Dec. 20, 1938. E. S. CORNELL, JR 2,140,787

CONDITIONED AIR SUPPLYING AND AIR WITHDRAWING THERMAL SYSTEM

Filed Aug. 10, 1935 2 Sheets-Sheet 1

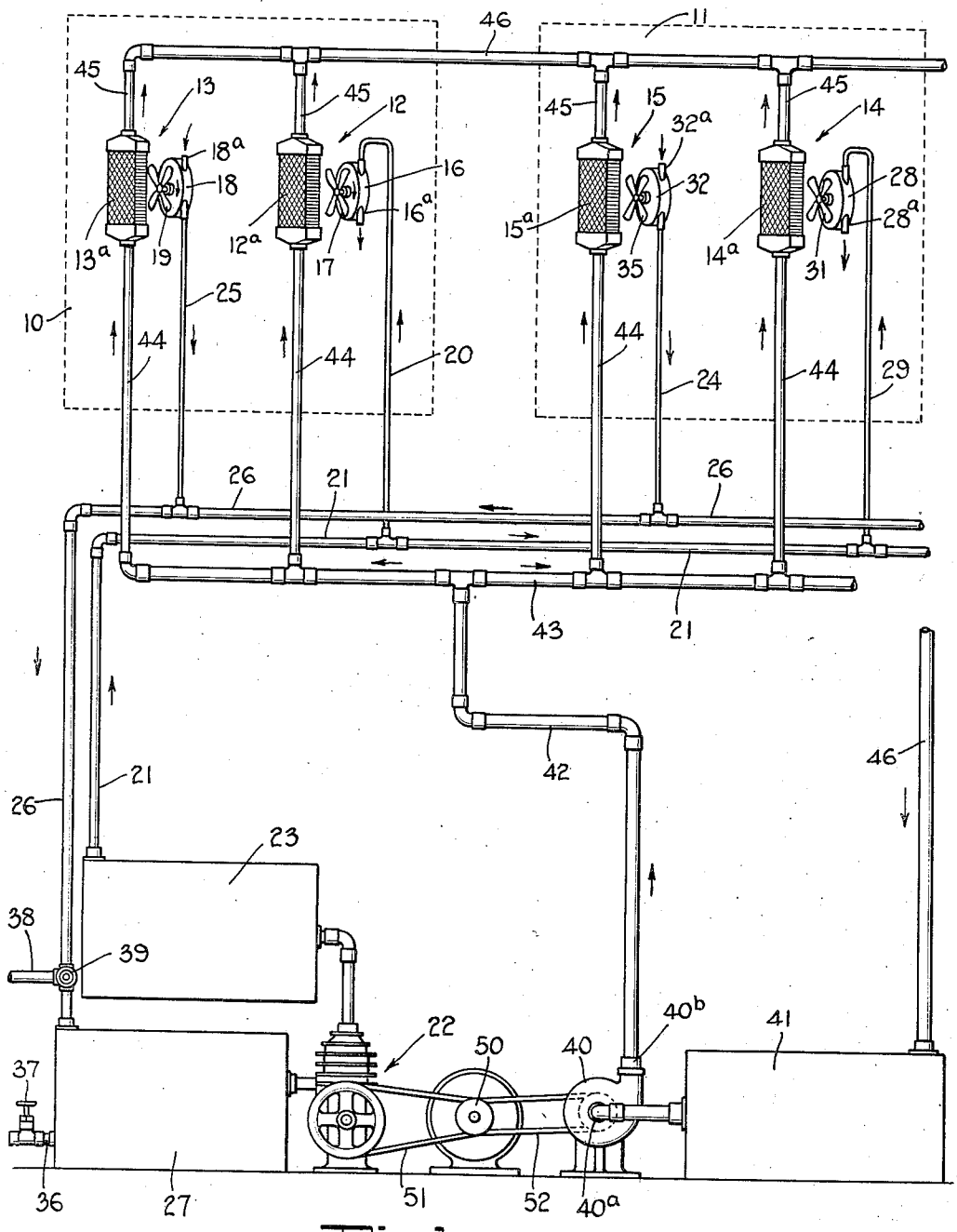

Fig. 1.

