

Description

The present invention is directed to split system air conditioning systems, and more particularly, to an outdoor, or outside, section of a split system air conditioning system. In a split air conditioning system, an indoor, or inside, section containing a heat exchanger is located in an environment to be conditioned, and refrigerating conduit connects that indoor section to an outdoor section containing an outside heat exchanger and a compressor. Split systems are particularly advantageous for residential use and are favored over window air conditioning units because the separation of the compressor and the outdoor heat exchanger from the indoor heat exchanger results in a substantially quieter air conditioning unit.

Previous outdoor sections typically require a propeller type fan blowing air through the outdoor section from front to back, or vice versa. This front-to-back arrangement produced a bulky design which lacks aesthetic appeal and which cannot be wall mounted without blocking airflow due to airflow clearance requirements. These minimum clearance requirements are at least two inches (5.09 cm) on the back side of the previous outdoor section with further clearance requirements of at least two inches (5.09 cm) of clearance on one side wall and at least ten inches (25.45 cm) of clearance on the other side wall. Additionally, the prior art units have at least ten inches (25.45 cm) or more of depth in addition to the two inches (5.09 cm) of back clearance.

Additionally, the combination of a compressor and a heat exchange coil within the outdoor section results in the transmission of compressor vibrations and noise into the environment to be cooled by means of the outside heat exchange coil and the conduit connecting that coil to the inside section.

Patent Abstracts of Japan vol. 14 no. 319 (M-0996) 9 July 1990, JP-A-2106636 and Patent Abstracts of Japan vol. 12, no. 269 (M-723) 27 July 1988, JP-A-63 049 647 cited in the International search on this application each show an outside section for a split system air conditioning unit comprising:

a housing including first and second interior segments separated by a baffle, the first segment including an air inlet, an air outlet and a heat exchange coil located therebetween, and

the second segment including a compressor operably connected to the heat exchange coil.

The present invention provides such an outside section characterised in that said air inlet is a three sided recess in which none of the three sides are parallel to any of the other sides of the recess.

Preferably, the housing includes a first side, a second side, a top, a bottom, a front, and a back;

said air inlet being located in a middle portion of the front, and said air outlet being located in the first side.

Also, advantageously, the air inlet and the air outlet each substantially extend from the top to the bottom of the housing.

The outside section may include a top air intake located in the top of the housing.

Preferably the back does not require a minimum clearance between the back and an external surface.

Preferably the housing has a width, a height, and a depth, and the air inlet, the air outlet, and the heat exchange coil are aligned with and are substantially coextensive with the height of the housing.

The ratio of the width to the depth may be greater than 2.20 and preferably approximately 2.8.

The outside section may further include a tangential blower extending the length of the heat exchange coil and located between the air outlet and the heat exchange coil.

The ratio of the width to the depth of the housing is preferably less than 1.25 times the ratio of the depth of the housing to a diameter of the blower.

Preferably, the housing has a planar front side, the heat exchange coil is flat, and the heat exchange coil is at a diagonal angle with respect to the planar front side.

Two of the three sides of the recess may be perpendicular, allow airflow and include louvers.

The baffle may form an acoustical barrier between the first and second segments.

The outside section may include a second baffle located adjacent the heat exchange coil to preclude airflow between the inlet and the outlet other than through the heat exchange coil.

The outside section may further include an airflow path through the housing including the air inlet, the air outlet and the heat exchange coil wherein the airflow path enters the air inlet at approximately right angles to the airflow path at the air outlet.

In order that the invention may be well understood an embodiment thereof, which is given by way of example only, will now be described with reference to the accompanying drawings, in which:

Figure 1 shows the arrangement of a split system air conditioning unit.

Figure 2 shows a perspective view of an outside section of the split system air conditioning unit of Figure

Figure 3 shows an exploded view of the outside unit of Figure 2.

Figure 4 shows a top view of the arrangement of the outside section of Figure 2.

