ADJUSTABLE PORTABLE A/C SYSTEM

Inventor: Antonio Vazquez, San Juan, PR (US)

Correspondence Address:
ROBERTO J. RIOS
P.O. BOX 70012 - PMB 96
FAJARDO, PR 00738 (US)

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ABSTRACT
An apparatus is provided to condition the air of a selected area. A portable A/C system encloses a reduced space area and condition the air within the enclosed reduced space area. An adjustable mechanism is also provided to selectively readjust the size of the portable A/C system to enclose a plurality of areas having different sizes of width and length.
ADJUSTABLE PORTABLE A/C SYSTEM

TECHNICAL FIELD

[0001] The present invention relates to air conditioning systems. More specifically, the present invention relates to a system for conditioning the air inside a desired confined space.

BACKGROUND OF THE INVENTION

[0002] Air conditioning (A/C) systems are well known and widely used for “conditioning” the breathable air inside closed structures such as: buildings, offices, and dwellings among others. More specifically, there exist A/C units that can be mounted in different parts of the closed structure such as: a window, a wall or a roof to cool one or more rooms inside said structure. “Conditioned” air may include cooled air, warmed air, dehumidified air or any other method by which the quality and/or properties of the air are selectively modified.

[0003] A/C systems could be broadly classified into two categories: (1) fixed systems and (2) portable systems.

[0004] Fixed systems are those that are permanently fixed to the structure and cannot be easily removed or replaced. A central A/C system is one common example of a fixed unit that could “condition” the air of an entire building or dwelling. However, there are several disadvantages involved in using a central A/C unit. Central A/C systems comprise expensive equipment that requires a high initial cost and a costly periodic maintenance program for the consumer. In addition, central A/C systems are designed to provide “conditioned” air to an entire structure usually by means of an air duct system. Thus, a high capacity system that consumes high levels of energy is required to “condition” the air inside the entire structure.

[0005] Portable systems are those that may not be permanently fixed to the structure or can be easily removed or replaced. Wall/window mounted units (i.e., mini-split-units) are common examples of portable units that “condition” the air of a reduced area such as: a room or an office. Using this approach to provide “conditioned” air is less expensive than using a central A/C system since there is less expensive equipment involved.

[0006] Portable units “condition” the air inside limited areas of a structure, but there exists several situations in life where only certain areas of a structure need to be conditioned. For example, in a bedroom, cooling may not be required for the complete bedroom; in fact, it may be required only around the bed. Nevertheless, even in these situations, current air-conditioning systems (fixed or portable) would end up conditioning the complete bedroom, and hence require high equipment and energy costs.

[0007] There have been several prior attempts to provide a localized or reduced area A/C system.

[0008] U.S. Pat. Nos. 6,755,036; 6,425,255; and 4,602,486 describe a method and an apparatus for providing a localized or reduced area A/C system. All the above patents basically comprise of an enclosing means for thermally insulating and enclosing a desired area (i.e. a bed); and an A/C system for condition the air inside said enclosed area. The above mentioned systems reduce significantly the energy consumption since the amount of air to be conditioned is restricted by the enclosing means. The ‘036 and ‘486 patents describe enclosing means comprising a fixed frame that either closely surrounds the bed or is structurally fixed to the bed limiting the desirability of adjusting said frame to different bed or desired areas sizes. The ‘255 patent enclosing means comprises a “V” shaped telescopic poles arrangement, wherein a draping material is positioned over said arrangement to create an enclosed area. However, said arrangement is only suitable for sleeping purposes and does not provide an adjustability feature for other desired purposes.

[0009] Hence, there exists a need for a portable A/C system that can be selectively readjusted to enclose a plurality of desired area dimensions.

SUMMARY OF THE INVENTION

[0010] It is a general object of the invention to provide an A/C system for “conditioning” the air inside a structure.

[0011] It is an object of the invention to provide a reduced space conditioning system that allows for controlled conditioning of air within an enclosed area.

[0012] Yet another object of the invention is to provide a reduced energy consumption A/C system for conditioning the air inside limited areas at low initial equipment cost.

