

Aug. 13, 1940.

O. J. ST. PIERRE

2,210,960

AIR CONDITIONING SYSTEM

Filed May 17, 1937

4 Sheets-Sheet 1

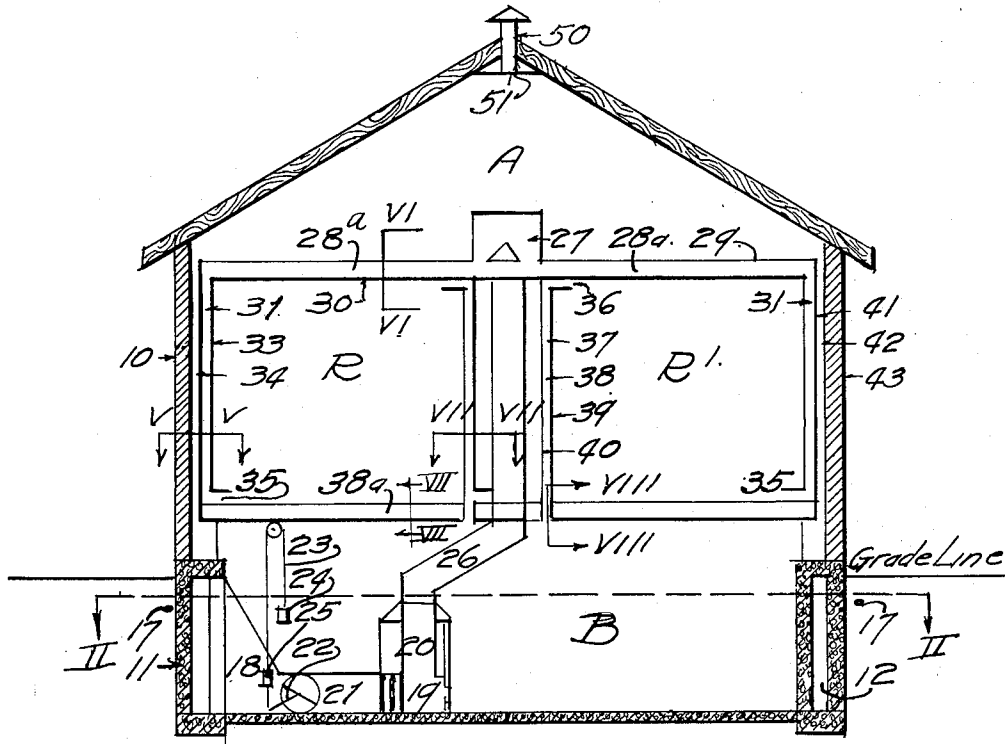


FIGURE 1

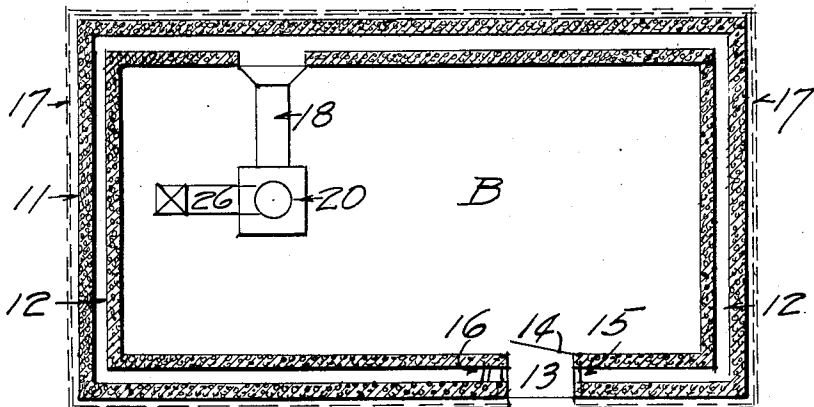


FIGURE 2.