Figure 1 shows the general arrangement of a split system air conditioning unit 10 including an inside section

12 having an inside heat exchange coil (not shown), and a thermostat 14 for controlling the operation of the split system unit 10. The split system unit 10 also includes an outside section 16 connected to the inside section 12 by refrigerant conduit 18. The outside section 16 is suitable for mounting on an exterior wall 20 because there are no air inlets or outlets on a back 22 of the outside section 16 which can be blocked by the wall 20. Thus the back 22 does not require a minimum clearance between the back 22 and an external surface. Additionally, the low profile and ergonomic design of the outside section 16 make the outside section 16 suitable for installation on an outside living space such as a balcony 24. The outside section 16 includes an air inlet 26 located in a middle portion 27 of the front 28 of the outside section 16, and an air outlet 30 located on a first side 32 of the outside section 16. Since the air inlet 26 is at approximately right angles to the air outlet 30, the outside section 16 can be mounted with both the back 22 of the outside section 16 and a second side 36 of the outside section 16 flush in a corner of an exterior wall 20.

Referring now to Figure 2, the outside section 16 has a housing 17 which includes the back 22, the front 28, and the first side 32 and also includes a bottom 42, a top 34, and the second side 36. The front 28 is divided by the air inlet 26 into a first portion 38 and a second portion 40. The air inlet 26 itself is a recess 35 substantially extending from the top 34 of the outside section 16 to the bottom 42 of the outside section 16. The recess 35 has three sides 44, 46, 48, none of which are parallel to each other. The sides 44 and 46 are adjacent and at right angles to each other. The sides 44 and 46 of the recess 35 allow airflow into the outside section 16 and include louvers 50 and 52 respectively, while the side 48 does not allow airflow but acts as an air director so as to funnel air to the sides 44, 46. The first portion 38 of the front 28 may extend over an end 45 of the side 44 so as to protect the air inlet 26. Additionally, the first side 32 includes a tiered louver 58 over the air outlet 30 substantially extending from the top 34 to the bottom 42 of the outside section 16. Optionally, the top 34 may include a top air intake 54 including louvers 56. The second side 36, the back 22, and the bottom 42 do not include airflow apertures.

Referring to Figures 3 and 4, Figure 3 shows an exploded view of the outdoor section 16. An acoustical baffle 60 divides the interior of the outdoor section 16 into a heat exchange segment 62 and a compressor segment 64. The first portion 38 covers the heat exchange segment 62. The compressor segment 64 is covered by the second portion 40 and contains a compressor 66 which in a cooling mode of operation compresses hot vapor from the indoor section 12 for cooling by a flat heat exchange coil 68, and in a heating mode of operation compresses hot vapor from the outdoor heat exchange coil 68 for cooling by the indoor section 12. The heat exchange coil 68 itself is contained in the heat exchange segment 62 and is arranged on a diagonal path 70 in such a manner that all airflow between the air inlet 26 and the air outlet 30 must pass over the heat exchange coil 68. The heat exchange coil 68, the air inlet 26, and the air outlet 30 are substantially coextensive with a height H of the housing 17. A baffle 72 is provided between an end 74 of the heat exchange coil 68 and the first portion 38 of the front panel 28 so that airflow cannot bypass the heat exchange coil 68. A vertical tangential blower 76 having a height 78 (preferably 15.75 inches or 400 mm) which is approximately the same height as the height 80 of the heat exchange coil 68 is provided between the heat exchange coil 68 and the outlet 30. The blower 76 maintains airflow on an air path through the air inlet 26, over the heat exchange coil 68, through the blower 76, and out the air outlet 30. Although the blower 76 is shown in the preferred embodiment between the air outlet 30 and heat exchange coil 68, the blower 76 can also be located between the air inlet 26 and the heat exchange coil 68. If the optional top air intake 54 is provided, the top air intake 54 opens into the heat exchange segment 62 on the opposite side of the heat exchange coil 68 from the air outlet 30.

