July 3, 1956 J. L. HOYER 2,753,157

ECONOMY AIR CONDITIONING SYSTEM FOR BUILDINGS

Filed Dec. 12, 1952 3 Sheets-Sheet 1

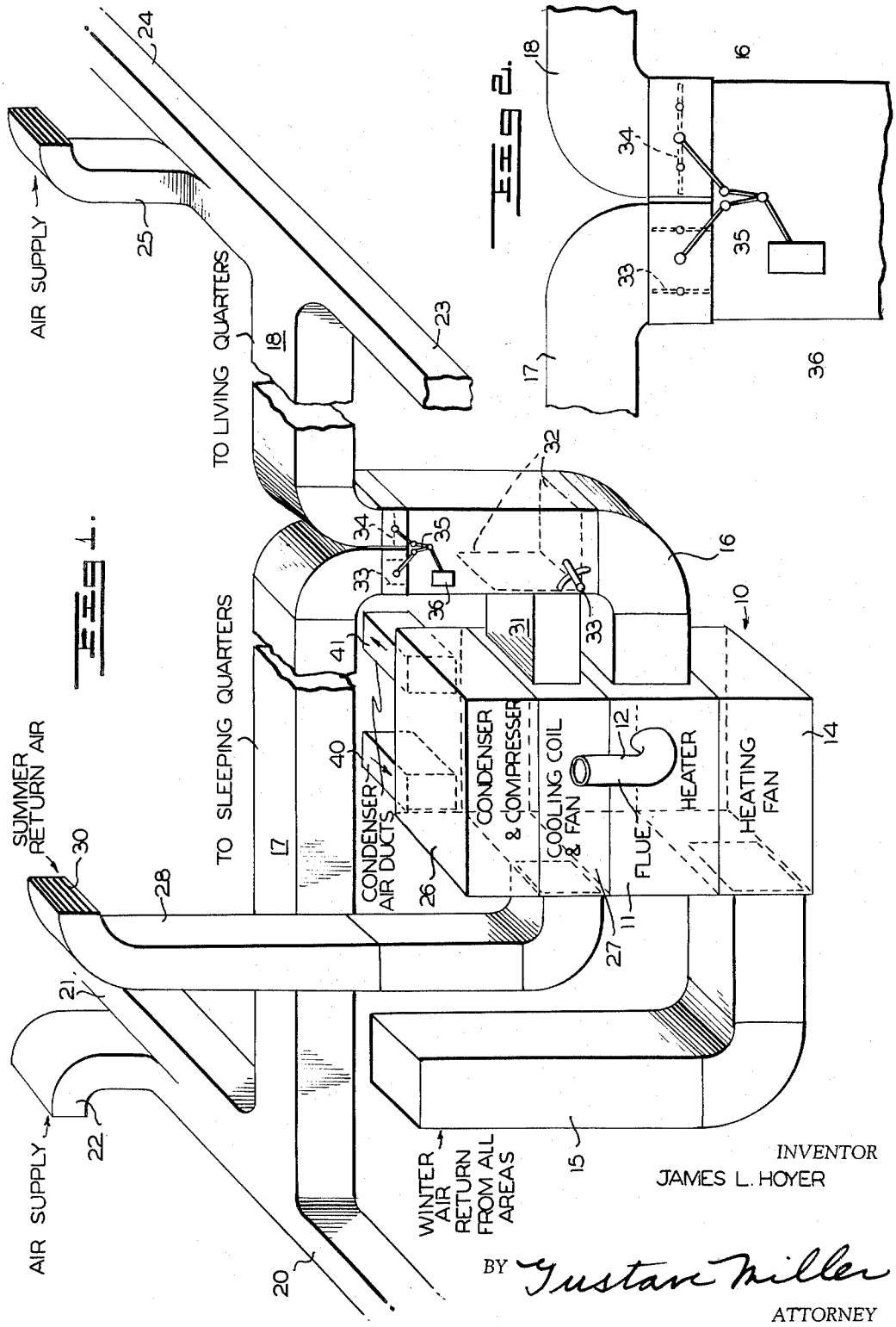


Fig. 1.

Fig. 2.