[0013] In the preferred embodiment, the invention is directed to a reduced area conditioning system that selectively conditions the air within a given structure. The reduced area conditioning system comprises of an air conditioning unit connected to a reduced space inside a structure. The conditioning unit supplies conditioned air to the reduced space area in order to selectively modify or adjust the quality and properties of the air inside said reduced space area. The reduced space area is surrounded and covered by a layer or layers of thermal insulation material. This thermal insulation material reduces heat losses as well as leakage of conditioned air from the reduced space area.

[0014] Another advantage of the present invention is that only a smaller volume needs to be conditioned in comparison to the volume of the entire structure. Hence, only a reduced “livable” area is actually conditioned as opposed to conditioning regions or areas in the room or building that are not normally occupied by people.

[0015] Another advantage of the invention is that it provides a compact and portable A/C system as compared to split or window A/C systems.

[0016] Another advantage of the invention is that optimizes the efficiency of the A/C system since there is no direct sunlight in contact with the enclosed area frame or walls.

[0017] Yet another advantage of the invention lies in the ease of installation, portability and adjustability of the A/C system. The system comprises adjustable means that allows the system to be selectively readjusted to surround a plurality of articles of furniture having different sizes. Thus, only one portable system needs to be acquired to selectively enclose different areas.

[0018] Another advantage of the present invention lies in the easy of air filtration, purification and control within the reduced space area.
In the preferred embodiment, the adjustable portable A/C system is adapted for conditioning the air within a desired reduced space area surrounding a region of an article of furniture to be occupied by at least one person.

Another advantage of the present invention is that the A/C system is a separate and independent apparatus not attached to the article of furniture. Hence, the portable A/C system of the present invention can be selectively positioned around different articles of furniture.

Another advantage of the present invention is that an A/C unit is positioned on top of the enclosed area at the ceiling level to ensure efficient distribution of air within the reduced space area. Thus, in the preferred embodiment the A/C unit and the surrounding frame are integrated into a single unit.

Yet another advantage of the invention lies in the use of a heat reflective material to reduce the air conditioning demand and to lower energy costs.

Another advantage of the present invention is that it provides uninterrupted power to the A/C system to ensure continuous air conditioning within the reduced space area even if there is a power outage in the structure.

Other objectives and advantages of this invention will become apparent from the following detailed description taken in conjunction with the accompanying illustrations.

**BRIEF DESCRIPTION OF THE DRAWINGS**

The preferred embodiments of the invention will hereinafter be described in conjunction with the included drawings provided to illustrate and not to limit the invention, wherein like designations denote like elements, and in which:

**FIG. 1** is a perspective view of the preferred embodiment used for conditioning the air surrounding an enclosed bed.

**FIG. 2A** is a top view of the preferred embodiment in an extended position.

**FIG. 2B** is a detailed view of the preferred embodiment of the adjusting means in an extended position.

**FIG. 3A** is a top view of the preferred embodiment in a retracted position.

**FIG. 3B** is a detailed view of the preferred embodiment of the adjusting means in a retracted position.

**DETAILED DESCRIPTION OF THE INVENTION**

This specification and the included drawings disclose several preferred embodiments as examples of the invention. The invention is not intended to be limited to the embodiments illustrated. Numerous modifications, changes, variations, substitutions and equivalents will be apparent to those skilled in the art without departing from the spirit and scope of the present invention as described in the claims.

For facilitating understanding of the present invention, terms such as opened, closed, extended and retracted are interchangeably used throughout the entire specification to indicate the status of the inventive apparatus. It will be understood, that the apparatus of this invention may be manufactured, stored, transported, and sold in a plurality of orientations, size, materials, etc. . . . other than the described in the preferred embodiments. The shapes and sizes of the components herein described are not essential to the invention unless otherwise indicated.

Some of the figures illustrating the apparatus of this invention show conventional structural details and conventional mechanical elements that will be recognized by one skilled in the art. However, detailed descriptions of such elements are not necessary to an understanding of the invention, and accordingly, are not herein presented.

