Oct. 7, 1969 F. H. SCHMIDT 3,470,945

AIR CONDITIONING APPARATUS

Filed Aug. 24, 1967 4 Sheets-Sheet 1

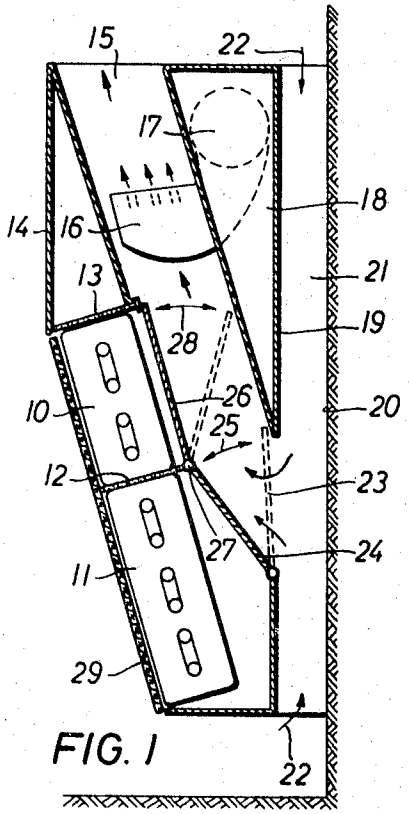


FIG. 1

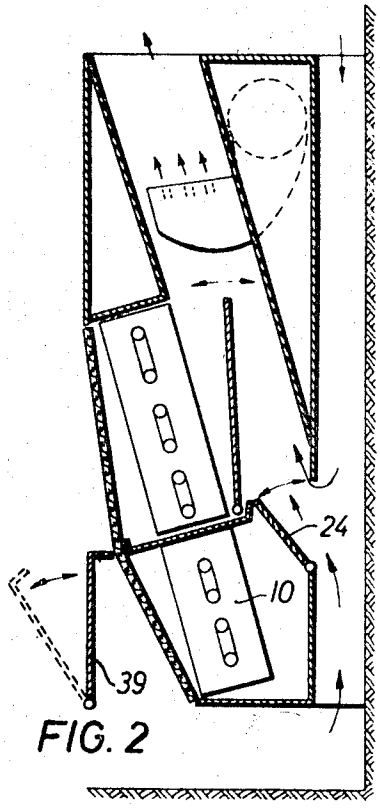


FIG. 2

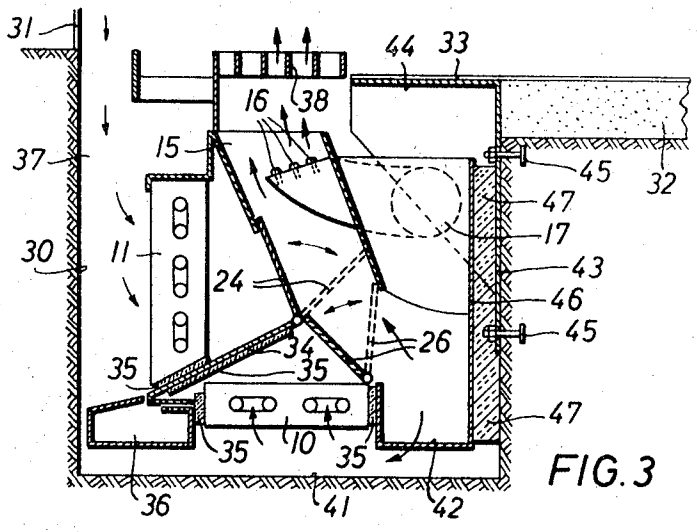


FIG. 3

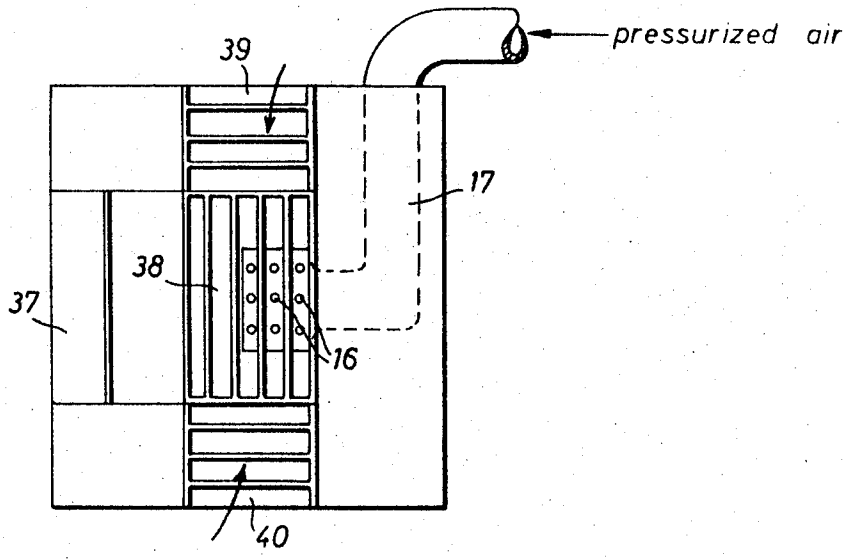
INVENTOR
FRIEDRICH H. SCHMIDT

Oct. 7, 1969 F. H. SCHMIDT 3,470,945

AIR CONDITIONING APPARATUS

Filed Aug. 24, 1967 4 Sheets-Sheet

FIG. 3a



INVENTOR
FRIEDRICH H. SCHMIDT

Oct. 7, 1969 F. H. SCHMIDT 3,470,945

AIR CONDITIONING APPARATUS