INVENTOR
JAMES L. HOYER

BY Gustave Miller
ATTORNEY

July 3, 1956 J. L. HOYER 2,753,157

ECONOMY AIR CONDITIONING SYSTEM FOR BUILDINGS

Filed Dec. 12, 1952 3 Sheets-Sheet 2

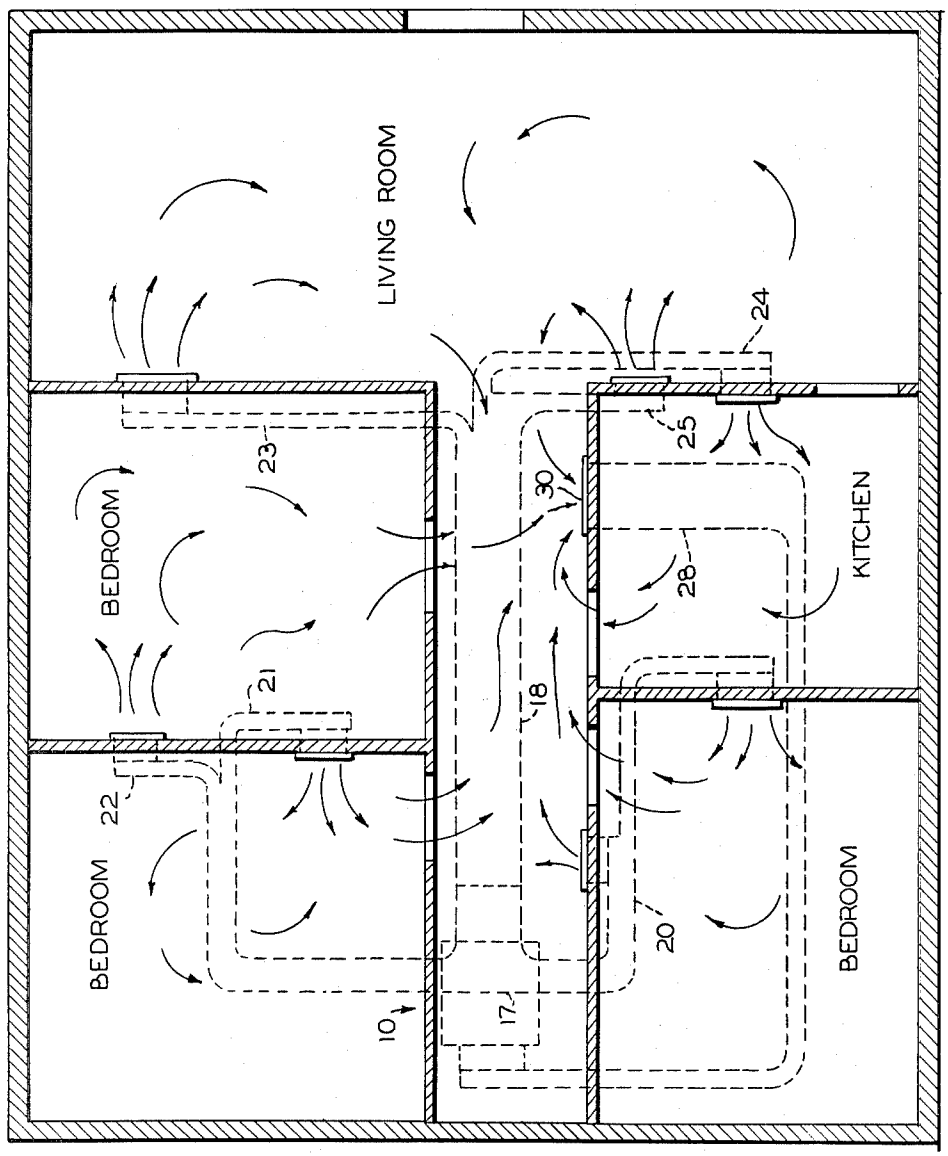


Fig. 2

INVENTOR
JAMES L. HOYER