Figure 4 shows a top view of the arrangement of the outdoor section 16. Figure 4 shows how the baffle 60 isolates the compressor 66 within the compressor segment 64 from the heat exchange coil 68 in the heat exchange segment 62. This baffle 60 acts as an acoustical isolator preventing compressor noise and vibration from reaching the heat exchange coil 68 and being carried into the environment to be cooled by means of the refrigerant conduits 18. The acoustical baffle 60 also closes the compressor segment 64 to airflow. All airflow in the outside section 16 is through the heat exchange segment 62. A double headed arrow 82 shows how airflow enters the air inlet 26 through the sides 44 and 46. The baffles 60 and 62 ensure that this airflow 82 must pass through the heat exchange coil 68 and the fan 76 before being directed out the air outlet 30.

In applicant's preferred embodiment the housing 17 has a height H of 23.7 inches (602 mm) or 33.86 inches (860 mm) depending on capacity, a depth D of 11.3 inches (287 mm), and a width W of 31.89 inches (810 mm) thus providing a width to depth ratio of 2.82 in the preferred embodiment. Previous outside sections have required heights, widths, depths and minimum clearances as shown by Examples 1-4 in Table 1.

TABLE 1 (IN MILLIMETERS)

		<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Width/Depth (No Clearance)</u>	<u>Minimum Clearance</u>	<u>Width/Depth With Clearance</u>
5							
10	Embodiment	602/860	810	287	2.82	0	2.82
	Example 1	461	742	337	2.20	50.8	1.91
	Example 2	622	464	464	1.00	50.8	.90
15	Example 3	461	742	337	2.20	50.8	1.91
	Example 4	642	582	582	1.00	50.8	.92

20 Additionally, the ratio of the width-to-depth of the housing 17 of the embodiment is less than 1.25 times the ratio of the depth D of the housing 17 to the diameter 84 (4.92 inches (125 mm)) of the tangential blower 76.

What has been described is the outdoor section of a split system air conditioning unit which can be wall mounted and which has a lower depth profile, and width to depth ratio than previous outside sections.

25 It should be recognized that modifications and alterations of the embodiment as described herein within the scope of the claims are contemplated, including a side inlet/side discharge arrangement should compressor noise be ignored.

30 Claims

1. An outside section (16) for a split system air conditioning unit comprising:
 - a housing (17) including first and second interior segments (62, 64) separated by a baffle (60), the first segment including an air inlet (26), an air outlet (30) and a heat exchange coil (68) located there-
35 between, and
 - the second segment (64) including a compressor (66) operably connected to the heat exchange coil (68) characterised in that said air inlet (26) is a three sided recess (35) in which none of the three sides (44, 46, 48) are parallel to any of the other sides of the recess (35).
- 40 2. An outside section as claimed in claim 1, wherein said housing (17) includes a first side (32), a second side (36), a top (34), a bottom (42), a front (28), and a back (22);
said air inlet (26) being located in a middle portion (27) of the front (28), and said air outlet (30) being located in the first side (32).
- 45 3. An outside section as claimed in claim 2, wherein the air inlet (26) and the air outlet (30) each substantially extend from the top (34) to the bottom (42) of the housing (17).
4. An outside section as claimed in claim 2 or 3, further including a top air intake (54) located in the top (34) of the housing (17).
- 50 5. An outside section as claimed in claim 2, 3 or 4, wherein the back (22) does not require a minimum clearance between the back (22) and an external surface (20).
- 55 6. An outside section as claimed in any one of claims 2 to 5, wherein the housing (17) has a width (W), a height (H), and a depth (D), and wherein the air inlet (26), the air outlet (30), and the heat exchange coil (68) are aligned with and are substantially coextensive with the height (H) of the housing (17).
7. An outside section as claimed in claim 6, wherein the ratio of the width to the depth of the housing is great-

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		<u>Height</u>	<u>Width</u>	<u>Depth</u>	<u>Width/Depth (No Clearance)</u>	<u>Minimum Clearance</u>	<u>Width/Depth With Clearance</u>
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the second segment (64) including a compressor (66) operably connected to the heat exchange coil (68) characterised in that said air inlet (26) is a three sided recess (35) in which none of the three sides (44, 46, 48) are parallel to any of the other sides of the recess (35).

