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(54) A room air cooling arrangement

(57) A ceiling mounted room air cooling device comprises a longitudinal primary air channel, a room air cooling coil, a mixing chamber for mixing cooled room air and primary air, means for supplying primary air to the mixing chamber through the medium of an induction effect which serves to suck room air into the device and to pass said air through the cooling coil and into the mixing chamber, and one or more outlet channels through which a mixture of cooled room air and the supplied primary air exit from said device. The device is characterised in that the primary air channel is divided into two spaces by a longitudinal air-permeable partition wall. The first space receives primary air from an external source and is delimited from the second space with respect to flow. The second space forms that part of the primary air channel in which the primary air supply means is arranged in a partition wall or partition walls delimiting the mixing chamber. The air-permeable partition wall preferably comprises perforated sheet metal. The partition wall or walls between the second space and the mixing chamber will conveniently extend generally transversely to the flow direction in the adjacent outlet channel.

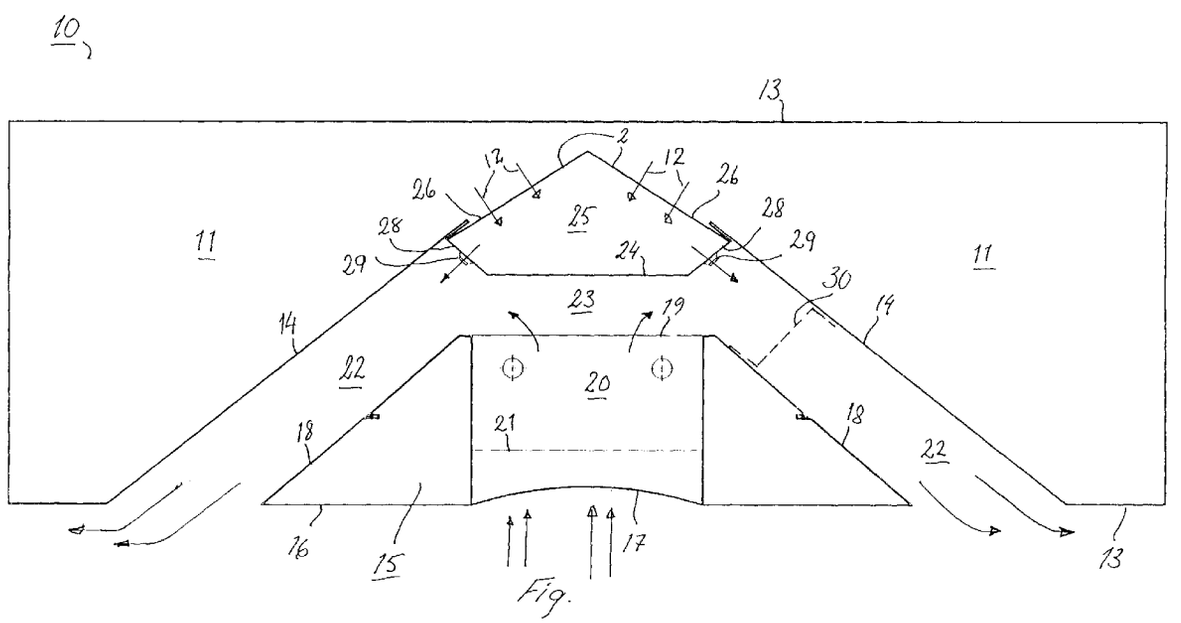

Fig.

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Description

[0001] The invention relates to a ceiling-mounted device for cooling room air which includes a longitudinal primary air duct, a room air cooling battery, a mixing chamber for cooled room air and primary air, and means for delivering primary air to the mixing chamber through the medium of an induction effect by means of which room air is sucked into the device and is passed through the cooling battery to the mixing chamber. The device also includes one or more outlet ducts through which a mixture of cold room air and the primary air leave the device.

