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(54) **AIR CONDITIONING UNIT**

KLIMAANLAGE

UNITE DE CONDITIONNEMENT DE L'AIR

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Description

Field of the invention

[0001] The present invention concerns an air conditioning unit, in particular an air conditioning unit for use with an elevated floor assembly.

Background of the invention

[0002] Elevated floor assemblies are commonly used in commercial and office buildings, where substantial numbers of cables, pipes and ducts are required and where it is desirable to maintain accessibility to the latter for ease of installation, change or removal. An elevated floor assembly basically consists of floor panels supported above the base floor by pedestals. Cables, pipes or ducts are installed in the under floor plenum, i.e. the chamber formed between the base floor and the elevated floor, and are easily accessible by removing floor panels where needed. The under floor plenum can also be used as part of an air conditioning circuit.

[0003] Generally, an air conditioning unit, placed in a convenient location in a room to be cooled, draws air from the room into the under floor plenum. As the air is drawn through a cooling coil of the air conditioning unit, the air is cooled. The cooled air is then led back from the under floor plenum into the room through a passage placed at another convenient location. However, as the air is drawn through the cooling coil, some of the air condenses and forms water droplets, also referred to as condensate. In order to avoid that the condensate falls into the under floor plenum, a tray is arranged directly underneath the cooling coil for catching the condensate.

[0004] As the air volume through the air conditioning unit is increased, as is the case for modern, precision air conditioning units, the condensate does not drop onto the tray, but tends to be sprayed into the under floor plenum by the drawn air.

Object of the invention

[0005] The object of the present invention is to provide an air conditioning unit that allows drawing high air volumes and wherein the condensate is effectively collected.

Summary of the invention

[0006] This object is achieved by an air conditioning unit according to claim 1. Such an air conditioning unit comprises a cooling coil and a condensate tray arranged under the cooling coil. According to an important aspect of the invention, the condensate tray is in a spaced relationship with respect to the cooling coil, such that a portion of the air flowing through the cooling coil flows between the cooling coil and the condensate tray.

[0007] In state of the art air conditioning units, where

the cooling coil is directly seated on the condensate tray, i.e. where no air can flow between the cooling coil and the condensate tray, condensate is sprayed over the condensate tray into the under floor plenum. The spraying of condensate into the under floor plenum is avoided in the air conditioning unit according to the present invention. By allowing part of the airflow through the cooling coil to pass between the cooling coil and the condensate tray, the airflow will pass over the whole of the condensate tray, and the condensate can be more effectively collected by the condensate tray.

[0008] The performance of an air conditioning unit can thereby significantly be improved. The improved ability to capture the condensate permits a higher flow-through of air for a given size of cooling coil. A standard coil with a certain face area can therefore operate with a higher volume, whereby improved efficiency for the air conditioning unit is achieved.

[0009] Preferably, the cooling coil comprises an upper part and a lower part, wherein an airflow through the lower part of the cooling coil passes between the cooling coil and the condensate tray. Indeed, it has been found that, due to a compounding effect, the air pressure in the lower part of the cooling coil is higher and that it is in particular air flowing through this lower part that sprays condensate into the under floor plenum. The lower part of the cooling coil is also where condensate droplets are conveyed by gravity. The lower part of the cooling coil therefore becomes the most critical area for the sprayed condensate. By redirecting this airflow through the lower part of the cooling coil between the cooling coil and the condensate tray, the condensate of this airflow can effectively be collected, whereas it is not necessary to redirect the airflow through the upper part of the cooling coil.

[0010] Advantageously, downstream of the cooling coil and upstream of the condensate tray, the airflow is substantially parallel to an outlet face of the cooling coil. It follows that the airflow is directed directly onto the condensate tray, so that the condensate tray can effectively collect the condensate.

[0011] The condensate tray preferably comprises an angled portion for redirecting the airflow between the cooling coil and the condensate tray. It thereby ensures that the airflow passes over the whole condensate tray, so that more condensate can be collected by the condensate tray before the airflow reaches the under floor plenum.

[0012] The condensate tray preferably comprises a base floor and side walls, wherein the base floor and side walls form a collecting portion. The condensate collected by the condensate tray can be collected in the collecting portion and evacuated through suitable channels.

