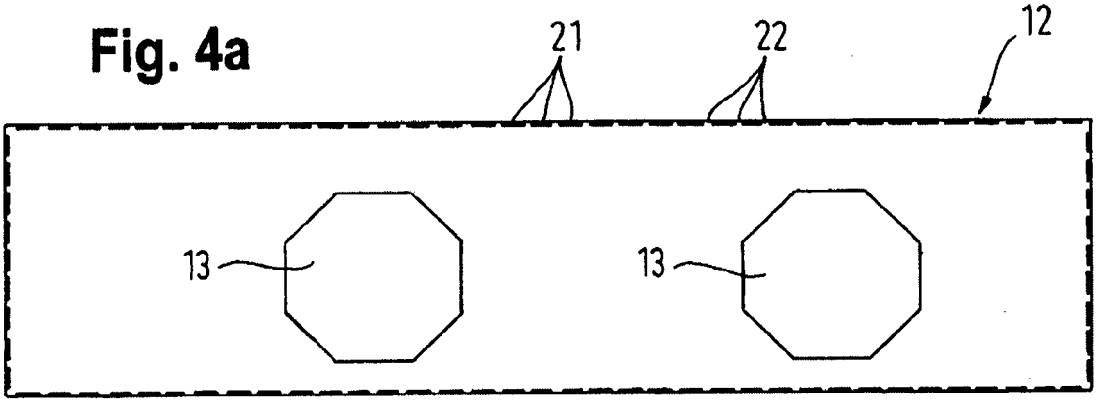


Fig. 4b

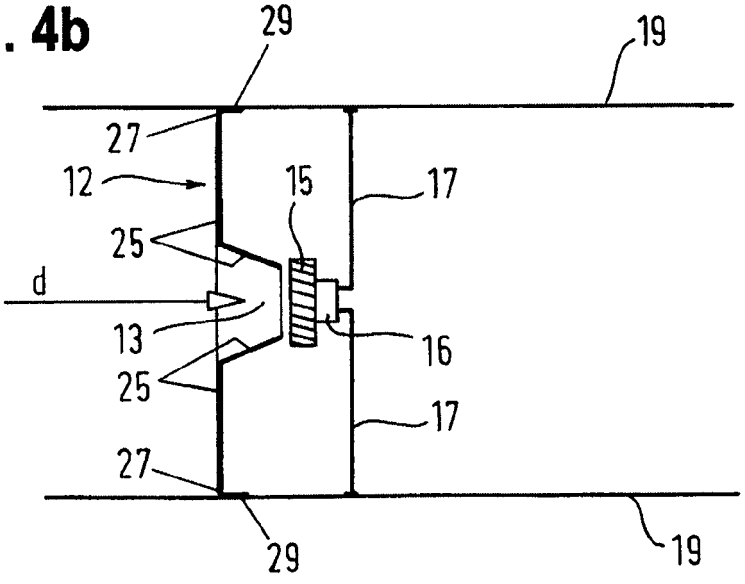


Fig. 4c

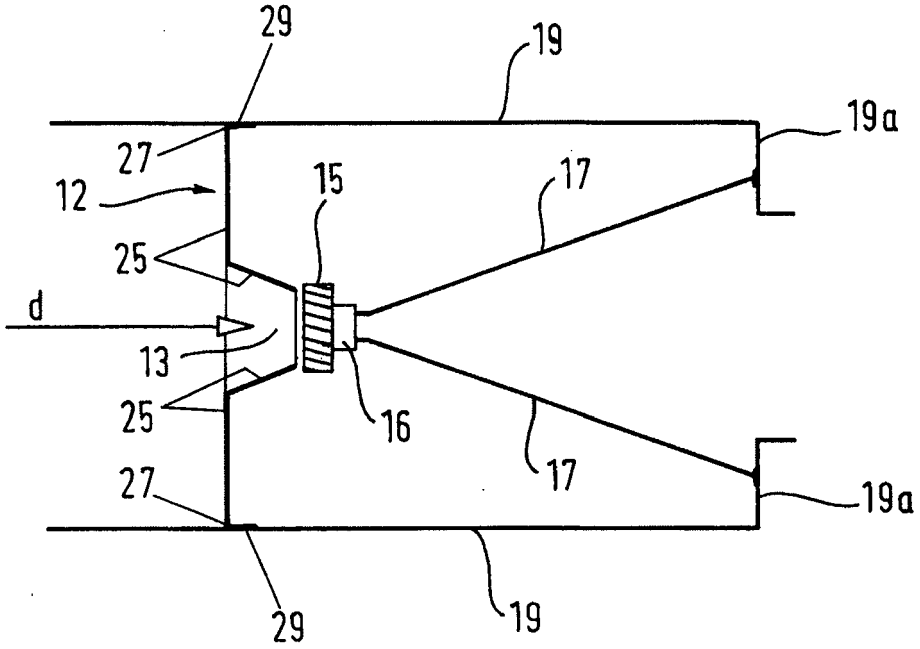

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Fig. 5