40 2. An outside section as claimed in claim 1, wherein said housing (17) includes a first side (32), a second side (36), a top (34), a bottom (42), a front (28), and a back (22);

said air inlet (26) being located in a middle portion (27) of the front (28), and said air outlet (30) being located in the first side (32).

45 3. An outside section as claimed in claim 2, wherein the air inlet (26) and the air outlet (30) each substantially extend from the top (34) to the bottom (42) of the housing (17).

4. An outside section as claimed in claim 2 or 3, further including a top air intake (54) located in the top (34) of the housing (17).

50 5. An outside section as claimed in claim 2, 3 or 4, wherein the back (22) does not require a minimum clearance between the back (22) and an external surface (20).

55 6. An outside section as claimed in any one of claims 2 to 5, wherein the housing (17) has a width (W), a height (H), and a depth (D), and wherein the air inlet (26), the air outlet (30), and the heat exchange coil (68) are aligned with and are substantially coextensive with the height (H) of the housing (17).

7. An outside section as claimed in claim 6, wherein the ratio of the width to the depth of the housing is great-



er than 2.20.

8. An outside section as claimed in claim 7, wherein the ratio of the width (W) to the depth (D) is approximately 2.8.
9. An outside section as claimed in any one of claims 1 to 8, further including a tangential blower (76) extending the length of the heat exchange coil (68) and located between the air outlet (30) and the heat exchange coil (68).
10. An outside section as claimed in claim 9 when appended to claim 6, 7 or 8, wherein the ratio of the width (W) to the depth (D) is less than 1.25 times the ratio of the depth (D) of the housing (17) to a diameter of the blower (76).
11. An outside section as claimed in any one of claims 1 to 10, wherein the housing (17) has a planar front side (32), the heat exchange coil (68) is flat, and the heat exchange coil (68) is at a diagonal angle (70) with respect to the planar front side (32).
12. An outside section as claimed in any one of claims 1 to 11, wherein two of said three sides (44, 46, 48) of said recess (35) are perpendicular, adjacent, allow airflow, and include louvers (50, 52).
13. An outside section as claimed in any one of claims 1 to 12, wherein the baffle (60) forms an acoustical barrier between the first and second segments (62, 64).
14. An outside section as claimed in any one of claims 1 to 13, further including a second baffle (72) located adjacent the heat exchange coil (68) to preclude airflow between the inlet (26) and the outlet (30) other than through the heat exchange coil (68).