[0002] Devices of the aforesaid kind are also referred to as cooling baffles or false ceiling panels. Such devices are known for treating room air and are available in different designs, including designs in which natural ventilation generated by a chimney effect is used instead of primary air, although a common feature of those cooling baffles that use primary air of the aforesaid kind is that they include one or more primary air channels to which primary air can be delivered through a central air-conditioning plant installed either in the building concerned or in the proximity of said building, or which is sucked-in from outside by fans provided to this end, so that the pressure in the primary air channel will always be higher than atmospheric pressure. The primary air is blown into the baffle interior through such devices as nozzles for instance, and the influence of said pressure. There is thus generated an induction effect which serves to draw room air from said room and through the cooling battery and into the mixing chamber in the baffle interior, where the primary air and the room air sucked into the device as a result of said induction effect are mixed together. The resultant air mixture then flows through one or more outlet channels into the room with the aid of the primary air as a transporting medium. Such devices that operate with an inductor effect are described in GB-A-1011742, GB-A-1274540, GB-A-1468754, GB-A-2271175 and DE-A-3321612, for instance. All of these known devices are referred to as air-conditioners, since they concern both the cooling and heating of room air and it would be obvious for those skilled in this art to equip the cooling baffles with means for delivering hot water to the cooling elements (the heat exchanger) if so desired, so as to enable the devices to be used for both cooling and heating purposes. One advantage with cooling baffles in comparison with ventilating and air-conditioning apparatus is that cooling baffles are lean in energy and do not generate draughts. The level of noise generated is also relatively low.

[0003] However, the manufacturers of such devices have endeavoured to reduce the level of sound that is generated as the primary air passes through the nozzles, this sound level being due, among other things, to the velocity of the primary air flow through said nozzles, and consequently the risk of a disturbing sound level naturally restricts the capacity of these known devices.

[0004] An object of the present invention is to provide a room air cooling device of the cooling baffle type that uses induction with the aid of a primary air supply, so as to obtain a lower noise level or, alternatively, a higher capacity without raising the sound level. The invention is characterised to this end by the features set forth in the accompanying Claims.

[0005] The primary air channel of the inventive device is divided into two spaces separated by a longitudinally extending air-permeable partition wall, wherein the first space, which receives primary air from an outer source, is delimited with respective flow from the second space which forms that part of the primary air channel in which said primary air supply means is arranged adjacent the partition wall or walls delimiting the mixing chamber. By delimited with respect to flow is meant here that the kinetic energy of the primary air in the first space is propagated only partially and generally only vertically to the second space, although the static air pressure in the primary air channel will, of course, be able to adjust equally in the whole of the primary air channel despite the presence of the partition wall, which can be designed in several different ways to provide such an effect and which may consist of different types of permeable membranes made of fabric, plastic or like materials, although metal is perhaps the simplest material from the aspect of construction and also the most hygienic. The air permeable partition wall may thus conveniently have the form of a perforated plate with a perforated area of about 50%.

[0006] The partition wall or walls between the second space and the mixing chamber may suitably be disposed generally transversely to the flow direction in the adjacent outlet channel.

[0007] The inventive device may have many different configurations within the scope of the Claims and cooling baffles and like induction apparatus of the aforementioned kind forming part of the known art may, in many cases, include a divided primary air channel.

[0008] However, a particularly preferred embodiment of the device is one in which the part of the device that lies outside the first primary air channel space has a triangular cross-sectional shape, wherein the second primary air channel space forms the upper part of the triangle, the mixing chamber forms the centre-most part of the triangle, and the cooling coil and its surrounding air outlet channels connected to the mixing chamber forms the lower part of the triangle. The triangle is preferably an isosceles triangle having an upper obtuse angle, such that the height of this part will be smaller than its width. The second primary air channel space is suitably delimited by five walls, of which one is horizontal and forms a lower air-impermeable delimiting wall of the mixing chamber, of which two are said partition walls facing towards the mixing chamber, and of which two are said partition walls facing towards the first primary air channel space. The lower delimiting wall will conveniently be removable, so as to facilitate cleaning of the second primary air channel space.

[0009] When comparing inventive cooling baffles with earlier known versions of cooling baffles, it was noted that the sound level generated with the inventive baffles was up to 20% lower than the dBA values generated with the known baffles. However, this can only be seen as an indication to the effect that the inventive baffle generates lower sound levels, since known cooling baffles can generate different sound levels and since the sound levels generated by some older designs may be substantially greater.