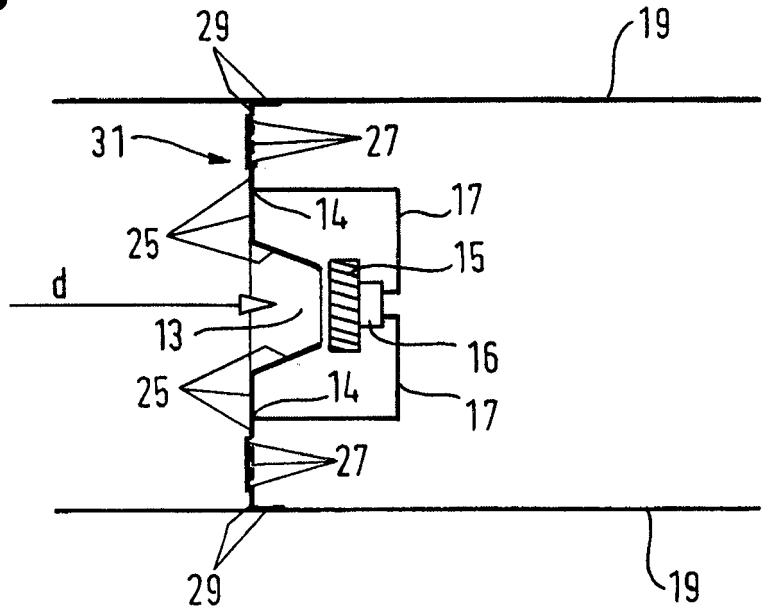
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Fig. 6

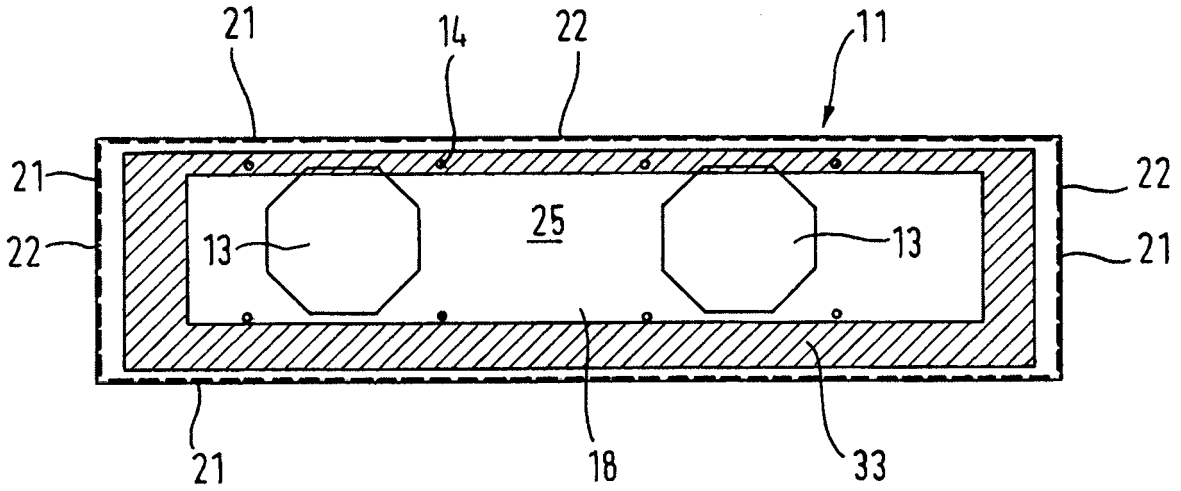
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Fig. 7a