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4 Sheets-Sheet 2

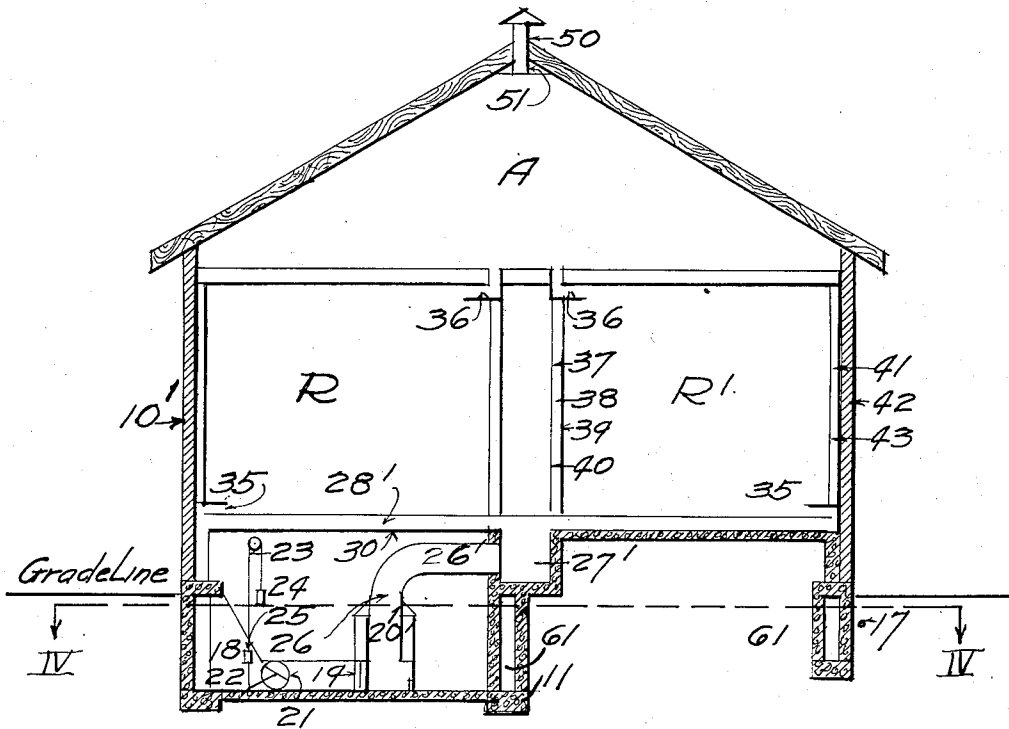


FIGURE 3

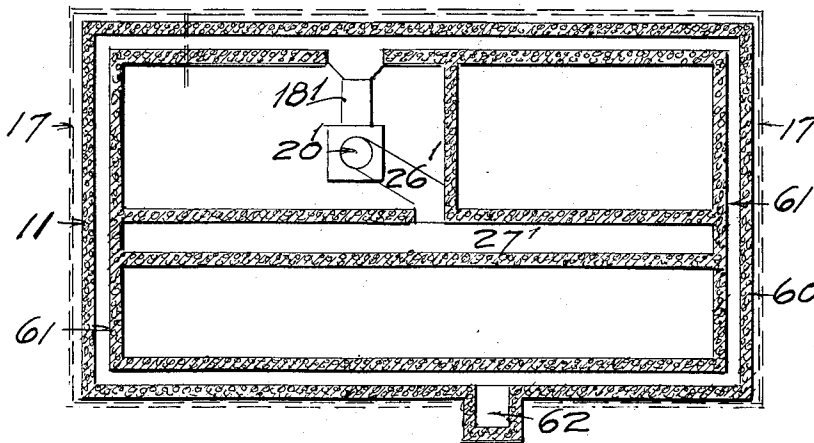


FIGURE 4.