Patentansprüche

1. Außenseitiges Teilgehäuse (16) für ein geteiltes Klimagerät mit einem Gehäuse (17) mit ersten und zweiten inneren Abschnitten (62, 64), die durch eine Trennwand (60) getrennt sind, wobei der erste Abschnitt einen Lufteinlaß (26), einen Luftauslaß (30) und eine dazwischen angeordnete Wärmetauscher-Schlange (68) hat, und der zweite Abschnitt (64) einen Verdichter (66) hat, der in Wirkverbindung steht mit dem Wärmetauscher (68) dadurch gekennzeichnet, daß der Lufteinlaß (26) eine dreiseitige Ausnehmung (35) ist, in der keine der drei Seiten (44, 46, 68) parallel zu irgendeiner der anderen Seiten der Ausnehmung (35) ist.
2. Außenseitiges Teilgehäuse gemäß Patentanspruch 1, wobei das Gehäuse (17) eine erste Seitenfläche (32), eine zweite Seitenfläche (36), eine Deckfläche (34), eine Bodenfläche (42), eine Frontfläche (28) und eine Rückfläche (22) hat, wobei der Lufteinlaß (26) in einem Mittelabschnitt der Frontfläche (28) und der Luftauslaß (30) in der ersten Seitenfläche (32) ausgebildet sind.
3. Außenseitiges Teilgehäuse gemäß Patentanspruch 2, wobei der Lufteinlaß (26) und der Luftauslaß (30) sich im wesentlichen von der Deckfläche (34) zur Bodenfläche (42) des Gehäuses (17) erstrecken.
4. Außenseitiges Teilgehäuse nach Patentanspruch 2 oder 3, dadurch gekennzeichnet, daß es weiterhin enthält einen oberen Lufteinlaß (54), der an der Deckfläche (34) des Gehäuses (17) angeordnet ist.
5. Außenseitiges Teilgehäuse nach einem der Patentansprüche 2, 3 oder 4, wobei die Rückfläche (22) keinen Minimalabstand zwischen der Rückfläche (22) und einer Außenwandung (20) benötigt.
6. Außenseitiges Teilgehäuse nach einem der Patentansprüche 2 bis 5, wobei das Gehäuse (17) eine Breite (W), eine Höhe (H) und eine Tiefe (D) hat und wobei der Lufteinlaß (26), der Luftauslaß (30) und der Wärmetauscher (68) mit Bezug zur Höhe und im wesentlichen über die Erstreckung der Höhe (H) des Gehäuses (17) angeordnet sind.



7. Außenseitiges Teilgehäuse nach Patentanspruch 6, wobei das Verhältnis der Breite zur Tiefe des Gehäuses größer als 2.20.
- 5 8. Außenseitiges Teilgehäuse nach Patentanspruch 7, wobei das Verhältnis der Breite (B) zur Tiefe (D) etwa 2.8 ist.
9. Außenseitiges Teilgehäuse nach einem der Patentansprüche 1 bis 8, weiterhin umfassend ein Tangentialgebläse (76) das sich entlang der Länge des Wärmetauschers (68) erstreckt und das zwischen dem Luftauslaß (30) und dem Wärmetauscher (68) angeordnet ist.
- 10 10. Außenseitiges Teilgehäuse nach Patentanspruch 9 und in Abhängigkeit von den Patentansprüchen 6, 7 oder 8, wobei das Verhältnis der Breite (W) zur Tiefe (D) kleiner als das 1,25-fache des Verhältnisses der Tiefe (D) des Gehäuses (17) zum Durchmesser des Gebläses (76).
- 15 11. Außenseitiges Teilgehäuse gemäß einem der Patentansprüche 1 bis 10, wobei das Gehäuse (17) eine plane Frontfläche (32) hat, der Wärmetauscher (68) flach ausgeführt ist und der Wärmetauscher (68) in einem diagonalen Winkel (70) mit Bezug zur planen Frontfläche (32) angeordnet ist.
- 20 12. Außenseitiges Teilgehäuse gemäß einem der Patentansprüche 1 bis 11, wobei zwei der drei Seiten der Ausnehmung (35) im rechten Winkel zueinander stehen, benachbart zueinander sind, eine Luftströmung erlauben und Luftschlitze (50, 52) enthalten.
- 25 13. Außenseitiges Teilgehäuse nach einem der Patentansprüche 1 bis 12, wobei die Leitwand (60) eine akustische Barriere zwischen den ersten und zweiten Abschnitten (62, 64) bildet.
- 30 14. Außenseitiges Teilgehäuse gemäß einem der Patentansprüche 1 bis 13, weiterhin beinhaltend eine zweite Leitwand (72), die benachbart zum Wärmetauscher (68) angeordnet ist, um andere Luftströmungen zwischen dem Einlaß (26) und dem Auslaß (30) auszuschließen als diejenigen durch den Wärmetauscher (68).