[0013] The angled portion is advantageously arranged so as to lead captured condensate into the collecting portion. The condensate captured by the angled portion can thereby be fed into the collecting portion and then evacuated.

[0014] The cooling coil is advantageously a hydrophilic

cooling coil, i.e. a coil having the surfaces of its fins treated to prevent water from spraying. As such coils are designed for high capacity, the limits of the air velocity through the cooling coil can further be increased.

Brief description of the drawings

[0015] The present invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1: is a section view through a state of the art air conditioning unit; and

Figure 2: is a section view through an air conditioning unit according to the invention.

[0016] In the Figures, same reference numbers indicate similar or identical elements.

Detailed description of a preferred embodiment

[0017] Fig.1 shows a state of the art air conditioning unit 10 comprising a fan 12 for drawing air from a first area 14 through a cooling coil 16 into a second area 18. In the case of an air conditioning unit 10 installed in an elevated floor assembly 19, the first area 14 is the room to be cooled, and the second area 18 is the under floor plenum, i.e. the space between the elevated floor and the base floor. Such an air conditioning unit 10 is generally positioned in a convenient location in the elevated floor assembly 19. A ventilation opening (not shown) in the elevated floor assembly, in another convenient location, is used to feed the conditioned air back into the room 14. A condensate tray 20 is arranged directly underneath the cooling coil 16 and serves to collect condensate generated in the cooling coil 16.

[0018] During operation of the fan 12, air is drawn from the room 14 through the cooling coil 16 into the under floor plenum 18. The cooling coil 16 can be divided into an upper part 22 and a lower part 24. The airflow through the upper part 22 of the cooling coil 16 is represented by arrow 26, whereas the airflow through the lower part 24 of the cooling coil 16 is represented by arrow 28.

[0019] As the air passes through the cooling coil 16, condensate is generated in form of water droplets. The water droplets formed in the upper part 22 of the cooling coil 16 drop down onto the condensate tray 20 as the air leaves the cooling coil 16. However, as the air volume is increased, the water droplets are carried further by the drawn air. In fact, the drawn air sprays a large proportion of these droplets past the condensate tray 20 into the plenum area 18. This is particularly true for the water droplets formed in the lower part 24 of the cooling coil 16, as the air pressure within the lower part 24 of the cooling coil 16 is at its highest due to a compounding effect. The air volume is hence limited by the ability of the condensate tray to collect condensate.

[0020] Fig.2 shows an air conditioning unit 30 according to the invention, comprising a fan 12 for drawing air from a first area 14, the room to be cooled, through a cooling coil 16 into a second area 18, the under floor plenum. A condensate tray 32 is arranged underneath the cooling coil 16 and serves to collect condensate from the cooling coil 16. According to the invention, the condensate tray 32 is in a spaced relationship with respect to the cooling coil 16, such that a portion of the airflow through the cooling coil 16 flows between the cooling coil 16 and the condensate tray 32.

[0021] The spaced relationship of the condensate tray 32 with respect to the cooling coil 16 causes a partial diversion of the air flowing through the lower part 24 of the cooling coil 16. The airflow through the lower part 24 of the cooling coil 16, represented by arrow 34, is redirected down along an outlet face 36 of the cooling coil 16, straight onto the condensate tray 32, then over the condensate tray 32, between the latter and the cooling coil 16 and finally into the under floor plenum 18.

[0022] The present invention allows the air drawn through the lower part 24 of the cooling coil 16 to be diverted in such a way that the direction of the air is maintained approximately parallel to the outlet face 36 of the cooling coil 16, instead of being approximately perpendicular to it. The water droplets formed in the lower part 24 of the cooling coil 16 are therefore now carried by the drawn air downwards along the outlet face 36 of the cooling coil 16 directly onto the condensate tray 32. The condensate tray 32 can therefore capture a considerable part of the water droplets before the drawn air arrives in the under floor plenum 18.

[0023] The condensate tray 32 comprises a base floor 38 and side walls 40, 42 forming a collecting portion 44 for collecting the water droplets therein. The water collected in the collecting portion 44 can then be evacuated through appropriate channels (not shown). Side wall 40 is extended upwards with an angled portion 46 for directing the airflow between the cooling coil 16 and the condensate tray 32. The angled portion is also further designed for capturing the droplets and leading the latter into the collecting portion 44.