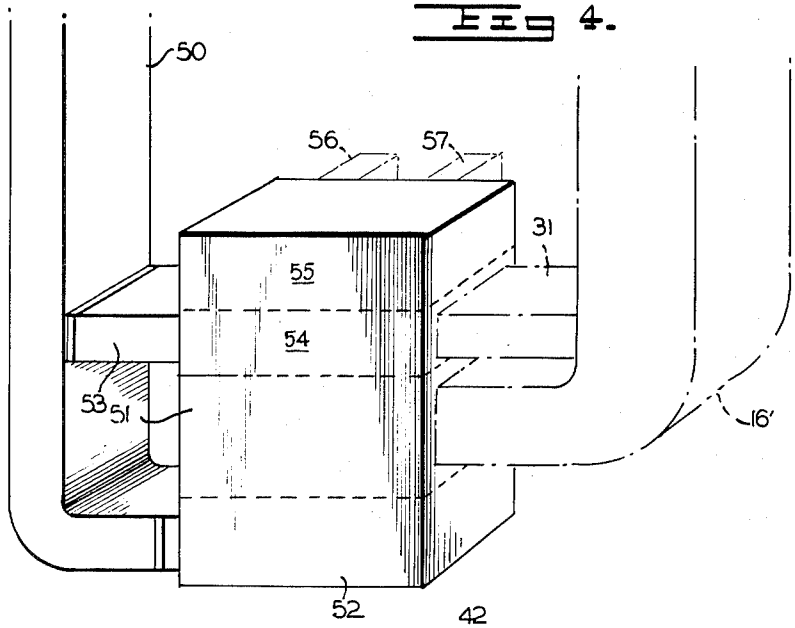
BY Gustave Miller
ATTORNEY

July 3, 1956 J. L. HOYER 2,753,157

ECONOMY AIR CONDITIONING SYSTEM FOR BUILDINGS

Filed Dec. 12, 1952 3 Sheets-Sheet 3

Fig 4.



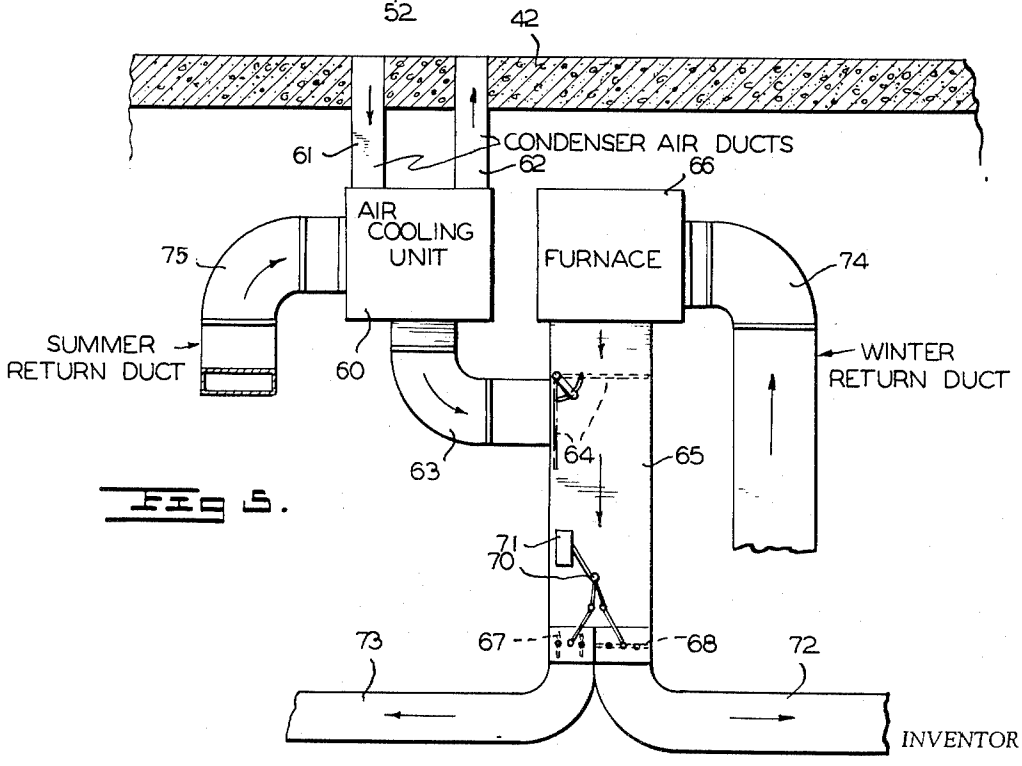


Fig 5.