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4 Sheets-Sheet 3

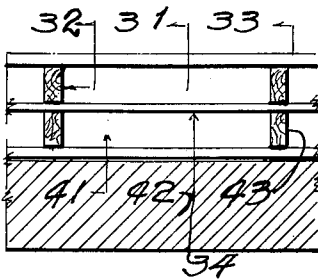


FIGURE 5

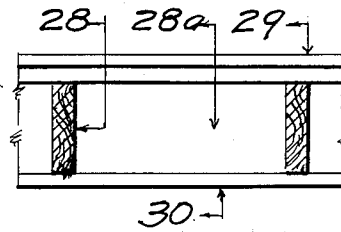


FIGURE 6

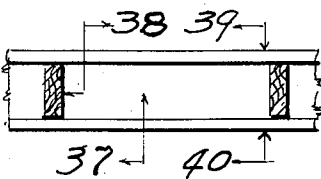


FIGURE 7

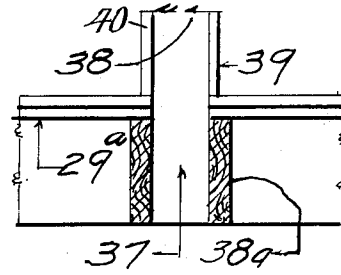


FIGURE 8

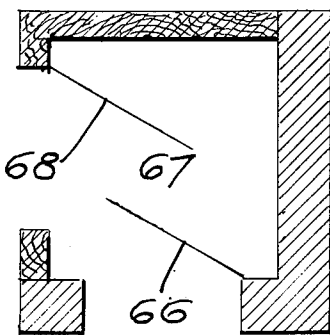


FIGURE 11

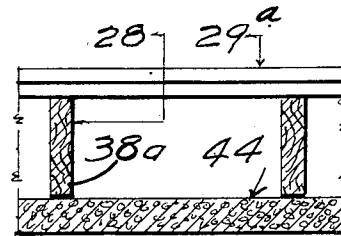


FIGURE 12

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AIR CONDITIONING SYSTEM

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4 Sheets-Sheet 4

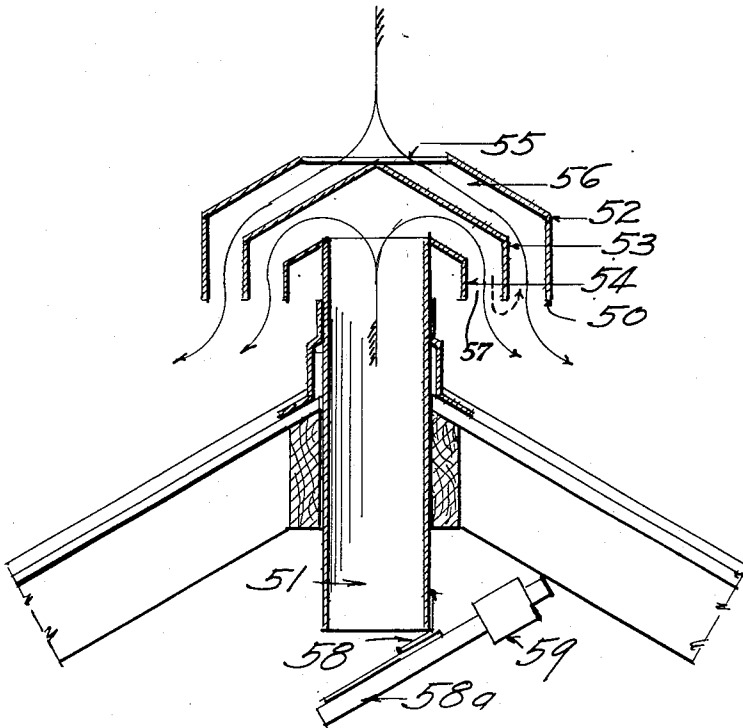


FIGURE 9.