Filed Aug. 24, 1967 4 Sheets-Sheet 3

FIG. 4

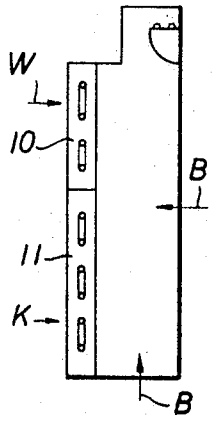


FIG. 5

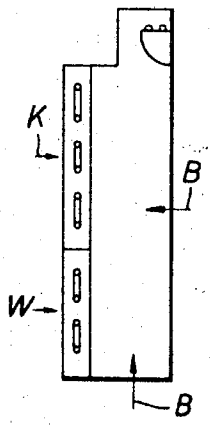


FIG. 6

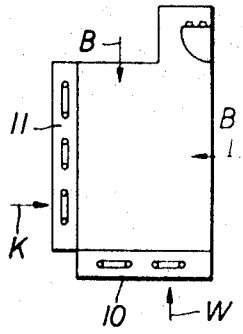


FIG. 7

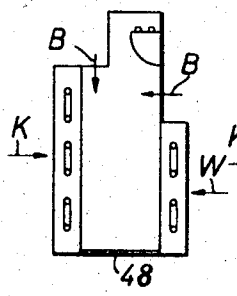


FIG. 8

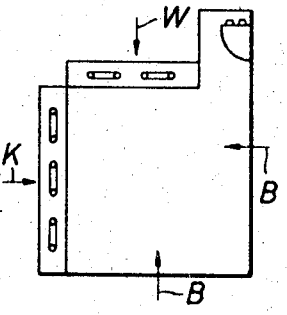


FIG. 9

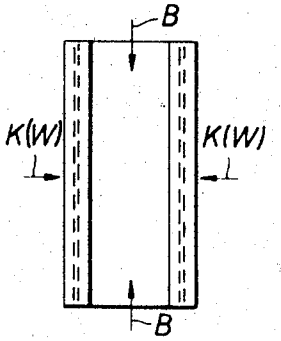


FIG. 10

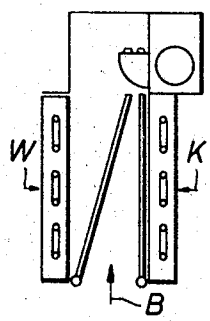


FIG. 11

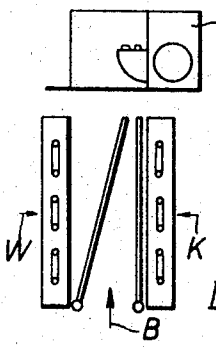


FIG. 12

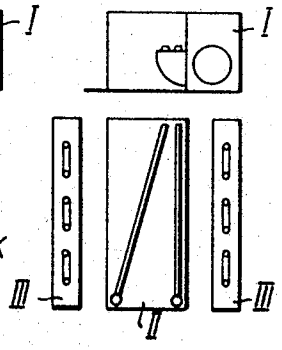
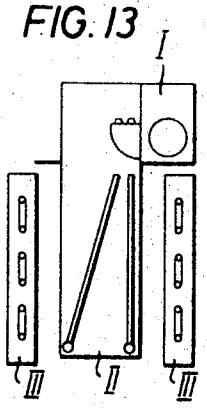