INVENTOR
JAMES L. HOYER

BY Gustave Miller
ATTORNEY

United States Patent Office 2,753,157
Patented July 3, 1956

2,753,157

ECONOMY AIR CONDITIONING SYSTEM FOR BUILDINGS

James L. Hoyer, Washington, D. C.

Application December 12, 1952, Serial No. 325,643

2 Claims. (Cl. 257—3)

This invention relates to an economy air conditioning system for buildings and has for an object to provide an improved air conditioning system for economically conditioning the air in a building, that is, for heating it, or for cooling it, or for dehumidifying it, or for both cooling and dehumidifying it, according to the weather conditions.

A further object of this invention is to provide an air conditioning system for buildings which utilizes a much smaller air refrigerating unit than is used in the normal conventional installation.

It has now become recognized that air conditioning a home in the summer is just as important from the standpoint of human efficiency as is heating it in the winter, and while practically nearly all homes located in areas subject to cold, winter weather are provided with heating means, only recently has there been a trend toward adding summer air conditioning to such homes, that is, adding refrigerating and dehumidifying units thereto. At the present time two systems of adding summer air conditioning are generally used, one being the provision of individual air refrigerating and dehumidifying units in each room, usually in the window thereof, which is fairly expensive in view of the high cost of such individual units and the necessity of providing a unit for each room that it is desired to cool, and the other system of providing an air cooling and dehumidifying unit of a size sufficient to cool the entire building, such unit being less expensive than a plurality of units, one in each room, as in the first mentioned system, but still fairly expensive, both in initial cost and in upkeep, not only in connection with the amount of electrical power consumed thereby, but also in connection with the amount of water necessarily employed in removing the heat extracted by the coils of the refrigeration unit therein. Generally, the smallest size unit for summer air conditioning a residence building is a minimum of two to five horsepower, and such unit is too large for practical condenser cooling other than by water and uses a substantial water supply, so much so, that in many cities regulations have been passed forbidding the use of city water in such summer air conditioning units, making it necessary for the owner to provide other water supply, such as, local wells, if available, or make provision for recirculating the water over and over again after cooling it, another added expense.

With this invention, it becomes possible to utilize a conventional type of summer air conditioning unit of about one-half normal horsepower requirements to cool its condensers by air from outside the building, and to utilize it in conjunction with the hot air ducts of a hot air furnace.

It is an object of this invention to provide an air conditioning system utilizing a conventional hot air furnace and a summer air conditioning or refrigerating unit of such size that its condensers may be air cooled from outside the home, thereby substantially decreasing the overall cost of the installation, decreasing the amount of electrical power consumed, and eliminating the need for any water cooling of the condensers of the refrigerating unit.

A further object of this invention is to provide an air

conditioning system which in the winter time will heat the entire building in the conventional manner, and in the summer time will serve to cool that area in the home that is in use at the time it is in use, thus, cooling only the sleeping areas of the home at the time when the sleeping areas are in use, and cooling only the living quarters of the home at the time the living quarters are in use. By so dividing the home into the two areas, and dividing the air duct system of the furnace into two separable air duct systems selectively connectable to the summer air conditioning unit, it is possible to provide an economical system that will continuously cool the portion of the home that is in use at a much smaller initial expense, and much smaller installation expense, and much smaller upkeep expense than previously possible.

A further object of this invention is to provide an economy air conditioning unit consisting of a hot air furnace and a small summer air conditioning unit with selectively controllable damper means, and a duct system divided into two separable duct systems, one to the living quarters and one to the sleeping quarters, wherein the damper means in the winter time will direct heated air from the furnace to both duct systems to all portions of the building, and wherein in the summer time the damper system may be either manually or automatically operated to direct cooled air to one duct system or to the other, but not to both, so as to selectively cool the sleeping quarters during the time they are normally occupied, and to cool the living quarters during the time that the living quarters are normally occupied, and the sleeping quarters are normally unoccupied.