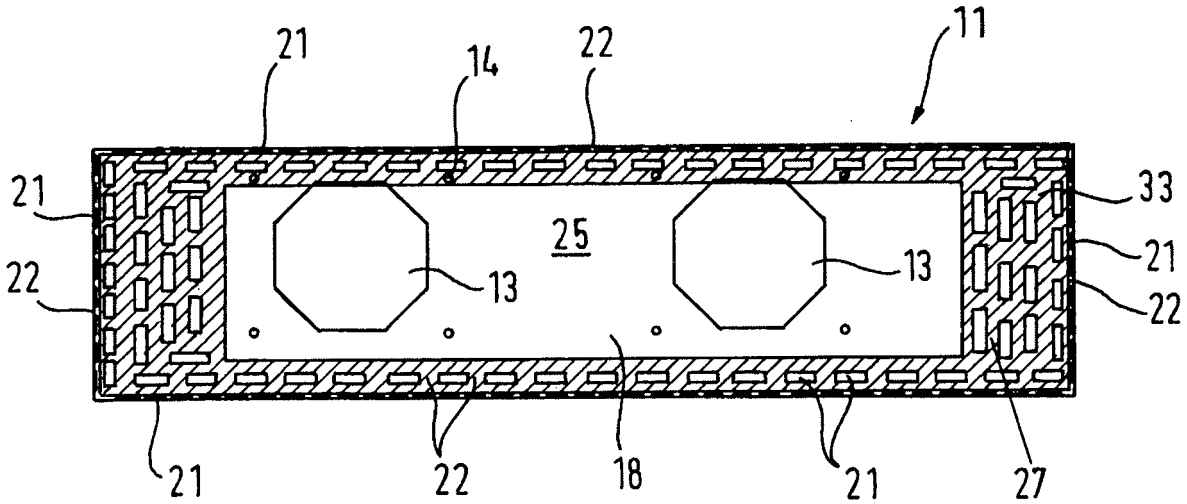
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Fig. 7b

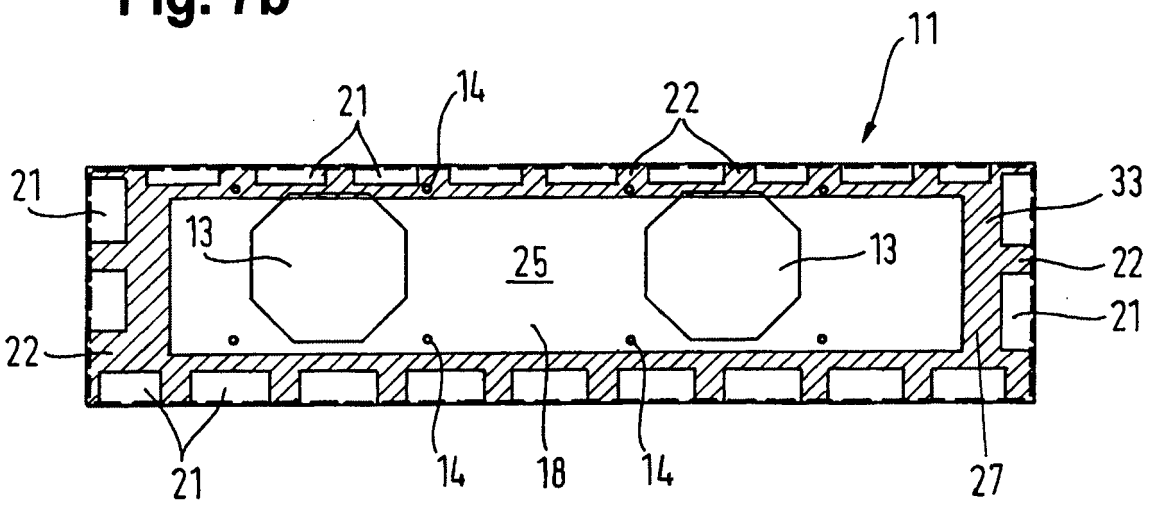
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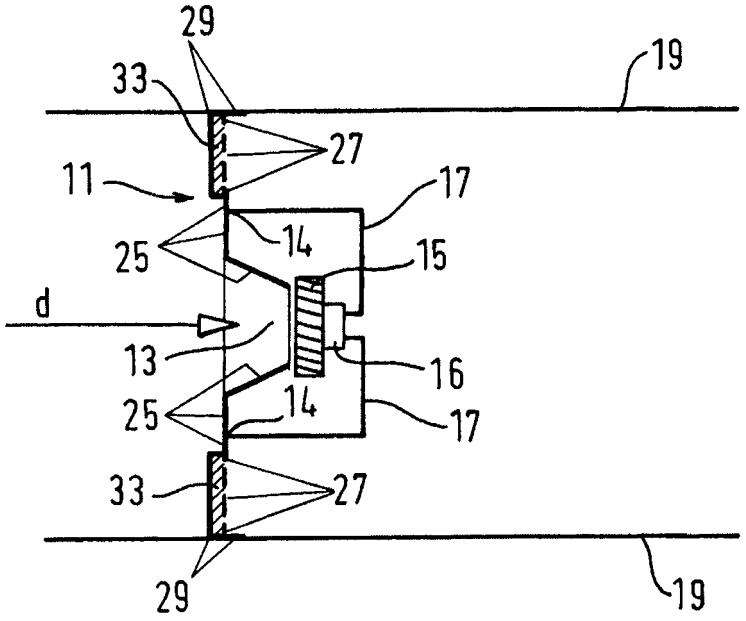
Fig. 7c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EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	17 March 2016	Salaün, Eric

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