FIG. 13



INVENTOR

FRIEDRICH H. SCHMIDT

Oct. 7, 1969 F. H. SCHMIDT 3,470,945

AIR CONDITIONING APPARATUS

Filed Aug. 24, 1967 4 Sheets-Sheet 4

FIG. 14

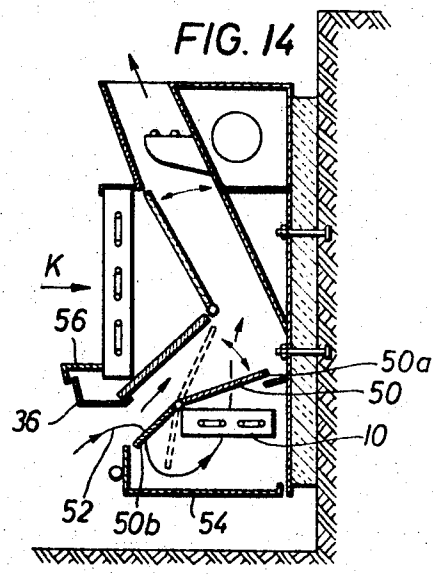
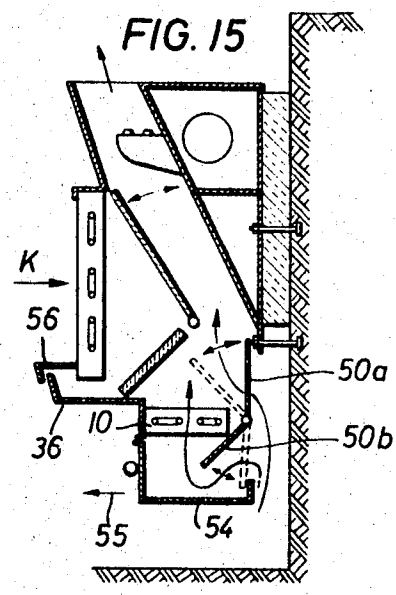


FIG. 15



INVENTOR
FRIEDRICH H. SCHMIDT

United States Patent Office

3,470,945

Patented Oct. 7, 1969

3,470,945

AIR CONDITIONING APPARATUS

Friedrich H. Schmidt, 15 Rheindorferstrasse, 5 Cologne-Weidenpesch, Germany

Filed Aug. 24, 1967, Ser. No. 663,479
Claims priority, application Germany, Aug. 27, 1966, Sch 39,467
Int. Cl. F25b *29/00;* F28f *13/12;* F24f *3/04*
U.S. Cl. 165—48 13 Claims

ABSTRACT OF THE DISCLOSURE

An air conditioner comprising an air injector type for introducing pressured and clean air from a central source to a room or space; an upwardly extending exhaust discharging air handled by the apparatus back into the room, with the jet jump of the primary air supply discharging in the exhaust conduit in a direction toward the exhaust outlet into the room whereby secondary air entering the conduit is entrainable to move with the primary air through the outlet; an air warming coil heat exchanger unit and an air cooling coil heat exchanger unit supplied with respective streams of heat exchange media hotter and colder than the ambient air to be conditioned; the units each, for air flow therethrough of secondary air, having one side opening to the room and the opposite side opening to the conduit upstream of the ejector pump; an air bypass inlet opening upstream of the openings of the units into the conduit, and having its inlet opening to the room so located relative to the heat exchanger units that secondary air entering the bypass does not pass over the external faces of the units to be consequently partially heated or cooled thereby; damper type air valves in the conduit controlling the secondary air drawn in the respective secondary air openings and preferably thermostat regulated; coplanar or angular dispositions of the units being shown, with thermal insulation therebetween; in modifications an opening of one or both units opening to the conduit downstream of the bypass opening thereto; the apparatus arranged alternatively for wall and for pit installations; and a further modification, with units disposed endwise to one another and the heater lowermost, including a heating panel arranged in a damper-like association across the front of the room side inlet of the heater unit, so that with air passing therebetween to a lower bypass inlet, when primary air supply system is inoperative, this damper in combination with the upward conduit enables utilization of the heater unit in a convection heater function for the room; further constructing as sub-assemblies or modules the heat transfer units, the damper valves, and the jet pump type air moving device with respective enclosing housings or supports separably attached to one another, to afford ready access for service and repairs; also air-controlling damper means comprising two damper flaps mounted on a common axis; and an air flow enclosure for the apparatus having a drawer-like bottom construction as a removable debris collector.