Still a further object of this invention is to provide an air conditioning system wherein the same air cooling unit may be selectively operated to cool any one area of a building which is substantially less than the entire area of the building, and to provide a duct system so that the desired area of the building may be cooled at the desired time.

With the foregoing and other objects in view, this invention comprises the combination, construction and arrangement of parts hereinafter set forth, claimed and disclosed in the accompanying drawings, wherein:

Fig. 1 is an isometric layout of one form of this invention.

Fig. 2 is an enlarged fragmentary detail view of the cool air duct damper control.

Fig. 3 is a phantom layout of the invention as applied to a residence building.

Fig. 4 is an isometric view as applied to a furnace having a single air return duct.

Fig. 5 is a plan view showing the invention as added to a furnace already in place.

There is shown at 10 the winter and summer air conditioning unit in which this invention has been incorporated. This combination unit 10 includes a hot air heater furnace portion 11 using any customary conventional fuel, such as oil, gas, or even coal, provided with a flue 12 through which the products of combustion escape to the chimney. This heater portion 11 heats the air which is blown therethrough by a conventional heating fan 14 getting the air from the main winter return duct 15 which has its usual branches leading from each individual room which is being heated.

From the heater portion or furnace 11, the heated air travels into the main supply duct 16, which normally branches off to each and every room, hallway, or the like, which is to be heated.

With this invention, however, before the main duct subdivides to the various rooms, it first sub-divides into two separate ducts 17 and 18. The duct 17 in turn sub-divides to provide an individual duct in each room in the sleeping quarters of the home as at 20, 21, and 22. The other duct

18 sub-divides into individual ducts 23, 24, and 25 leading to different rooms or locations in the living quarters of a home, such as a living room or parlor, the kitchen, etc., that is, those rooms that are normally used in the daytime as differentiated from the bedrooms normally used only at night time.

Also included in the combination unit 10 is a condenser and compressor refrigerating unit 26 for cooling or refrigerating air supplied to the cooling coil and fan portion 27 by means of a single summer return air duct 28. A grill 30 at the end of the single duct 28 is located in a suitable location in the boundary area between the living quarters and the sleeping quarters. The fan 27 delivers the air that has been chilled or refrigerated by means of a short duct 31 to the main air duct 16, a control damper 32, here shown as manually controlled by a control handle 33, being provided at the junction of the short duct 31 into the main duct 16 so that it can either completely close off the short duct 31 and leave the main duct 16 entirely open from the furnace area 11 to the two ducts 17 and 18, or it may be manipulated by means of handle 33 so as to completely close off the main duct 16 below the short duct 31 to the furnace area 11, and simultaneously open the short duct 31 so that the air from the short duct 31 will travel through the remainder of the main duct 16 to the two ducts 17 and 18.

At the junction of the main duct 16 with the two ducts 17 and 18 there are provided individual damper controls 33 and 34 connected by links 35 to a control motor 36 for simultaneously opening one of the dampers 33 or 34, and simultaneously closing the other of these two dampers 33 or 34. The motor 36 will preferably be connected to an automatic clock for shifting the positions of the dampers 33 and 34 twice a day at any predetermined times, so that during the sleeping time of the night the damper 33 will be open to the duct 17 leading to the sleeping quarters, and the damper 34 will be closed cutting off the duct 18 leading to the living quarters, as shown in Figs. 1 and 2.

In the morning, the control clock will actuate the motor 36 to reverse the positions of these dampers, that is, it will close the damper 33 to the duct 17 to the sleeping quarters, and open the damper 34 to the duct 18 to the living quarters.

In the winter or heating season, the links 35 connecting the dampers 33 and 34 to the motor 36 may be manually disconnected and leave both dampers 33 and 34 in the open position, and the damper 32 will be set in the position to cut off the shaft duct 31 and open the duct 16 from the hot air furnace 11 to both ducts 17 and 18.