**FIG. 1** illustrates the preferred embodiment of the present invention for sleeping purposes surrounding a reduced space area around an article of furniture such as a bed 2. The apparatus 1 of the present invention comprises an A/C unit 14 and an adjustable portable frame 3 surrounding bed 2. The reduced space area is defined by the width and length of the frame surrounding bed 2. Portable adjustable frame 3 comprises a top portion 4, and legs 10. In the preferred embodiment, top portion 4 includes a removable cover comprising of at least part of the outer ceiling portion that allows ease of repair and maintenance of at least the A/C unit 14. The removable cover could be selectively configured to have different dimension according at least in part to the dimension of said top portion. Moreover, the removable cover could be constructed as a pre-selected single-size piece, wherein the size is selected according at least in part to the dimension of said frame (i.e., queen, king, twin). Alternatively, the removable cover could be constructed as a plurality of removably interconnected pieces, wherein the quantity and dimensions of said plurality of removably interconnected pieces is selected according at least in part to the dimensions of said frame (i.e., queen, king, twin). Thermal insulation material 15 is selectively attached to the top portion 4 of portable frame 3 to completely surround the reduced space area formed around bed 2 as shown in **FIG. 1**. In the preferred embodiment, the apparatus 1 is selectively adjusted by an adjusting means arrangement comprising adjustable beams 11, hollow beams 12, pins 17 and holes 18 located at side panels 9 of the top portion 4. A person of ordinary skilled in the art will understand that said adjusting means is provided at each corner of the frame. This two-hole locking arrangement is well known in the art and thus, is not going to be explained in details, unless required to further understand the invention as shown in FIGS. 2B and 3B.

A/C unit 14 is a small energy consumption unit design to “condition” the air within the reduced space area. Conditioned air may include cooled air, heated air, dehumidified air, or any other type of air that has had its quality and properties modified or adjusted as desired by a person. A/C unit 14 may “condition” the air inside the reduced space area using recirculated air from the enclosed area or air from outside the enclosed area. The temperature, humidity and other properties of air can be selectively controlled and maintained by a control unit that receives inputs from a person through a user interface. The user interface is implemented by way of switch means, touch means, wired means, wireless means or any other equivalent input means well known in the art. A/C unit 14 is a lightweight unit designed as a low wattage consumption unit as compared to wall or split units, since only a reduced surface area needs to be “conditioned” and not the entire room or office surface area. As used herein, the term “low wattage consumption unit” means a unit that requires less power to operate than a traditional A/C unit cooling the air of an entire area such
as but not limited to: a room, a building floor. In a preferred embodiment said A/C unit 14 requires less than or equal to 5 kW and more preferably, less than or equal to 2 kW. The “conditioned air” can be supplied directly from the A/C unit 14 or alternatively through a vent system providing plural air outlets throughout the entire interior ceiling structure. In the preferred embodiment, the A/C unit 14 can be powered using a common single-phase residential power outlet (120/ 240V). However, other kind of power means may be alternatively used to power the unit 14. Furthermore, power backup means can be provided to ensure continuous operation of the A/C system, even if the main power means fails. Backup means can be selected from the group comprising of batteries, capacitors, generators or any other equivalent backup means that are well known in the art. The details of the A/C unit 14 have been omitted from the description and the drawings since they are not necessary to an understanding of the invention and a person skill in the art would understand that any A/C unit can be used as long as it provides the above mentioned benefits and features.

[0036] Thermal insulating material 15 may be fabricated from a lightweight flexible material. In the preferred embodiment, the flexible material can be made of a thermoplastic material. However, other materials having good thermal and insulating properties are also envisioned as part of the invention. Insulating material 15 can be in the form of a sheet or a plurality of individual sheets surrounding the reduced space enclosed area as shown in the preferred embodiment of FIG. 1. Some or all portions of the sheets may be partially or totally colored or transparent as desired. Individual sheets may also be fastened together by any well known permanent or removable fastening means. In the preferred embodiment, the sheets are implemented in the form of adjustable hinging curtains 15 that surround the entire reduced space area on its four sides. Hinging curtains 15 may comprise of a single piece or alternatively of a plurality of selectively attached pieces that are selectively repositioned to the enclosed area of the reduced space area as selectively changed by a person. The plurality of pieces can be fastened or attached together and to the frame 3 by any well known permanent or removable fastening and/or attaching means.

[0037] Portable adjustable frame 3 may be constructed from a lightweight rigid material. In the preferred embodiment, frame 3 can be made of a lightweight thermally insulating material to increase the efficiency of the system. In addition, frame 3 can be coated with a heat reflective material to reduce the heat reflections on the apparatus and thus, reducing the air conditioning demand and lowering the energy costs.