The present invention relates generally to air conditioning apparatus and more particularly to a room or space air conditioning apparatus having independent cold and warm heat exchangers, as air cooler and air heater units, used under control of air valves, for example flap valves or dampers, and having, for the requisite movement of primary air circulated by and through the apparatus, an air pumping assembly, which depending upon the setting of the air valves also draws air from the room through the cold or the warm heat exchanger or through a bypass, and returns the total air handled by the air conditioner to the room as conditioned air.

In known apparatus of this type the bypass is disposed between the air heating and cooling heat exchangers with the disadvantage that the secondary air flowing through the bypass into the apparatus is affected by the heat exchangers so located on both sides of the bypass, being partially heated or cooled in flowing over the front sides of the heat exchangers to enter the bypass and thus rendering the desired temperature regulation quite uncertain and problematic. Further, such prior arrangements of the bypass between the air cooling and the air warming heat exchanger units permit of only a few possible spatial arrangements of the two heat exchanger units relative to each other within the apparatus.

It is the object of the present invention to overcome these and other disadvantages, and to provide an air conditioning apparatus with other advantageous characteristics. For the attainment of this object, it is proposed in accordance with the invention that, in an air conditioner of the type described, warm and the cold heat exchanger units be structurally connected with one another or so disposed in such manner that the air bypass, the air flow of which is valve-regulated, is located in a region other than that between these two heat exchangers. This expedient of the invention then permits of multifarious modifications of the mutual spatial arrangement of the heat exchanger units; it being proposed that the two heat exchanger units be disposed in a common plane and separated from one another by an interposed thermal insulation means, or disposed at an angle to one another without possibility of flow therebetween of secondary air, which would be affected by the front sides of the heat exchangers. Further it is proposed that these heat exchanger units be disposed in spaced relation to one another, preferably vertically, and be connected at their lower ends in air-tight relation through a plate or the like.

Further in accordance with the invention it is proposed that the air heating unit be disposed beneath the air cooling unit in such manner that it serves in combination with the air exhaust conduit or shaft within the apparatus as a convection heater, when the primary air supply is shut off.

In air conditioners, as known, many heat losses arise especially through radiation from the heated exchanger unit. Since such radiation losses are in part dependent upon the temperature of the heat exchangers, a heater at higher temperature having radiation losses greater than a heater at lower temperature, to avoid or reduce the losses, by operation at a lower temperature by use of a heat supplying medium (generally heated water) of lower temperature, such heat exchangers have come to be provided with greater heat transfer surface or larger coils and accordingly to have larger structural, physical dimensions. The present invention proposes to solve this problem in another and simpler manner, by arranging the air heater unit within a chamber suitably insulated and fully closeable by a damper, which also serves for control of the actual thermal output of the heater; whereby it is possible to use heaters of smaller structural dimensions, supplied with the heat transfer medium at a correspondingly higher temperature.

In accordance with a further proposal of the invention, such a damper in air conditioning apparatus is comprised of two damper halves swingable on a common pivot shaft, and preferably disposed at an angle to each other.

In accordance with a further characteristic of the invention the lower part of the chamber enclosing the heater assumes a drawer-like structure serving as an easily cleaned and serviced dust and debris collector.

In prior air conditioners the heat exchanger units, the primary air impelling or pumping system and the dampers have been enclosed by a common housing; so that, if in the course of time the dampers must be serviced or

damaged individual components must be replaced by new parts, access to the dampers is extremely difficult. As a rule for this purpose, and also for repair of the heat exchanger units or of the air impelling assembly, the entire housing must be removed from the supporting wall or other place of installation, necessitating disconnection of the water supply lines to the heat exchangers.

To avoid this hitherto inconvenient labor, the present invention proposes that the heat exchangers, the air valves in the form of dampers, and the air supply system be arranged in separate, independent structural groups or subassemblies with enclosing housings or supports removably connected with one another; by further modification the primary air supply system being enclosed by a housing separably attached to the housing for the heat exchangers, with the air valves or dampers arranged in a housing or support which in its entirity is removable from the heat exchangers. It is also possible for the heat exchangers on the one hand and on the other the jet pump air drive or propelling system with the dampers to comprise respective sub-assemblies or modules.

The invention is explained in further detail with respect to some embodiments represented in the drawings. It is not limited to the depicted examples, but rather there are other possible modifications falling within the scope of the invention.