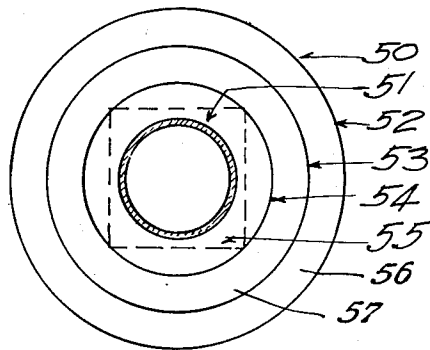


FIGURE 10

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UNITED STATES PATENT OFFICE

2,210,960

AIR CONDITIONING SYSTEM

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Application May 17, 1937, Serial No. 142,947

4 Claims. (Cl. 98—33)

This invention relates to building constructions providing an air conditioning system operated by the natural forces of nature and more specifically relates to an air conditioning system for homes and industrial buildings actuated by wind, sun heat, ground temperature, and evaporation. The system of this invention can be used in combination with a heating plant for heating the building.

The buildings of this invention are constructed on foundation walls or other means providing and defining therebetween a subterranean air passageway. Outside air is received in this passageway and as the air circulates in the passageway, it is naturally cooled in the summer time by the outer foundation walls or ducts which are below the ground level and therefore are cooler than walls disposed above the ground level. During the winter months, however, the foundation walls or ducts, by virtue of their being below the ground level, are warmer than the temperature above the ground level and thus serve to warm or cool the air passing through the subterranean air passageway. The invention may include means for moistening the ground adjacent to the outer foundation walls or ducts to aid in cooling these walls for example, by evaporation.

The air is introduced from the foundation walls or ducts into a duct located remote from the air inlet to the foundation walls. This duct may communicate with the selected heating plant for the building. The air circulates from the heating plant through a central duct located within the building into a plenum chamber or duct from which it is distributed between rafters and studs of the building construction to the various rooms or other areas in the building. The air is introduced into the rooms at the bottoms thereof along the baseboards, at floor line for example, and it is intended to utilize small slot-like or other openings around the entire room if required. Air is exhausted from the room through a slot or other openings adjacent to the ceiling thereof, for example, at the picture frame molding of the room. The exhausted air flows downwardly between the stud partition back to the basement of the building and then circulates upwardly from the basement between exhaust passageways formed outside of the passageways circulating air from the plenum chamber. The air then enters the attic or vacuum chamber where it is exhausted by means of a ventilating device operated by the outside wind or other natural forces. The attic

is maintained at a sub-atmospheric pressure for inducing the circulation through the building.

No air impelling means are utilized other than the natural forces of nature.

It is then an object of this invention to provide building structure for the complete air conditioning of a building of any type without the aid of mechanically driven appliances.

Another object of this invention is to produce a constant supply of fresh air in properly heated or cooled condition throughout a building.

Another object of this invention is to provide a completely air conditioned building utilizing passageways between the studs and rafters of the building for air circulation.

Another object of this invention is to exhaust air from a building through passageways provided adjacent outside walls of the building and passageways for supplying air to the various rooms in the building thereby increasing the insulation between the rooms in the building and the outside atmosphere.

Another object of this invention is to provide automatic intake and exhaust means for regulating the circulation of air through the building.

Other and further objects of this invention will become apparent to those skilled in the art from the following detailed description of the annexed sheets of drawings which disclose preferred embodiments of the invention.

It should be understood that the invention is of wide scope and that the structures illustrated on the drawings are intended as examples of suitable devices for carrying out the invention and may be widely varied without departing from the scope and intent of the invention.

On the drawings:

Figure 1 is a vertical cross-sectional view taken through a building having an air conditioning system according to this invention.

Figure 2 is a horizontal cross-sectional view taken substantially along the line II—II of Figure 1.

Figure 3 is a vertical cross-sectional view of a building equipped with an air conditioning system of this invention showing a construction usable on buildings not provided with basements but having an excavated boiler room.