[0024] The improved ability to capture the condensate permits a higher flow-through of air for a given size of cooling coil. For a standard coil, with a certain face area, the system can operate with a higher volume, thereby achieving improved efficiency.

[0025] When using a hydrophilic coil, i.e. a coil having the surfaces of its fins treated to prevent water from spraying, which already allow higher capacity, the limits of the air velocity through the coil can further be increased.

[0026] It will be understood that the optimal shape and position of the condensate tray will depend on the size, shape and capacity of the cooling coil. It will further be understood that the use of the air conditioning unit according to the invention is not limited to air conditioning units for elevated floor assemblies.

Claims

1. Air conditioning unit (30) comprising a cooling coil (16) and a condensate tray (32) arranged under said cooling coil (16)
characterised in that
said condensate tray (32) is in a spaced relationship with respect to said cooling coil (16), such that a portion of the air flowing through said cooling coil (16) flows between said cooling coil (16) and said condensate tray (32). 5
2. Air conditioning unit according to claim 1, wherein said cooling coil (16) comprises an upper part (22) and a lower part (24), wherein an airflow (34) through said lower part (24) of said cooling coil (16) passes between said cooling coil (16) and said condensate tray (32). 10
3. Air conditioning unit according to claim 2, wherein, downstream of said cooling coil and upstream of said condensate tray (32), said airflow (34) is substantially parallel to an outlet face (36) of said cooling coil (16). 15
4. Air conditioning unit according to claim 2 or 3, wherein said condensate tray comprises an angled portion 46 for redirecting said airflow (34) between said cooling coil (16) and said condensate tray (32). 20
5. Air conditioning unit according to any of claims 2 to 4, wherein said condensate tray (32) comprises a base floor (38) and side walls (40, 42), said base floor (38) and side walls (40, 42) forming a collecting portion (44). 25
6. Air conditioning unit according to claim 5, wherein said angled portion (46) is arranged so as to lead captured condensate into said collecting portion (44). 30
7. Air conditioning unit according to any of claims 1 to 6, wherein said cooling coil (16) is a hydrophilic cooling coil. 35

Patentansprüche

1. Klimaanlage (30), umfassend eine Kühleischlange (16), und eine Kondensatwanne (32), die unter der Kühleischlange (16) angeordnet ist,
dadurch gekennzeichnet, dass
die Kondensatwanne (32) in einer Abstandsbeziehung in Bezug auf die Kühleischlange (16) angeordnet ist, so dass ein Teil der durch die Kühleischlange (16) strömenden Luft zwischen die Kühleischlange (16) 50

und die Kondensatwanne (32) fließt

2. Klimaanlage nach Anspruch 1, wobei die Kühleischlange (16) einen oberen Teil (22) und einen unteren Teil (24) umfasst, wobei ein Luftstrom (34) durch den unteren Teil (24) der Kühleischlange (16) zwischen die Kühleischlange (16) und die Kondensatwanne (32) fließt.
3. Klimaanlage nach Anspruch 2, wobei der Luftstrom (34) in Strömungsrichtung hinter der Kühleischlange und in Strömungsrichtung vor der Kondensatwanne (32) im Wesentlichen parallel zu einer Auslassseite (36) der Kühleischlange (16) ist. 10
4. Klimaanlage nach Anspruch 2 oder 3, wobei die Kondensatwanne einen Winkelabschnitt (46) umfasst, um den Luftstrom (34) zwischen die Kühleischlange (16) und die Kondensatwanne (32) umzulenken. 15
5. Klimaanlage nach irgendeinem der Ansprüche 2 bis 4, wobei die Kondensatwanne (32) einen Grundboden (38) und Seitenwände (40, 42) umfasst, wobei der Grundboden (38) und die Seitenwände (40, 42) einen sammelnden Abschnitt (44) bilden. 20
6. Klimaanlage nach Anspruch 5, wobei der Winkelabschnitt (46) so angeordnet ist, dass er das aufgefangene Kondensat in den sammelnden Abschnitt (44) leitet. 25
7. Klimaanlage nach irgendeinem der Ansprüche 1 bis 6, wobei die Kühleischlange (16) eine Wasser anziehende Kühleischlange ist. 30