In the drawings:

FIG. 1 is a vertical section through an air conditioning apparatus representing another embodiment of the invention;

FIG. 2 is a vertical section through another embodiment representing a modification of FIG. 1;

FIG. 3 shows in vertical section a further modification of the invention; FIG. 3*a* the embodiment of FIG. 3 in plan view;

FIG. 3*a* is a plan view of the apparatus installation shown in FIG. 3;

FIGS. 4–9 show various possible mutual dispositions of the heating and cooling heat exchangers in an air conditioner;

FIG. 10 is a vertical section through one form of air conditioning apparatus;

FIG. 11 is a vertical section of an air conditioning apparatus modified in accordance with another aspect of the invention from that of FIG. 10;

FIGS. 12–13 are vertical sections through further modifications of the invention;

FIG. 14 is a vertical section through another air conditioning apparatus in accordance with the invention; and

FIG. 15 is a vertical section through a modification of the invention represented in FIG. 14.

In the air conditioning apparatus of FIG. 1, the heat supplying heat exchanger or air heater **10** and the thereunder lying cold supplying heat exchanger or air cooler **11** are disposed in a common plane and advantageously slightly forwardly inclined; with the cooler **11** having a greater heat transfer area than the heater.

The units are closely disposed endwise one upon the other with a thermal insulation block or plate **12** disposed therebetween to impede heat transmission from one to the other; the top end of heater unit **10** being also covered with a similar plate **13**. The front or inlet faces of both heat exchangers **10** and **11** are covered by a single advantageously changeable filter **29**.

The heat exchangers **10** and **11** are enclosed at the top, bottom and both sides by a housing **18** through which opens the top end of the discharge conduit **15** as an air moving duct within which there is disposed an air ejector **16** for pressured and clean primary air, having therewith associated and connected a primary air supply pipe **17** disposed in a downwardly tapering wedge-shaped casing. A set of jets supplied with pressurized air, located at **16** in the end of the elbow termination of the primary air supply pipe and aimed toward the discharge outlet of duct **15**, discharge primary air introduced by pipe **17** from a central source of clean pressurized air; the primary air sucking secondary air into conduit **15** and leads it back in the room. The secondary air has entered through the bypass or one of the heat exchangers **10** or **11**.

The apparatus back wall **19** is sufficiently spaced from the wall or like surface of the room to be air conditioned to provide a passage **21** having openings on several sides to permit inflow of secondary air as represented by the arrows **22** to enter the apparatus through a secondary air inlet opening or bypass **23** disposed in the back wall **19**.

Beneath this secondary air bypass inlet opening **23** the apparatus and flap type air valve or damper **24**, associated with the cooling coil type heat exchanger **11**, is attached to the back wall for pivoting about a horizontal axis. As represented in the position shown in solid lines in FIG. 1 this damper closes off the cooler **11** and opens fully the bypass opening **23** for inflow of the secondary air; at the position shown in dashed lines, completely closes the bypass **23**; while in stepless fashion intermediate positioning in the directions indicated by the arrow **25** is also possible. This damper then controls the cooling of the air and therefore, in effect the operation of the cooler by regulating the amount of secondary air passed therethrough.

With the air heater **10** is similarly associated a damper **26** swingable about a pivot axis **27** disposed close to and in the plane of separation of the heat exchangers **10** and **11**. This damper **26** can likewise be steplessly set in positions along the direction indicated by the arrow **28** between the position shown in dashed lines, full open for secondary air entering the front face of the heater and simultaneous closing off of introduction of secondary air through the inlet opening or bypass **23**, and the closed position shown in solid lines. When in the closed position represented by solid lines in FIG. 1 this damper renders the heater **10** ineffective, and serves to regulate the effectiveness or extent of heat transfer by the heater to secondary air and hence to the room.

The two dampers **24** and **26** can be set individually or jointly and through their arrangement they cannot interfere with each other; and by each it is possible to open and close or to provide an intermediate setting for the bypass **23**. Hence it is possible through the available settings of each of the individual dampers to provide the optimum conditions for conditioning of the room.

In the modification of FIG. 2 the air heater is shown in the lower position in combination with a radiation panel in the form of a damper type structure **39**, which, with the by pass closed through the damper **24**, has the purpose, in combination with air exhaust duct **15**, of enabling utilization of the air heater **10** as a convection-type air heater for heating of the room when the primary air feeding system is shut off.

In the embodiment of FIGS. 3 and 3*a*, the room or space air conditioning apparatus is disposed in a pit **30** close to the window **31** of the room thereabove. The floor slab or pavement **32** of the room is shown as finished by the floor covering **33**. In contrast with the embodiment of FIG. 1, here the cooler unit **11** is disposed above and at right angles to the heater **10**. A partition **34** provided on its upper and lower sides with thermal insulation layers **35** is disposed therebetween, so that no exchange of heat or cold can occur between the two heat exchanger units **10** and **11**; a similar insulation layer being provided also on both ends of the heat exchangers. A condensed moisture pan or drip trough **36** is also provided for the cooling unit.