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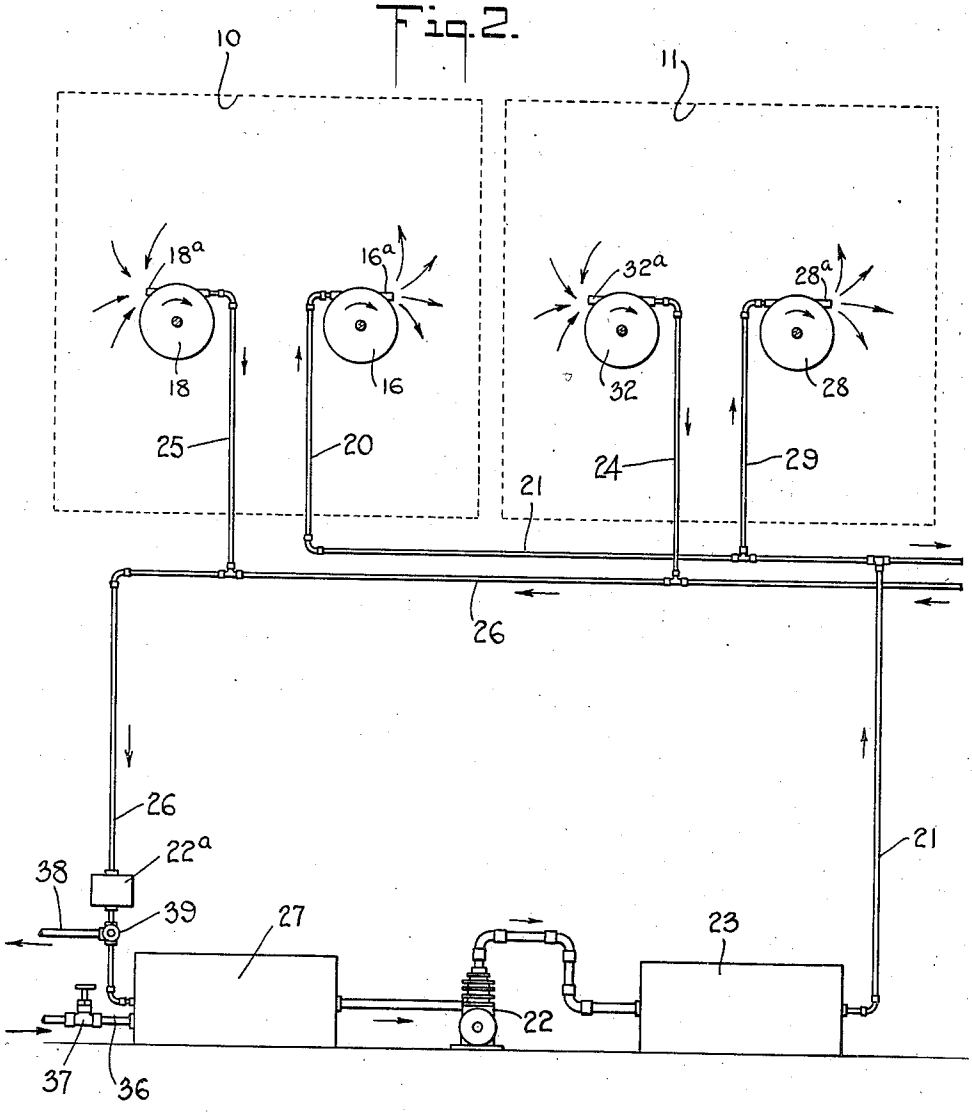
Fig. 2.



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CONDITIONED AIR SUPPLYING AND AIR WITHDRAWING THERMAL SYSTEM

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Application August 10, 1935, Serial No. 35,662

6 Claims. (Cl. 98—33)

My invention relates to air supplying and air withdrawing thermal systems.