[0010] The invention will now be described in more detail with reference to the accompanying drawing, the single Figure of which is a cross-sectional view of a cooling baffle 10 constructed in accordance with a preferred embodiment. The cooling baffle 10 includes a primary air channel having a first space 11 to which primary air 12 is delivered from an external source (not shown). The baffle 10 also includes an outer casing 13, which delimits the primary air channel outwards, and inner walls 14 which delimit the primary air channel against the remainder of the baffle, which comprises a lower part 15 having a lower plate 16 which forms an outer, lower delimiting wall 17 of the lower part 15 and two outlet channel walls 18, and which together with an upper plate 19 also forms an upper delimiting wall of the lower part 15, said plates preferably being removable. The lower part 15 accommodates one or more cooling coils 20 mounted in a coil holder 21 and functioning to cool room air that flows in through openings (not shown) in the lower wall 17. Formed between the outlet channel walls 18 of the lower part 15 and the inner walls 14 bordering on the first space 11 of the primary air channel are outlet channels 22 from a mixing chamber 23 which open out at a level with the lower part of the outer casing 13, which is normally placed on a level with the false ceiling of a room. The mixing chamber 23 is disposed above the lower part 15 and is delimited downwards by the upper plate 19 of the lower part 15, on one side of parts of the inner walls 14 that delimit the space 11, and delimited upwards by a lower air-impermeable delimiting wall 24 of the second space 25 of the primary air channel. The second primary air channel space 25 has a pentahedral/?/ cross-sectional shape and is separated from the first primary air channel space 11 by an air-permeable partition wall 26, normally comprised of perforated sheet metal and, in the illustrated case, bent to form an obtuse angle at its upper ridge-like part 27. The space 25 is also delimited by two obliquely extending partition walls 28 which border on the mixing chamber 23 and define generally a right angle with the partition walls 26 and the inner walls 14 extending parallel with said partition walls. Provided in each partition wall 28 in the longitudinal direction of the device 10 are mutually spaced nozzles 29 through which primary air is blown from the primary air channel into the mixing chamber 23. When the cooling baffle shall be used as a 1-way baffle, the nozzles 29 shown in the higher rows may be blocked or removed and the holes plugged. A screening plate 30, shown in a broken line, may also be fitted in this case.

[0011] When the baffle 10 is in use, the overpressure in the primary air channels 11, 25 will cause primary air 12 to be blown in through the nozzles 29, so as to form a subpressure in the mixing chamber 23. This subpressure contributes towards sucking room air into the baffle (through induction) as illustrated by the upwardly pointing arrows, and up through the cooling coil 20 and into the mixing chamber 23. The primary air blown into the device transports the room air sucked in by induction down through the outlet channels 22 and out along the ceiling of the room, as indicated by arrows. The primary air delivered to and flowing through the first space 11 of the primary air channel flows through the holes in the air-permeable partition wall 26 and moves into the second primary air channel space 25 essentially from above and downwards.

[0012] The reasons for this noticeable effect have not been clearly established, although it is assumed that because the flow pattern from the first primary air channel space 11 is changed with the aid of the air-permeable partition wall 26, such that the primary air will now have kinetic energy that acts essentially in a downward plane, the primary air will flow further through the second primary air space 25 and out through the nozzles 29 with only insignificant eddy currents and therewith low energy losses. The sound generated by these losses will also have a lower level than the sound that would be generated if the air passed through the nozzles 29 directly from the primary air channel 11, where the air has an essentially longitudinal kinetic energy, i.e. in the longitudinal direction of the baffle. Thus, most of the energy available is utilized for induction purposes and less for sound generation.

Claims

1. A ceiling mounted room air cooling device which includes a longitudinal primary air channel (11, 25), a room air cooling coil (20), a mixing chamber (23) for mixing cooled room air and primary air, means (29) for delivering primary air to the mixing chamber (23) through the medium of induction that serves to suck room air into the device and to pass said air through the cooling coil (20) and to the mixing chamber (23), and one or more outlet channels (22) through which a mixture of cooled room air and the delivered primary air exits from the device, **characterised** in that the primary air channel (11, 25) is divided into two spaces by means of a longitudinally extending, air-permeable partition wall (26), wherewith the first space (11), to which primary air is delivered from an external source, is delimited with respect to flow from the second space (25), said second space constituting that part of the primary air channel in which said primary air supply means (29) is arranged in the partition wall or partition walls (28) de-

limiting said mixing chamber (23).

2. A room air cooling device according to Claim 1, **characterised** in that the air-permeable partition wall (26) is comprised of perforated sheet metal.