Figure 4 is a cross-sectional view taken substantially along the line IV—IV of Figure 3.

Figure 5 is a cross-sectional view taken substantially along the line V—V of Figure 1.

Figure 6 is a cross-sectional view taken substantially along the line VI—VI of Figure 1.

Figure 7 is a cross-sectional view taken substantially along the line VII—VII of Figure 1.

Figure 8 is a cross-sectional view taken substantially along the line VIII—VIII of Figure 1.

Figure 9 is an enlarged cross-sectional view, with parts in elevation, of the air exhaust and control therefor mounted in the roof of a building according to this invention.

Figure 10 is a plan view of the air exhaust device shown in Figure 9.

Figure 11 is a plan view of double doors for giving entrance to the building.

Figure 12 is an enlarged cross-sectional view taken along the line XII—XII of Figure 1.

As shown on the drawings:

In Figure 1 the reference numeral 10 designates generally a house having a basement B, rooms R and R' and an attic A. The house 10 is supported on a foundation 11 preferably built up of concrete blocks. The foundation walls define an air passageway 12.

As best shown in Figure 2, an opening 13 is provided in the foundation walls 11 to define an entrance to the basement B. This entrance opening may be closed by a door 14. The passageway 12 is open as at 15 on each side of the door opening 13 in front of the door 14. These openings can be provided with a screen grille and filters 16 may be disposed back of the grille in the passageway on each side of the opening 13. Air can thus enter into the passageway 12 and circulate in contact with the foundation walls 11 which walls are below the ground level as shown in Figure 1.

The air in passing along the passageway 12 is cooled in the summer months because the foundation walls are below the ground level. To increase the cooling of the air, subterranean water pipes 17 can be disposed around the foundation walls for moistening the ground therearound. These pipes 17 can be perforated or provided with spray heads.

In the winter months, the air is warmed by passage through the passageway 12 because temperatures below the ground level are warmer than temperatures above the ground level.

A duct 18 in the basement B communicates with the passageway 12 at a point to define passageways of equal lengths from the openings 15. The air in the passageway 12 enters the duct 18 and may be directed through filters 19 into a heating plant 20 for the building. The heating plant 20 can be any type of heating unit. The amount of air entering the heating plant 20 may be controlled by a damper 21 positioned in the duct 18. The damper 21 may be connected through a bell crank arm 22 and cable 23 to a thermostatic device 24 which automatically regulates the operation of the damper in accordance with the temperature of the incoming air. The thermostatic device 24 is controlled by a thermostatic bulb 25 positioned in the air duct 18.

From the heating plant 20 the air is directed upwardly through a duct 26 into a plenum chamber 27 mounted in the attic A. From the plenum chamber 27 the air passes along passageways 28a between the rafters 28 as shown in Figure 6 under the construction floor 29 and above the room ceilings 30. From these passageways 28a between the rafters 28 the air passages between passageways 31 defined by studs 32 as shown in Figure 5, the room walls 33 and a siding wall 34. The air is introduced into the rooms R and R' from the passageways 31 through slots 35 extending around the periphery of the room at the baseboard there-

of. These slots 35 may be of small width only and can be suitably screened or grilled as desired.

The air after circulating through the rooms R and R' is exhausted through slots or openings 36 extending along the tops of the rooms on the inner walls thereof. The exhausted air then passes through passageways 37 (Figure 7) defined between studs 38, the inner room walls 39 and additional walls 40 secured to the studs 38 in spaced relation from the room walls 39. From the passageways 37 the air is directed between rafters 38a under floors 29a into the basement B to the outside walls of the house where it passes upwardly through the passageways 41 (Figure 5) defined by the outer walls 42 such as brick walls of the house 10 and the siding wall 34. The studs 38 rest on the rafters 38a as shown in Figure 8 so that the passageway 37 is unobstructed. The walls 42 and 34 may be secured to studs 43 as shown in Figure 5. The rafters 38a rest on side walls 44 as shown in Figure 12.