More particularly, my invention relates to a thermal system comprising thermal means serving a room or other space of a building or other structure, means including a fan or equivalent in association with such thermal means for projecting air in thermal exchange relation therewith, and air under superatmospheric and subatmospheric pressures respectively operating said air projecting means, whereby dually air is supplied to and withdrawn from the room or other space served by the thermal means.

Pursuant to my invention, such air projecting means effects a circulation of the air of the room or other space served by its associated thermal means.

Preferably, the air supplied under superatmospheric pressure is conditioned, thus supplying conditioned air and circulating the same within the room or other space. The air withdrawn from the room or other space under subatmospheric pressure may be treated for conditioning, and in conditioned status may be compressed to superatmospheric pressure for supply to the room or other space.

If desired, the whole or substantially the whole of the conditioned air may be drawn from the outer atmosphere, i. e., fresh air, and/or the whole or substantially the whole of the air withdrawn from the room or other space may be discharged into the outer atmosphere.

My system may provide also for the utilization of fresh air supplied to the room or other space, supplementing the air conditioned or to be conditioned and supplied under superatmospheric pressure, and/or supplementing the air returned, i. e., withdrawn from the room or other space, and subsequently supplied thereto.

My invention is applicable for heating purposes, the heating medium being supplied either by an individual heating source per suitable piping or the heating medium may be supplied from a central source per a suitable central supply piping and additional heating units respectively serving additional rooms or other spaces.

My invention is applicable for cooling purposes, the cooling medium being supplied either by an individual cooling source per suitable piping with the thermal means, or the cooling medium may be supplied from a central source per a suitable central supply piping and additional cooling units respectively serving additional rooms or other spaces.

In general, my thermal system embodies the principles set forth in my co-pending application, Serial No. 687,376, entitled Air conditioned heating and cooling system, maturing as U. S. Patent No. 2,038,347, dated April 21, 1936.

The specific structure of thermal unit, air motor and fan and enclosing casing, and also their mounting means and relative positioning within the casing, set forth in my co-pending application, entitled Thermal unit, bearing Serial #24,283, filed May 31st, 1935, may be utilized for any or all of the respective thermal means arranged and operated pursuant to my present invention.

Further features and objects of my invention will be more fully understood from the following detail description and the accompanying drawings, in which

Fig. 1 is a diagrammatic view showing one manner of application of my invention; this view illustrates thermal means respectively for two rooms or other spaces, as a portion of a central thermal system.

Fig. 2 is a simplified diagrammatic view showing one manner of supply of superatmospheric pressure air to air motors of the respective indicated two rooms and the withdrawal of air from such two rooms respectively through air motors under subatmospheric pressure, such air motors cooperating respectively with suitable thermal members (not shown).

Referring to the drawings, it is stated that the specific embodiments shown therein are purely for illustrative purposes.

Referring to the system diagrammatically indicated in Figure 1—

10 indicates one room or other space served by its thermal means referred to more particularly hereinafter, such room or other space 10 being diagrammatically indicated in dash outline.

11 indicates similarly a second room or other space served by its thermal means. It is understood that the number of rooms additionally served by their respective thermal means may be as desired. Also, whereas the system illustrated in Fig. 1 is of the central thermal supply type, also of the central supply type with respect to the superatmospheric and subatmospheric pressure air lines, the principle of the system is not limited thereto and is applicable to a single or individual system as distinguished from a central thermal supply system and/or central superatmospheric pressure and subatmospheric pressure air system.

As is indicated in Fig. 1, the thermal means for the room 10 comprises two thermal units respectively designated 12, 13. The structure of

such thermal units 12, 13, may be as desired; I prefer the structure of such thermal units as is set forth in my copending application Serial No. 24,283, filed May 31st, 1935, entitled Thermal unit.

The thermal means of the room 11 are indicated at 14, 15; the structure of the same may be that of the structure of the thermal means 12, 13, or other approved structure.