Revendications

- 35 1. Section extérieure (16) pour une unité de conditionnement d'air de type fractionné, comprenant :
un logement (17) comprenant des premier et second segments intérieurs (62, 64) séparés par une chicane (60), le premier segment comprenant une entrée d'air (26), une sortie d'air (30) et un serpentin d'échange de chaleur (68) situé entre les deux ; et
le second segment (64) comprenant un compresseur (66) connecté en fonctionnement au serpentin d'échange de chaleur (68), caractérisé en ce que ladite entrée d'air (26) est un évidement à trois côtés (35) dans lequel aucun des trois côtés (44, 46, 48) n'est parallèle à l'un quelconque des autres côtés de l'évidement (35).
- 40 2. Section extérieure selon la revendication 1, dans laquelle ledit logement (17) comprend un premier côté (32), un second côté (36), une partie supérieure (34), une partie inférieure (42), une partie avant (28) et une partie arrière (22) ;
ladite entrée d'air (26) étant située dans une partie intermédiaire (27) de la partie avant (28), et ladite sortie d'air (30) étant située dans le premier côté (32).
- 50 3. Section extérieure selon la revendication 2, dans laquelle l'entrée d'air (26) et la sortie d'air (30) s'étendent chacune sensiblement de la partie supérieure (34) à la partie inférieure (42) du logement (17).
4. Section extérieure selon la revendication 2 ou 3, comprenant en outre une prise d'air supérieure (54) située à la partie supérieure (34) du logement (17).
- 55 5. Section extérieure selon la revendication 2, 3 ou 4, dans laquelle la partie arrière (22) ne nécessite pas un espacement minimum entre la partie arrière (22) et une surface externe (20).
6. Section extérieure selon l'une quelconque des revendications 2 à 5, dans laquelle le logement (17) a une



largeur (W), une hauteur (H) et une profondeur (D), et dans laquelle l'entrée d'air (26), la sortie d'air (30) et le serpentin d'échange de chaleur (68) sont alignés et sensiblement coextensifs avec la hauteur (H) du logement (17).

- 5 7. Section extérieure selon la revendication 6, dans laquelle le rapport de la largeur à la profondeur du logement est supérieur à 2,20.
8. Section extérieure selon la revendication 7, dans laquelle le rapport de la largeur (W) à la profondeur (D) est approximativement de 2,8.
- 10 9. Section extérieure selon l'une quelconque des revendications 1 à 8, comprenant en outre une soufflante tangentielle (76) prolongeant la longueur du serpentin d'échange de chaleur (68) et située entre la sortie d'air (30) et le serpentin d'échange de chaleur (68).
- 15 10. Section extérieure selon la revendication 9, lorsqu'elle est dépendante de la revendication 6, 7 ou 8, dans laquelle le rapport de la largeur (W) à la profondeur (D) est inférieur à 1,25 fois le rapport de la profondeur (D) du logement (17) à un diamètre de la soufflante (76).
- 20 11. Section extérieure selon l'une quelconque des revendications 1 à 10, dans laquelle le logement (17) possède un côté avant plan (32), le serpentin d'échange de chaleur (68) est plat et le serpentin d'échange de chaleur (68) forme un angle de diagonale (70) avec le côté avant plan (32).
- 25 12. Section extérieure selon l'une quelconque des revendications 1 à 11, dans laquelle deux des trois côtés (44, 46, 48) dudit évidement (35) sont perpendiculaires, adjacents, permettent la circulation d'air et comprennent des volets d'aération (50, 52).
13. Section extérieure selon l'une quelconque des revendications 1 à 12, dans laquelle la chicane (60) forme une barrière acoustique entre les premier et second segments (62, 64).
- 30 14. Section extérieure selon l'une quelconque des revendications 1 à 13, comprenant en outre une seconde chicane (72) située de façon adjacente au serpentin d'échange de chaleur (68) pour empêcher une circulation d'air entre l'entrée (26) et la sortie (30) qui ne s'effectuerait pas à travers le serpentin d'échange de chaleur (68).

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