In like manner, as described for and shown in FIG. 1, the inlet for the secondary air going through the bypass is not disposed between the heat exchangers **10** and **11** in FIGS. 2 and 3, but rather in these embodiments, looking in the flow direction of the secondary air through the heat exchangers, it is disposed behind the latter. Inasmuch as the heat exchangers are closeable at their back sides by dampers in the conduit **15** this sec-

ondary air can be introduced into the air conditioner substantially uneffected by the heat exchangers.

Likewise, as in FIG. 1, the air impulsion of exhaust conduit **15** is provided with an air jet pump type arrangement for the primary air supplied through the primary air supply connection pipe **17**; and the secondary air introduced into the conduit **15** is controlled through the damper valves **24** and **26**. Here the damper **24** controls the secondary air to be cooled in the cooler **11** either by full closure as shown in solid lines in FIG. 3 to render the cooler ineffective, or fully open as represented by dashed lines to handle and correspondingly cool secondary air exclusively through the air cooler **11**.

The secondary air to be cooled enters cooler **11** through vertically extending passage **37** corresponding in width to the air cooler unit **11**. The passage is provided exclusively for the cooler unit and is shown in FIG. 3 as located close to and below the window **31**.

When the damper **24** associated with cooler **11** is open, the air passes through the conduit **15** with its air moving assembly **16** and leaves through advantageously changeable grill or grate **38** disposed above the conduit **15**.

When the damper **26** for the air heater unit **10** is open, at the dashed line position, then the secondary air feed is conducted exclusively through the heater **10**, coming in through the grills **39** and **40** having therebeneath on the sides of the apparatus vertically extending passages reaching to the pit bottom **41**.

The conduction or flow of secondary air past the heat exchanger **10** is precluded since the damper valve **26** obstructs the feed to conduit **15** of secondary air which is not going through the heat exchanger **10**, because the conduit **15** is closed off by valve **26** (as represented in dashed lines) for such untreated air.

When the heater **10** is rendered ineffective by the valve **26** at its closed position (represented by solid lines in FIG. 3), then the secondary air introduced through the grills **39** and **40** with the associated passages is prohibited from getting through the heater **10** into the conduit **15**. This secondary air can, however, through the trough or channel **42**, reach the conduit **15** to discharge therefrom through the grating **38**, because the channel **42** does not reach endwise to the side walls of the pit and accordingly is open at both lateral ends.

By the setting of the dampers **24** and **26** at different intermediate positions, for which they are advantageously controlled through thermostats, the desired air treating conditions are also provided with the arrangement of FIG. 3.

The heat exchangers with associated passages are either arranged inside of a housing mounted above the floor level **33** or, or represented in FIG. 3, installed in a pit **30**. For a pit installation the structural elements are mounted on a bracket or support **43** fabricated of a sheet steel plate, with associated bars or stiffeners **44** secured on the sides of the apparatus. This bracket is bolted into position on or supported by the anchor bolts **45** embedded in the concrete of the pit wall. To avoid the introduction of unwanted or leakage air, the back wall **36** of the apparatus is sealed to the adjacent facing wall of the pit through packing materials **47**.

In FIG. 4, showing an arrangement corresponding to FIG. 1 but having vertically extending heat exchange units in air-tight abutment to one another, the air streams which are passing from the air conditioned space into the appaartus through the heater unit **10** and the cooling unit **11** are indicated respectively at W and K; with suitable locations of the bypass air inlet being designated B. The air bypass again is not disposed between the heat exchange units but rather is located externally of these at other places, for example below or in the top or bottom regions of the back wall.

FIG. 5 is comparison with FIG. 4 shows the positions of the heat exchange units reversed with the cooling unit above and heating unit below.

FIG. 6 shows an arrangement of the two heat exchanger units **10** and **11** at an angle to one another wherein the bypass can be disposed at the locations indicated by the reference letter B.

FIG. 7 shows the two heat exchanger units **10** and **11** disposed vertically but spaced from one another and connected at the bottom by a plate **48** to preclude a secondary air access therebetween; but an equivalent of plate **48** can, however, also be provided by the bottom of a housing or of a pit.

FIG. 8 shows an arrangement of the heat exchange units in dispositions reversed from FIG. 6, with the horizontally disposed heater unit **10** here being located at the top end of and at an angle to the vertical cooler unit **11**. Since the heat exchanger units are closeable through dampers at their back sides, as was shown and described for FIGS. 1–3, the possibility appears that the secondary air can flow to the bypass uneffected by the heat exchangers.