An air motor 16 is associated with the thermal unit 12a and may be of any suitable structure; I prefer the air motor structure set forth in my U. S. Patents, No. 1,926,527 and No. 1,926,528, granted September 12th, 1933.

Air motor 16 is shown operated under superatmospheric pressure, under which condition of operation it is connected by suitable piping 20 to air main 21, in turn connected with the pressure port of a suitable compressor indicated at 22. Preferably a reservoir 23 is connected, as indicated in Fig. 1 or equivalent, between the compressor 22 and the air main 21. The discharge of the air motor 16 is indicated at 16a the air thus released from the motor 16 being delivered in any suitable manner to the interior of the room 10. The air under compression, i. e., superatmospheric pressure, supplied to the air motor 16, effects the rotation or other actuation of its rotor (not shown), and therewith the fan 17 or equivalent, thereby forcibly projecting air in thermal exchange relation with the effective thermal surfaces of its associated thermal member 12a. As is disclosed in my aforesaid copending application, Serial No. 24,283 such thermal member 12a and its associated fan are preferably enclosed in a casing, providing for inflow of air into such casing from the interior of the room such as the room 10, and its subjection thermally to the thermal member 12a, whereby the air of the interior of the room 10 is circulated, also, the released previously compressed air supplied to such room 10, and, further, the circulated air and the thus released air subjected to thermal treament by passage through such thermal member 12a.

The subatmospheric air motor 18 and its fan 19 of the same room, i. e., the room 10, may be similarly associated with its thermal member 13a.

The subatmospheric pressure motor 18 is shown connected by suitable piping 25 to the air main 26 connected with the suction port of a suitable compressor, which may be the stated compressor 22; if desired, and as preferred, a reservoir 27 is interposed between the air main 26 and such compressor.

The intake of the subatmospheric pressure motor 18 is indicated at 18a, the air thus being withdrawn from the interior of the room 10 under such subatmospheric pressure, whereupon the rotor or other movable element of the air motor 18 is actuated, effecting the drive of its fan 19 or equivalent, and effecting the projection of air of the room 10 relative to the thermal surfaces of the thermal unit 13a, whereby the air of the interior of the room 10 is circulated and also thermally treated, and also air effective under subatmospheric pressure in the operation of such suction air motor withdrawn from the interior of the room 10.

The thermal means of the room 11 may be of the same or other approved structure and the same or other approved relationship. As indicated in Fig. 1, the superatmospheric pressure air motor 28 is shown connected by suitable piping 29 to the compressed air main 21, the stated piping 20 of the superatmospheric pressure motor 16 and the piping 29 of the superatmospheric pressure motor 28 being preferably arranged in mutually multiple connection with the air main 21; other approved form of piping connection and/or air motor connection may be employed. The discharge of the superatmospheric pressure motor 28 is indicated at 28a and its fan at 31.

The air flow through the pressure main 21 and the therewith connected piping 20 and 29 is indicated by appended arrows.

The subatmospheric pressure air motor of the room 11 is indicated at 32, having an intake port 32a, and connected by suitable piping 24 to the suction air main 26, such piping 24 and the stated piping 25 of the subatmospheric pressure air motor 18 of the room 10 being preferably arranged in mutually multiple connection with the air main 26; however, the connection of such piping 25, 24, and/or such subatmospheric pressure air motors 18, 32, may be as preferred. The fan of the subatmospheric pressure motor 32 is indicated at 35.

The air flow through the stated main 26 and the therewith connected piping 25 and 34 is indicated by appended arrows.

By such or equivalent thermal means, the air of the interior of the room 11 is circulated, further, subjected to thermal treatment by the respective thermal units 14, 15, further, air is supplied to the interior of the room 11 by the operation of its superatmospheric pressure air motor 28 and air is withdrawn from such room 11 by the operation of its subatmospheric pressure motor 32.