[0038] FIG. 2A illustrates a top view of the apparatus 1, without the removable cover located on the outer ceiling portion 4. A/C unit 14 is removable attached and positioned inside a lightweight reinforced solid frame 13 to ensure proper support of the unit. Any well known fastening and/or attaching means may be used to attach the unit 14 to the solid frame 13. Reinforced support hollow beams 12 are structurally attached to the solid frame 13. Additionally, any reinforcing means may be desired for joining the ends of the hollow beams 12 between the solid frame 13 and the side panels 9 of top portion 4. Reinforced support hollow beams 12 are made from a lightweight rigid material.

[0039] FIGS. 2A and 2B show adjustable beams 11 being in an extended or opened state as indicated by the outwardly arrows. As can be seen from the FIG. 2A, the reduced space area is selectively increased by diagonally pulling the four adjustable beams 11 out of the hollow beams 12 to increase the width and length of the apparatus 1. In the preferred embodiment, adjustable beams 11 comprise openings or holes 16 that cooperate with holes 18 of the side panels 9 and a pin 17 to selectively secure the adjustable beams 11 to the hollow beams 12 and the side panels 9. Thus, the reduced space area is increased. A plurality of holes 16 are provided in the preferred embodiment to allow for a variety of adjustable sizes. The number of holes and the distance between each one is selectively provided to achieve a desired area. In the preferred embodiment, friction is reduced and a minimum clearance is provided between the hollow beams 12 and the adjustable beams 11 to allow ease of sliding movement by making the adjustable beams 11 slightly smaller in size than the hollow beams 12. Alternatively, a mechanical sliding means can be provided. Any reinforcing means may be desired for joining the ends of adjustable beams 11 and legs 10. Although not shown in FIG. 2B, legs 10 may alternatively have wheels or casters to easy movement and adjustment of the legs 10 in relation to the frame. As can be seen from FIG. 2A, the hinging curtains 15 are repositioned to cover the new selected extended or open area.

[0040] FIGS. 3A and 3B show adjustable beams 11 being in a retracted or closed state as indicated by the inwardly arrows. As can be seen from the FIG. 3A, the reduced space area is selectively decreased by diagonally pushing the four adjustable beams 11 into the hollow beams 12 to decrease the width and length of the apparatus 1.

[0041] A person of ordinary skill in the art can see that the above-described adjustable means is just a preferred embodiment and that additional or alternate means can be used. For example, adjusting means such as complementing serrated surfaces can also be used. In the preferred embodiment a four-beam diagonal adjusting system was used. However, a two-beam lateral adjusting system can also be used. In this system, only two side beams are laterally pulled/pushed to selectively modify either the width or the length of the frame, and wherein only two hollow beams are fixed to two sides of the top panel to correspond to the two adjusting beams.

[0042] It will be apparent to one of ordinary skill in the art that the apparatus of the present invention can be used to enclose any article of furniture or structure and can be of any size and shape. Furthermore, the height of the frame is selected according to the environment in which the apparatus is to be used. In the preferred embodiment, a height of the apparatus is selected based on the height of the bed and under the assumption that a person is either laying on the bed or seated. However, different heights can be custom designed for the purpose of intended use.

[0043] The reduced-space area portable adjustable A/C system offers an energy efficient alternative to reduce the energy consumption and lower costs associated with the use and maintenance of an A/C system.

[0044] The apparatus of the invention offers an inexpensive and lightweight portable and readjustable A/C system that can be used on different sized areas without the need to buy additional systems for each additional desired area.

[0045] The reduced-space area portable adjustable A/C system allows for quick “conditioning” of the air in the reduced space area because of the smaller volume of the reduced space area as compared to the entire room or office structure.
In an alternative embodiment, the apparatus of the invention can be provided with added features like a smoke detector, alarm system, communication system, fire retardant properties of the thermal insulation material, air freshener or ionizer, light, music and/or entertainment system, telephone and computer systems and storing space.

In yet another embodiment, the A/C unit and the reduced space frame can be provided into two separate units. Such an embodiment can be custom designed for the purpose of intended end use.

While the preferred embodiments of the present invention have been illustrated and described, it will be clear that the present invention is not limited to these embodiments only. Numerous modifications, changes, variations, substitutions and equivalents will be apparent to those skilled in the art without departing from the spirit and scope of the present invention as described in the claims.