This will, of course, necessitate manual manipulation of the damper handle 33 and of the damper links 35 twice a year, that is, when making a change over from the heating season to the summer season, and then, again from the summer season to the winter season, but otherwise, the motor 36 operated by the conventional control clock will handle or operate the ducts 33 and 34 automatically throughout the summer air conditioning season. Obviously, a separate motor could be provided for each damper 33, 34, and 32 to make the entire device automatic with a suitable circuit thereto, but in view of the fact that it is usually desirable to service an air conditioner unit at least twice a year, such as to check and lubricate the fan motors and check or change the air filters normally present, it would probably be also desirable to use a manual control, as shown on damper 32 and the manually connectable and disconnectable links 35 for the dampers 33 and 34.

In operation with this combination unit 10, during the heating season, the control handle 33 will be operated to close the control damper 32 against the short duct 31 and open the main duct 16 from the furnace portion 11 to both ducts 17 and 18, with the manual links 35 disconnected so that both dampers 33 and 34 will be in open position. After the heating season is over, sometime during the spring time, the links 35 will be again connected to connect the dampers 33 and 34 to the control motor 36, and the circuit from the motor 36 to the control clock will be placed in operation so that during the day time damper 34 will be open to the living quarters and damper 33 will be closed to the sleeping quarters, and during the night time the dampers will be reversed.

The same control clock or another thermostat may be connected in a conventional manner to the condenser and compressor for placing the same in operation in accordance with prevailing temperature conditions. The condenser and compressor 36 will have their heat of compression removed by means of the condenser air ducts 40 and 41 extending through suitable openings in the cellar wall 42 to the atmosphere outside of the building, thus, enabling the same to be air cooled and eliminating the necessity for expensive water cooling.

As a result of the divided duct system at 17 and 18, a much smaller unit is present in the condenser and compressor 26 than would be necessary if it had to cool the entire building at one time.

In the heating season, the furnace portion 11 provides heated air to the whole building, and this air is returned by means of the conventional winter return ducts generally having inlets located in each and every room or hall of the home. This is necessary and conventional because of the great differential between the temperature that must be maintained in the home in the winter time as compared to variations in temperature outside of the home. In the summer time, however, the temperature differential maintained in summer air conditioning between the inside of the home and the outside of the home is much smaller, and for this reason it has been found undesirable to use the furnace portion return ducts from the various rooms and instead provide the single return duct 28 and inlet 30 in the boundary area between the living quarters and the sleeping quarters of the home.

However, there are some styles of furnaces, particularly in small homes, which only use a single air inlet and return duct to the furnace, such as shown in Fig. 4 at 50. This single return duct 50 which leads to the furnace portion 51 by way of the fan unit portion 52 is provided with a branch duct 53 leading to the cooling coil and fan portion 54. Connected to the condenser and compressor portion 55 are its condenser air ducts 56 and 57 leading through the cellar wall to the outside atmosphere. A main air supply duct 16 connected to the furnace portion 51 and a short duct 31′ connects the air cooling unit within portion 54 to the main duct 16′, which in turn leads to the same divided ducts and through the control dampers identical with that already described in connection with Fig. 1.

In Fig. 5, this invention is shown as consisting of a separate air cooling unit 60 having its condenser air ducts 61 and 62 connected through suitable openings in the cellar wall 42 supplying air through a connecting duct 63 and control damper 64 similar in construction to the control damper 32 of the combination formed in Fig. 1 to the furnace main duct 65 connected from the existing hot air furnace 66 already in the home. This main duct 65 leads past control dampers 67 and 68 with a connecting link 70 to a control motor 71 and to the divided ducts 72 and 73, one to the living quarters, and one to the sleeping quarters, all identical with the construction already shown and described in connection with the combination unit of Fig. 1 at 33, 34, 35, 36, and the ducts 17 and 18.

The furnace 66 has its usual customary conventional winter return duct 74 from each and every room or location of the home, while the air cooling unit 60 has but a single return duct 75 for summer use leading from the boundary area between the sleeping quarters and living quarters. Obviously, in this form, utilizing the existing furnace, in addition to installing the air cooling unit and its return duct as well as its condenser air ducts, it will be necessary to regroup the conventional main supply duct

into one group of living quarters and another group of sleeping quarters and duct them accordingly, as herein shown.