Suitable air cleaning and/or humidity controlling equipment may be enclosed within the tanks 23, 27, or either, or associated anteriorly or posteriorly or otherwise with either or both tanks 23, 27, or equivalent. If desired the main 26 may be connected to a suction pump or equivalent and discharged into the outer atmosphere in whole or in part.

Fresh air may be supplied to the system as may be preferred. I have indicated a pipe 36 arranged to communicate with the outer atmosphere and controlled by any suitable valve 37, for the inflow increment of fresh air.

I have also indicated in Fig. 1 a pipe 38 and a regulating valve 39 for controlling the discharge of the air withdrawn from the rooms or other spaces 10, 11, etc. into the outer atmosphere.

The supply of the thermal fluid to the respective thermal members 12a, 13a, 14a, 15a, etc., may be effected as desired. For purposes of illustration, I have shown at 40 in Fig. 1 a circulator or equivalent, its intake port 40a suitably connected to a suitable central thermal device, viz., a heater or a cooler, indicated diagrammatically at 41, and the discharge port 40b suitably connected as by piping 42, to a main 43, with which the respective pipes 44 are suitably connected and thence with the respective inflow ports of the thermal members 12a, 13a, 14a, 15a, etc. The pipes 45 indicate piping connections with the discharge ports of the respective thermal members 12a, 13a, 14a, 15a, etc., thence to one or more return mains indicated at 46 and eventually returned to the central thermal device 41. The flow of the thermal fluid through the stated piping is indicated by appended arrows.

Such air compressor or compressors and/or air suction pump or equivalent, 22, may be driven by any suitable means. Such circulator or pump for the thermal fluid, such as water, indicated

at 40 may be driven by any suitable means. For illustration purposes I have indicated in Fig. 1 a motor at 50 and belts or equivalent at 51, 52, for driving in common such air compressing and suction means and such thermal fluid circulating means. Such common drive assembly possesses the further advantage in affording simultaneous and correlated flow of the air and thermal fluid, the latter relationship involving correlated flow of air and the thermal fluid.

As set out in my aforesaid co-pending applications, control valves for regulating the respective air motors or equivalent may be supplied, to partially restrict or fully shut off the same respectively. Advantageously, the thermal members or units or the thermal means of any room are located within a wall of the room or otherwise arranged to effect thermal treatment of the air of such room only upon actuation, full or partial, of the air motor and fan or equivalent, thus affording thermal treatment of the air of the respective rooms solely by corresponding setting of the control valve or valves of the air motor or motors or equivalent of any particular room to suit personal comfort, that is independently of the rate of flow of the thermal fluid supplied through the thermal member or unit of the thus controlled air motor or motors. Shut-off valves of the usual or other approved types for the individual thermal members or units and proper piping arrangement may be employed; whereby shutting-off the thermal member or units comprising the thermal means of any particular room or other space affords the supply of air, preferably conditioned, to such room or space, also, the withdrawal of air therefrom, and also the re-circulation of the air of such room, in such instance without thermal treatment.

In Fig. 2 the superatmospheric pressure, i. e. compressed air and the subatmospheric pressure, i. e. suction air lines and appurtenant parts, are indicated schematically, and the compressed air and suction air motors are illustrated, independently of the piping and thermal members or units. It is understood with reference to the diagrammatic illustration of Fig. 2 that each air motor is equipped individually with a fan, and further that each motor and fan assembly represents any suitable type of device actuated by compressed air or air under suction to respectively supply and withdraw air from the interior of the room or other space so served. Parts and elements depicted in Fig. 2 corresponding to those of Fig. 1 are designated by like reference characters. The appended arrows indicate the directions of air flow to and from the indicated respective rooms 10, 11, etc., in accordance with my invention.

In the arrangement shown in Fig. 2 I have also indicated a suction pump 22*a*, suitably driven, for exhausting air from the respective rooms or other spaces 10, 11, etc., discharged in whole or in part into the outer atmosphere, as through a pipe 38, controlled by a valve 39.