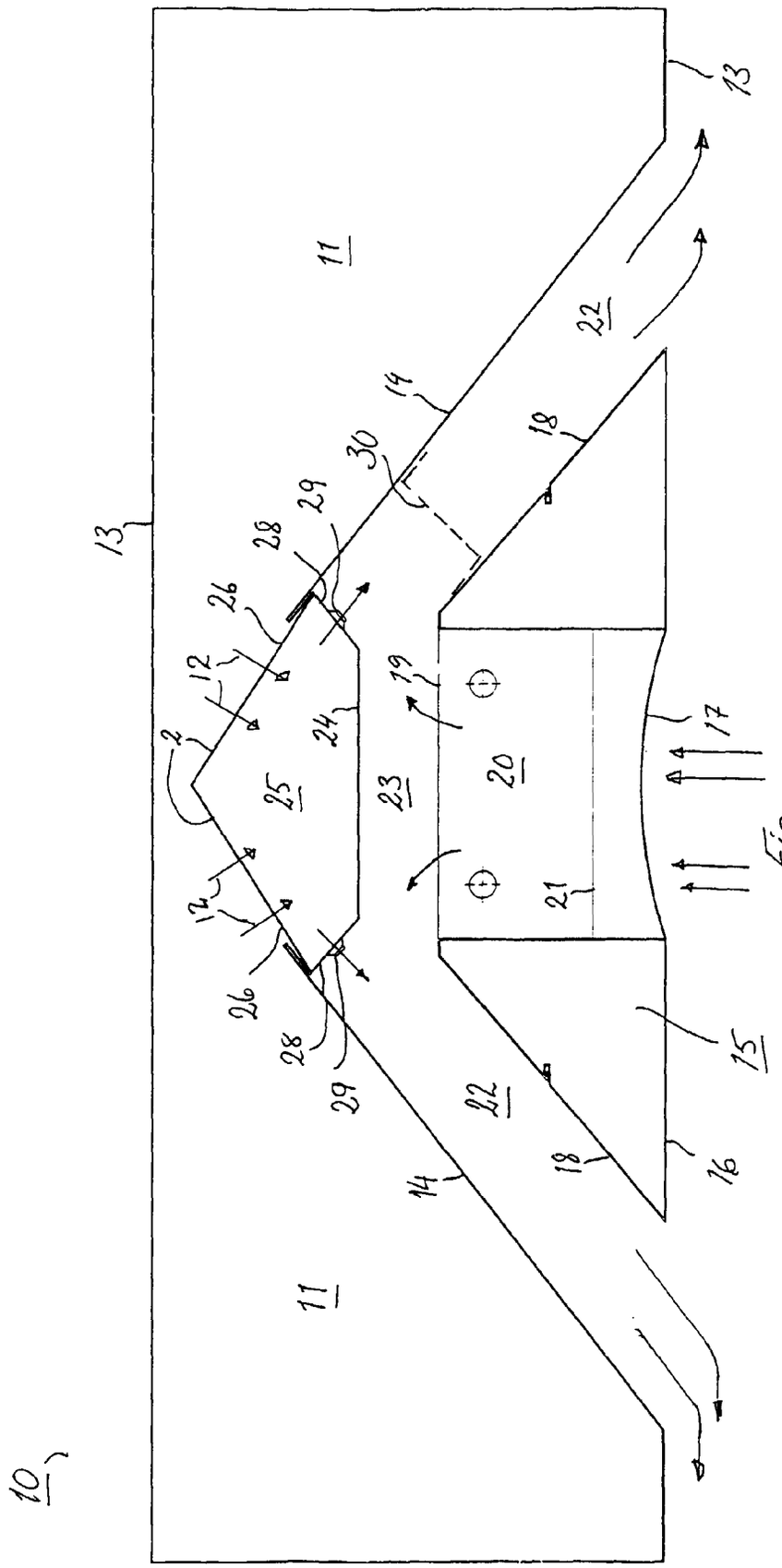
3. A room air cooling device according to any one of Claims 1 or 2, **characterised** in that the partition wall or partition walls (28) between the second space (25) and the mixing chamber (23) is/are disposed generally transversely to the flow direction in the adjacent outlet channel (22).

4. A room air cooling device according to any one of Claims 1-3, **characterised** in that the part (25) of the primary air channel (11, 25) located outside the first space (11) is triangular in shape, wherewith the second space (25) forms the outer part of the triangle, the mixing chamber (23) forms the centre-most part of the triangle, and the cooling coil (20) and its surrounding air outlet channels (22) connected to the mixing chamber (23) constitutes the lower part of said triangle.

5. A room air cooling device according to Claim 4, **characterised** in that the triangular shape is that of an isosceles triangle with an upper obtuse angle.

6. A room air cooling device according to Claims 4-5, **characterised** in that the second space (25) is delimited by five walls, of which one is horizontal and forms a lower air-impermeable delimiting wall (24), two are said partition walls (28) that face towards a mixing chamber (23), and two are comprised of said partition walls (26) that face towards the first space (11).

7. A room air cooling device according to Claim 6, **characterised** in that the lower delimiting wall (17) is removable.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