From the passageways 41 the air is directed into the attic A.

For the purpose of effecting the circulation of air to the attic A, the attic is maintained under a sub-atmospheric pressure. An exhaust device 50 may be mounted on the roof of the house and communicating through a duct 51 with the attic. The exhaust device 50 is best shown in Figures 9 and 10 and comprises a plurality of concentric bonnets 52, 53 and 54 mounted on the end of the duct 51 above the roof of the house. The bonnet 52 has an opening 55 in the top thereof. The bonnet 53 is disposed over the mouth of the duct 51 and is closed at the top. The bonnet 54 is preferably level with the mouth of the duct 51.

As indicated by the arrows, the outside wind if coming from the top of the house can pass through the opening 55 of the bonnet 52 and be directed along the passageway 56 defined by the bonnets 52 and 53. This will create a suction at the mouth of a concentric passageway 57 defined by the bonnets 53 and 54 tending to draw air out of the duct 51.

If, on the other hand, the outside wind is sweeping along the roof of the building some of it will be passed through the passageway 57 as shown by the arrows thereby drawing air from the duct 51 therewith.

A damper 58 is hingedly connected to the bottom of the duct 51 in the attic A. This damper 58 can be suitably counterbalanced by a weight 59 adjustably mounted on an arm 58a of the damper. Thus if the passage of air from the attic through the duct 51 is greater than desired, the suction caused by passage of the air through the duct 51 will tend to close the damper 58. The amount of suction necessary to close the damper can be properly regulated by adjusting weight 59 on the arm 58a for counterbalancing the operation of the damper.

From the above description it should be understood that the air is circulated through the building 10 without the aid of fans or other mechanically operated air impellers. The outside wind or sun heat effects a reduced pressure area in the attic A which draws air through the building as described above. In the event, however, that there is no wind blowing, the system will still operate because of a temperature differential between the incoming air and the outgoing air. In the winter months when the incoming air is heated, the air circulation will be by convection in the event that no outside wind is blowing. In the summer months the outgoing air is warmer

than the incoming air and air circulation is also assured.

In the modification shown in Figures 3 and 4, the building 10' is not provided with a full basement, but, on the other hand, is mounted on a hollow foundation 60 disposed beneath the ground level. The foundation 60 defines a passageway 61 for air entering through a passage 62 from above the ground level. The air is thus circulated through the passageway 62 around the passageway 61 and through a duct 18' in a boiler room B. R., into a hot air furnace 20' and then through a duct 26' into a plenum chamber 27' located beneath the rooms R and R'. Instead of in the attic. From the plenum chamber 27' the air is circulated to the outlets 35 in the rooms R and R'. Air is exhausted from the rooms at 36 into the attic A.

The buildings of this invention are well insulated and are intended to be equipped with glazed sealed windows and double doors. A suitable form of double door construction is shown in Figure 11, wherein the outside door 66 giving entrance to the building 10 opens into a vestibule 67. The door 66 is then closed and a door 68 opened to give entrance from the vestibule 67 into a room R.

In order to insure a complete closing of one of the doors 66 or 68 so that both doors are not open together, an electrical interlock arrangement can be provided. In an electrical interlock, one of the doors 66 or 68 must be completely closed before the other door can be opened. This insures against the sweeping in of air and dust into the building which tends to upset the desired air circulation of the system of this invention.

The continuous circulation of treated outside air throughout the building makes it unnecessary to open doors, windows and the like.

The air conditioning system of this invention is entirely automatic and requires no power for operation.

I am aware that many changes may be made and numerous details of construction may be varied through a wide range without departing from the principles of this invention, and I, therefore, do not purpose limiting the patent granted hereon otherwise than necessitated by the prior art.