In Fig. 3, a phantom view is shown disclosing how the combination unit 10 directs the chilled air to either the living quarters consisting of the living room and kitchen, or the sleeping quarters consisting of the bedrooms, as shown, with the air then passing through the open doorway and back to the return grill 30 and return duct 28 for recirculation.

As shown, the home here illustrated is all on one floor, but where a two story residence or home is involved, the return grill 30 will undoubtedly be placed in the customary hallway just at the bottom of the stairway, and thus, serve both areas as needed. Obviously, the actual location of the various ducts in every home will depend on its particular requirements but the system herein disclosed can obviously be applied to any new home or existing home. If the existing home does not have air ducts and a hot air furnace, but has another type of heat, such as hot water, steam vapor, or the like, and hence, does not have any existing air ducts, it is still possible to use the essence of this invention by installing an air cooling unit in the basement similar to that shown in Fig. 5, and also installing a single air duct leading therefrom to a separable pair of air duct systems utilizing a similar damper linkage and motor control, such as shown at 67, 68, 70 and 71 of Fig. 5, one of the ducts leading to the living quarters and the other to the sleeping quarters in the same manner with the return duct similar to that at 69 returning from the boundary area between the two quarters.

Of course, this would have no connection to the heating furnace, but it would still involve the essence of applicant's invention in that it provides air conditioning in an average home utilizing approximately one-half the horsepower requirements that is necessary under the present system, and also making it practical to cool the condenser unit by air from the outside atmosphere rather than the much more expensive conventional water cooling means for the condenser units.

While the device has been shown and the structure described in detail, it is obvious that this invention is not to be considered as being limited to the exact form disclosed, and that changes in detail and construction may be made therein within the scope of what is claimed, without departing from the spirit of this invention.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. An economy air conditioning system for a building having a plurality of areas only one of which is normally used at one time, said air conditioning system including a container unit having a heating zone, a heating means, a heating means air duct air supply means, a heating means air return means and a heating blower for circulating heating air from said heating means through said air supply means and said air return means and capable of providing heated air sufficient for all areas of the building, said unit having a cooling zone, a refrigeration cooling means including a blower in said cooling zone, separate from the heating blower, capable of providing cooled air sufficient for any one area at one time but too small to provide cooled air for all areas simultaneously, a branch duct from said cooling means to said heating means air duct means, said heating means air duct air supply means including a pair of separable duct means leading from said heating means to each area, damper control means for connecting all said separable duct means to said heating means and said heating blower or for selectively connecting any one of said separable duct means to said branch duct and thus to said air refrigeration cooling means and said cooling means blower, and cooled duct air return means, separate from said heating means air return means and bypassing said heating zone, leading from the boundary area between adjacent areas to said refrigeration cooling zone.

2. An economy air conditioning system for a residence building having two areas only one of which is normally used at one time, one of said areas being the sleeping area and the other being the living area, said air conditioning system including a container unit having a heating zone, a heating means, a heating means air duct air supply means, a heating means air return means and a heating blower for circulating heating air from said heating means through said air supply means and said air return means and capable of providing heated air sufficient for both areas of the building, said unit having a cooling zone, a refrigeration cooling means including a blower in said cooling zone, separate from the heating blower, capable of providing cooled air sufficient for either area at one time but too small to provide cooled air for both area simultaneously, a branch duct from said cooling means to said heating means air duct means, said heating means air duct air supply means including a pair of separable duct means leading from said heating means to each area, damper control means for connecting both separable duct means to said heating means and said heating blower or for selectively connecting either said separable duct means to said branch duct and thus to said air refrigeration cooling means and said cooling means blower, and cooled duct air return means, separate from said heating means air return means and bypassing said heating means leading from the boundary area between the two areas to said refrigeration cooling zone.

References Cited in the file of this patent

UNITED STATES PATENTS

2,055,988	Stacey et al.	Sept. 29, 1936
2,096,967	Johnson	Oct. 26, 1937
2,104,088	Lyman	Jan. 4, 1938
2,236,914	Nessell	Apr. 1, 1941
2,251,881	Danielson	Aug. 5, 1941
2,284,764	Parks	June 2, 1942