FIG. 9 shows what would be a top plan view of the embodiment of FIG. 7, but with the expedient that the bypass is arranged on the sides of the apparatus.

FIG. 10 is a vertical section showing in principle a prior construction of air conditioning apparatus in which all of the necessary functional parts are disposed in one housing. Inspection of the individual components, or the replacement of parts is therefore extremely burdensome. For example, if the air valves, particularly when in the form of dampers, must be overhauled, it has hitherto been necessary, in order to make these accessible, to disconnect the heat exchangers from the water pipes and take the apparatus apart.

In accordance with another aspect of the present invention, as shown in FIG. 11, an air conditioning apparatus is provided in three functional sections namely the jet pump air driving or impelling system as functional section I, the air controlling valve system as functional section II, and the heat exchangers as functional section III. In accordance with the invention it is not merely proposed to make a distinction between three functional sections or groups in an air conditioning apparatus, but rather to divide these three functional sections each into its own respective structural group or sub-assemblies, which are assembled into a unified air conditioner apparatus, but which can be separated from one another in a simple fashion as structural sub-assemblies.

Thus as outlined in FIG. 11, it is proposed that the jet pump air drive or system as a primary air supply be disposed in a separate housing to comprise the first functional section which can be separably connected with an enclosing housing or support for the heat exchangers and the control dampers. Hence it follows that for an inspection of the primary air supply system, the functional element I can be separated as a closed sub-assembly or structural group from the other sub-assemblies of II and III, providing a simple access to the sub-assemblies or structural groups II and III.

In accordance with a further modification of the invention in principle, in outline represented FIG. 12, it is proposed to arrange all three functional sections I, II, and III separable as to one another. Thus the primary air supply system I can be removed from the apparatus; and it is also possible to separate the control dampers as the functional section II from the heat exchangers. In similar manner it is possible to separate the heat exchanger as the functional section III, from the functional sections I or II. Accordingly a considerable expenditure of labor is saved in maintenance and also in a partial or complete renovation of the air conditioning apparatus. Also the fabrication of air conditioner apparatus comprised of the sub-assemblies I, II, and III, is now simplified. FIG. 13 discloses the design wherein the functional sections I and II stay together with the functional section III separable therefrom. It is to be noted that this division into sub-assemblies is independent of the spatial arrangement of the bypasses.

FIG. 14 discloses the heater unit **10** disposed in such

manner that it is completely closeable or enclosed through a damper **50** comprised of two damper halves **50***a* and **50***b* having a common pivot axis **51** and disposed at an angle to one another; the closed position being represented in solid lines to the extent that the heater unit **10** is externally completely hermetically closed. In combination with a thermal insulation applied to the dampers on the side which is disposed towards the heater unit **10**, heat radiation to the exterior is hindered. The open position of the valve **50** is represented in dashed lines. With this open condition of valve **50**, the secondary air can be lead back in the indicated arrow direction **52** through the air impelling conduit into the space to be air conditioned.

FIG. 15 is a modification of FIG. 14, where again the heater **10** is completely hermetically closable from the outside through the valve **50**, here comprised of two damper halves disposed at an angle to one another, pivotable about the axis **51** between the open and closed positions represented respectively in solid and dashed lines. The lower part of the housing surrounding the heater unit **10** is built as a drawer structure **54** and thereby serves as a dirt collector which can be easily removed through withdrawal of the drawer in the direction indicated by the arraw **55** or in another direction.

Beneath the cooling unit **11** there is disposed a condensed atmospheric water vapor receiving drip pan trough **36** covered by a removeable lid **56**. Dirt of like deposits in the air conditioning apparatus gather either in the above described drawer structure or in the moisture condensate pan, so that an easy removal of these is possible.

I claim:

1. A room or space air conditioning apparatus comprising:

an upwardly extending main duct discharging upward into said space;

two independent respectively air cooling and air heating heat exchanger units, through which air may pass from said space into said duct for return to said space;

on the duct side of each unit, a respective air valve opening to said duct for controlling air flow from said space through, and thereby the heat transfer of, the respective unit;

bypass passage from said space discharging through an air valve controlled opening to said duct;

a primary air supply and circulating system including jet pump type air ejector means discharging primary air into and upwardly through said duct and, dependently upon the setting of the air valves, thereby drawing secondary air from said space into said duct, through the cooling unit, the heating unit or the bypass passage, and returning it as conditioned air to the room;

said ejector means disposed in said duct at a level above, that is, downstream of, said heater exchangers and said air valves and opening of the bypass thereby to improve servicing accessibility of the ejector means from the discharge end of said duct and diminish internal, air flow noise in the apparatus.