I claim as my invention:

1. An air conditioned building comprising a hollow subterranean foundation defining an air conduit, said conduit having an inlet communicating with the outside atmosphere, a duct in said building for receiving air from the conduit, a damper for regulating flow of air through the duct, means for operating said damper, a heating plant in communication with the duct, a space at the top of the building, a plenum chamber in said space, means for conveying air from the heating plant to the plenum chamber, rooms or areas in said building for receiving air from said plenum chamber and defined by hollow inner walls spaced apart from the main outer walls of said building by hollow ceilings and by hollow floors, said inner walls being spaced apart from each other at interior positions of said building thereby forming air intake passages from said plenum chamber horizontally through said room ceilings and downwardly through said hollow inner vertical room walls, thence into said rooms near the floors thereof, said vertical room walls having air exhaust passages near the ceilings, said hollow vertical room walls and floor

forming exhaust passages to permit passage of air downwardly through said inner side walls and through the building basement, thence upwardly between said room walls and said building walls, and into said attic, and an exhaust element in the top of said attic whereby spent air from the rooms will exhaust therethrough.

2. An air conditioned building structure comprising outer side walls defining an enclosure, a roof closing the top of the enclosure, a floor in spaced horizontal relation below the roof to define with the roof an attic space, rafters supporting said floor extending in spaced horizontal relation between opposite side walls of the building, rooms in said building below said rafters having top, bottom and side walls, said top walls of the rooms and attic floor defining with the rafters a plurality of horizontal air passages, spaced vertical studs supporting said side walls of the room, outer walls secured to said studs to define with the room walls and studs vertical passageways, said vertical passageways adjacent the outer side walls of the building communicating with the horizontal air passages and having outlets communicating with the room, said vertical passageways along inner room walls having inlets communicating with the rooms for conveying spent air therefrom and additional passageways between the outer side walls of the building and the outer walls secured to the studs for conveying the spent air exhausted from the rooms to the attic space.

3. An air conditioned building structure comprising a shell consisting of outer side walls, roof and foundation walls and containing rooms and an attic space therein; a subterranean air passageway passing through said foundation walls and communicating with the atmosphere; a plenum chamber in said attic space; a passageway between said subterranean air passageway and said plenum chamber; a plurality of inner side walls, ceilings and floor defining said rooms, said side walls, floor and ceilings being hollow and forming air passages therethrough, certain of said inner side walls being spaced apart from the main side walls of said building and forming air passages between said side walls and said building side walls; said ceilings and outer side walls of said rooms forming air intake passageways from said plenum chamber and the lower part of said rooms; certain of said inner room walls having air exhaust ports near the ceilings, said inner room walls, said floors, said basement and said spaces between said building walls and outer room walls forming a continuous passage from said room air outlet ports to said attic; and an air outlet element mounted in said roof to permit exhaust of air from said attic to the atmosphere.

4. An air conditioned building structure comprising subterranean foundation walls defining an air passageway and including rooms and an attic space, a plenum chamber in said attic space, an inlet to said air passageway for conveying outside air thereto, an outlet from said air passageway for supplying air to the interior of the lower part of said building, thermostatic means for controlling the volume of air supplied to the building, walls defining said rooms in said building, air passageways extending through the walls, floors and ceilings of said rooms and surrounding said rooms, an air passageway communicating the lower portion of said building and said plenum chamber, said air passages surrounding

said rooms communicating with said plenum chamber and permitting air passage from said plenum chamber into the lower part of said rooms, through said rooms and through said room walls and floors and into said attic space, and a wind operated air exhausting device in the building roof for removing air from said attic space, some of said air passageways surrounding the rooms adapted to receive air from the subterranean passageway for feeding to the rooms,

other of said air passageways surrounding the rooms receiving spent air from the rooms for conveying said air to the attic space whereby outside air is either warmed or cooled by passage through the subterranean passageway dependent upon outside weather conditions and is circulated throughout the building by wind forces creating a reduced pressure area in the attic space.

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