What is claimed is:

1. An adjustable/portable AC system comprising: a frame defining an enclosed space having an internal environmental condition; and at least one adjusting element that selectively modifies at least one of: a volume enclosed by said frame and an area enclosed by said frame.

2. The adjustable/portable AC system of claim 1, further comprising at least one thermal insulating layer selectively connected adjacent said frame.

3. The adjustable/portable AC system of claim 2, wherein said at least one thermal insulating layer comprises a lightweight flexible material.

4. The adjustable/portable AC system of claim 2, wherein said at least one thermal insulating layer is selected from the group comprising at least one of: a thermal insulating sheet, a thermal insulating curtain or a combination thereof.

5. The adjustable/portable AC system of claim 2, wherein said at least one thermal insulating layer is made of a thermoplastic material.

6. The adjustable/portable AC system of claim 2, wherein said at least one thermal insulating layer is selectively configured to surround at least one of: the volume enclosed by said frame and the area enclosed by said frame.

7. The adjustable/portable AC system of claim 2, wherein said at least one thermal insulating layer comprises at least one of: a colored layer and a translucent layer.

8. The adjustable/portable AC system of claim 1, wherein said frame further comprises a top portion and at least one leg portion selectively connected adjacent to said top portion.

9. The adjustable/portable AC system of claim 1, wherein said frame further comprises at least one opening selectively adapted to receive at least of: air, a gas, an inert gas or a combination thereof.

10. The adjustable/portable AC system of claim 1, wherein said top portion comprises a removable cover.

11. The adjustable/portable AC system of claim 10, wherein said removable cover comprises at least one of: a single covering element, a plurality of interconnected covering elements, or a combination thereof.

12. The adjustable/portable AC system of claim 1, wherein said frame is made from at least one of: a lightweight rigid material, a thermally insulating material, or a combination thereof.

13. The adjustable/portable AC system of claim 1, wherein said frame comprises at least partially of a heat reflective material.

14. The adjustable/portable AC system of claim 1, further comprising an air conditioning device connected with respect to said frame comprising at least one of: an air cooling unit, a temperature control unit, a humidity control unit, an air recycling unit, a freshness control unit, a fan, a heating element, a heat dissipating unit, or a combination thereof.

15. The adjustable/portable AC system of claim 1, wherein said internal environmental condition is maintained by at least one of: internal air conditioning device, an external air conditioning device or a combination thereof.

16. The adjustable/portable AC system of claim 1, further comprising an air distribution portion selectively distributing air inside said enclosed space.

17. The adjustable/portable AC system of claim 1, further comprising a control unit for selectively monitoring and modifying said environmental condition; and a user interface selectively connected to said control unit.

18. The adjustable/portable AC system of claim 14, wherein said air conditioning device comprises a low-wattage consumption unit rated to operate at 5 kW or less.

19. The adjustable/portable AC system of claim 14, wherein said air conditioning device comprises at least one of: an AC powered unit, a DC powered unit, or a combination thereof.

20. The adjustable/portable AC system of claim 14, further comprising a back-up power source to selectively power said air conditioning device in case of a primary power failure, wherein said back-up power source is selected from the group comprising at least one of: a battery, a capacitor, a DC generator, a AC generator, solar source, hydro-electric source, gas-powered source, fuel-powered source, fuel cell or a combination thereof.

21. The adjustable/portable AC system of claim 1, wherein said at least one adjustable element is selectively coupled between said frame and said at least one leg element.

22. The adjustable/portable AC system of claim 1, wherein said at least one adjustable element comprises at least one of: a slideable element, complementing serrated element, a telescopic element, or a combination thereof.

23. The adjustable/portable AC system of claim 1, wherein said at least one adjustable element is selectively actuated to change at least one of: a distance, a dimension or a combination thereof, with respect to said frame.

24. The adjustable/portable AC system of claim 8, further comprising at least one latching element to selectively latch said at least one leg portion with respect to said frame.

25. The adjustable/portable AC system of claim 1, further comprising attachments connected adjacent with respect to said frame, wherein said attachments comprises at least one of: a smoke detector, an alarm system, a communication system, a fire retardation system, air freshener, ionizer, lighting system, music system, entertainment system, telephone system, storing space, shelving space, a computer access system, or a combination thereof.

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