Revendications

1. Unité de conditionnement d'air (30) comprenant un serpentin de refroidissement (16) et un plateau de récupération de condensat (32) disposé sous ledit serpentin de refroidissement (16)
caractérisée en ce que
ledit plateau de récupération de condensat (32) est en une relation espacée par rapport audit serpentin de refroidissement (16), de sorte qu'une portion de l'air s'écoulant à travers ledit serpentin de refroidissement (16) s'écoule entre ledit serpentin de refroidissement (16) et ledit plateau de récupération de condensat (32). 35
2. Unité de conditionnement d'air selon la revendication 1, dans laquelle ledit serpentin de refroidissement (16) comprend une partie supérieure (22) et une partie inférieure (24), dans laquelle un écoulement d'air (34) traversant ladite partie inférieure (24) dudit serpentin de refroidissement (16) passe entre ledit serpentin de refroidissement (16) et ledit pla- 40

teau de récupération de condensat (32).

3. Unité de conditionnement d'air selon la revendication 2, dans laquelle, en aval dudit serpentin de refroidissement et en amont dudit plateau de récupération de condensat (32), ledit écoulement d'air (34) est substantiellement parallèle à une face de sortie (36) dudit serpentin de refroidissement (16). 5
4. Unité de conditionnement d'air selon la revendication 2 ou 3, dans laquelle ledit plateau de récupération de condensat comprend une portion inclinée (46) pour rediriger ledit écoulement d'air (34) entre ledit serpentin de refroidissement (16) et ledit plateau de récupération de condensat (32). 10 15
5. Unité de conditionnement d'air selon l'une quelconque des revendications 2 à 4, dans laquelle ledit plateau de récupération de condensat (32) comprend un plancher de base (38) et des parois latérales (40, 42), ledit plancher de base (38) et les parois latérales (40, 42) formant une portion de récupération (44). 20
6. Unité de conditionnement d'air selon la revendication 5, dans laquelle ladite portion inclinée (46) est configurée de façon à acheminer le condensat capturé dans ladite portion de récupération (44). 25
7. Unité de conditionnement d'air selon l'une quelconque des revendications 1 à 6, dans laquelle ledit serpentin de refroidissement (16) est un serpentin de refroidissement hydrophile. 30

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Fig. 1

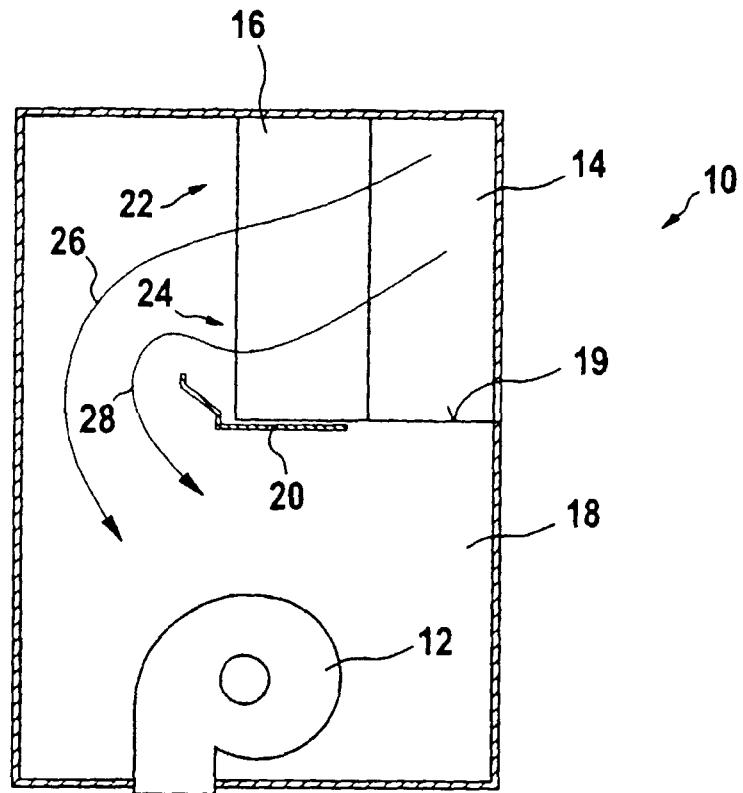


Fig. 2