The thermal means of any room or other space may comprise a single assembly of radiator sections or equivalent through which the thermal medium passes and having outer surfaces of relatively large area, with which both the superatmospheric pressure and subatmospheric pressure air devices jointly cooperate, as by positioning the same laterally or vertically side by side, or separate thermal means may be individually operated by the respective superatmospheric pressure and subatmospheric pressure devices of any given room or other space, to effect the stated combinational thermal and air supplying and air withdrawing treatments coupled with the circulation of the air of such room or other space.

In the claims, I employ for brevity the term "room" to include any space such as a hallway, corridor, entrance or other area of any floor or other portion of a building or like structure.

Whereas I have described my invention by reference to specific forms thereof, it will be understood that many changes and modifications may be made without departing from the spirit of the invention.

I claim:

1. The combination with a space of a building or the like, said space being defined by wall means; of thermal means disposed in such space; motor driven means disposed within said space for circulating the air of such space in thermal exchange relation with said thermal means; suction air motor means arranged for driving said air circulating means and for withdrawing air from said space; superatmospheric pressure means communicating with the interior of said space for supplying compressed air to the interior of said space; and common means for operating said suction air motor means and said superatmospheric pressure means.

2. The combination with a space of a building or the like, said space being defined by wall means; of thermal means disposed in such space; air motor driven means disposed within said space for circulating the air of such space in thermal exchange relation with said thermal means; suction air motor means arranged for driving said air circulating means and for withdrawing air from said space; superatmospheric pressure air motor means for supplying compressed air to the interior of said space; and common means for operating said suction air motor means and said superatmospheric pressure air motor means.

3. The combination with a space of a building or the like, said space being defined by wall means; of thermal means disposed in such space; motor driven means disposed within said space for circulating the air of such space in thermal exchange relation with said thermal means; suction air motor means arranged for driving said air circulating means and for withdrawing air from said space; superatmospheric pressure means communicating with the interior of said space for supplying compressed air to the interior of said space; an air compressor having an air inlet and an air outlet; piping connecting said suction motor means with the air inlet of said compressor; and piping connecting said superatmospheric pressure air means with the air outlet of said compressor.

4. The combination with a space of a building or the like, said space being defined by wall means, of thermal means disposed in such space; air motor driven means disposed within said space for circulating the air of such space in thermal exchange relation with said thermal means; suction air motor means arranged for driving said air circulating means and for withdrawing air from said space; superatmospheric pressure air motor means for supplying compressed air to the interior of said space; an air compressor having an air inlet and an air outlet; piping connecting said suction motor means with the air inlet of said compressor; and piping connecting said superatmospheric pressure air motor means with the air outlet of said compressor.

5. The combination with a space of a building or the like, said space being defined by wall

means; of thermal means disposed in such space; motor driven means disposed within said space for circulating the air of such space in thermal exchange relation with said thermal means; suction air motor means arranged for driving said air circulating means and for withdrawing air from said space; superatmospheric pressure means communicating with the interior of said space for supplying compressed air to the interior of said space; an air compressor having an air inlet and an air outlet; piping connecting said suction motor means with the air inlet of said compressor; piping connecting said superatmospheric pressure air means with the air outlet of said compressor; valve means disposed in said piping for admitting fresh air thereto; and valve means disposed in said piping for discharging air therefrom.

6. The combination with a space of a building or the like, said space being defined by wall means; of thermal means disposed in such space; motor driven means disposed within said space for circulating the air of such space in thermal exchange relation with said thermal means; suction air motor means arranged for driving said air circulating means and for withdrawing air from said space; superatmospheric pressure air motor means for supplying compressed air to the interior of said space; an air compressor having an air inlet and an air outlet; piping connecting said suction motor means with the air inlet of said compressor; piping connecting said superatmospheric pressure air motor means with the air outlet of said compressor; valve means disposed in said piping for admitting fresh air thereto; and valve means disposed in said piping for discharging air therefrom.

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