2. Air conditioning apparatus as described in claim **1** wherein said bypass enters said apparatus at an inlet location external to that smallest continuous external area of the apparatus comprehending the inlets from said space to the heat exchanger units.

3. Air conditioning apparatus as described in claim **2**, wherein the said heat exchanger units are disposed in a common plane separated from one another by interposed insulation means.

4. Air conditioning apparatus as described in claim **2**, wherein the said heat exchanger units are disposed at an angle to one another.

5. Air conditioning apparatus as described in claim **2** wherein the said heat exchanger units are disposed in a spaced parallel relation with one end of each connected to the corresponding end of the other by an air-blocking structure with a bypass inlet to the inter-unit space above said air-blocking structure.

6. Air conditioning apparatus as described in claim **1**, wherein said air heating unit is disposed below the air cooling unit at a lowermost position in the apparatus and extends under, to open at least partially upwardly to, the duct whereby in combination with the said duct the heating unit may serve as a convection heater for said space when the primary air supply system is not operating.

7. Air conditioning apparatus as described in claim **6**, wherein an inlet face of said heating unit is inclined toward the space and having in spaced relation before the said inlet face a movable wall formed as a damper whereby the wall may be pivoted to a non-functioning-position allowing free access of room air to said inlet face, and to a functioning position disposed to extend downwardly from the upper edge of and spaced from the heating inlet face to a level vertically spaced from underlying structure to define a secondary air inlet opening near the bottom of said apparatus for convection heater operation of the apparatus.

8. Air conditioning apparatus as particularly described in claim **1** wherein the heat exchanger units are disposed at an angle to one another and having:

said duct centrally disposed in the apparatus;

the cooling unit disposed in a vertical plane, and the heating unit extending from the region adjacent the bottom end of the cooling unit disposed in spaced relation to a horizontal surface to define an air inlet space beneath the inlet face of the heating unit; a front supply passage for secondary air to be cooled extending downwardly over the inlet face of the cooling unit; at least one secondary air lateral supply passage spaced from the first said supply passage, extending downwardly to open into the inlet space for the heating unit and likewise opening, above the heating unit, as a bypass opening, into the said duct;

as a said air valve for the heating unit, a damper located above the heating unit and disposed for completely or partially opening and closing off the paths for through flow of secondary air through the heating unit and for secondary air flow through the bypass into said duct; and

as a said air valve for the cooling unit, a damper located behind the cooling unit, and disposed for entirely or partially opening and closing off the paths for through-flow of secondary air through the cooling unit and for secondary air flow in the duct from said bypass and from said heating unit.

9. Air conditioning apparatus as described in claim **8**, wherein said dampers are mutually disposed to clear each other in all simultaneous settings, whereby all secondary air may be drawn through the bypass to provide air circulation without conditioning; may be drawn solely through the heating unit without dehumidification by the cooling unit; may be drawn solely through the cooling unit for cooling and dehmumidification; may be drawn partially through the bypass and through either the heating or cooling unit to regulate the degree of heating or cooling; and further may be drawn through both heating unit and cooling unit with or without bypass to obtain a desired temperature and relative humidity.

10. Air conditioning apparatus as described in claim **1** wherein said heating unit is disposed at a level below the cooling unit and having an enclosure for the heating unit including a drawer-like bottom structure to serve as a removable debris collector.

11. A construction for air conditioning apparatus, as particularly described in claim **1** wherein the air valves, the heat exchanger units, and the primary air supply system are disposed in at least two separate independent structural subassemblies having respective subassembly-enclosing housing and support structures separably connected with one another.

12. Air conditioning apparatus as described in claim 11, wherein the primary air supply system subassembly includes a housing separably attached to a housing for the heat exchanger units, and the air valves are disposed in a mounting removable as an entirety from the heat exchanger units.

13. Air conditioning apparatus as described in claim 11, wherein the primary air supply system and the air valves are comprehended in one subassembly, which is separable from a subassembly comprehending the heat exchanger units.

References Cited

UNITED STATES PATENTS

3,232,342	2/1966	Boysen et al.	165—123
3,323,584	6/1967	Serratto	165—123

ROBERT A. O'LEARY, Primary Examiner

C. SUKALO, Assistant Examiner

U.S. Cl. X.R.

165—123