

March 25, 1958

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2,828,076

AIR CONDITIONING APPARATUS

Filed Aug. 1, 1955

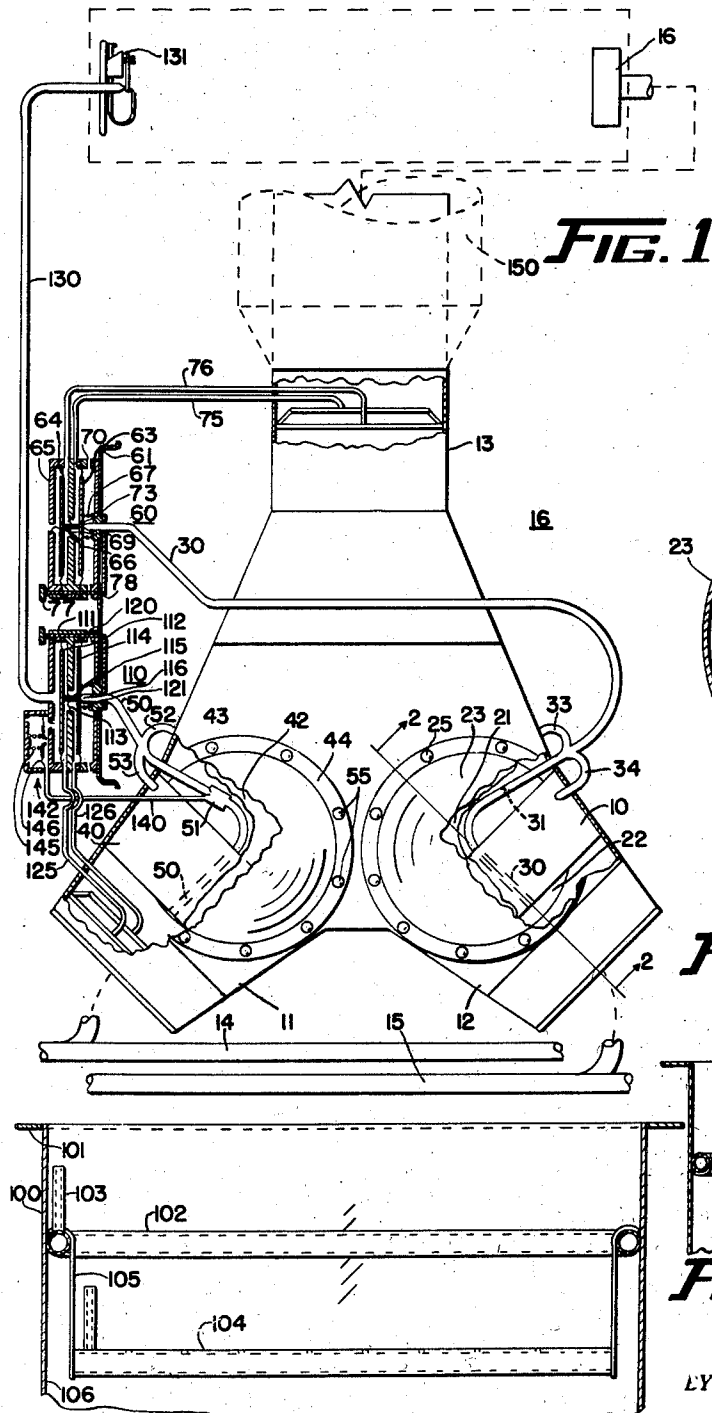


FIG. 1

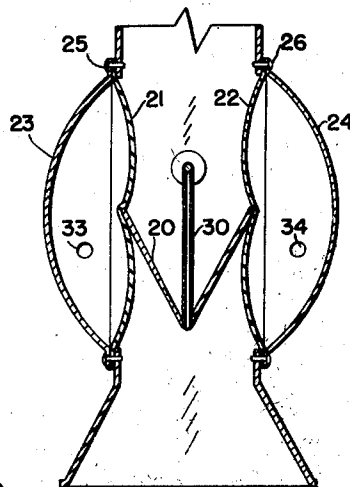


FIG. 2

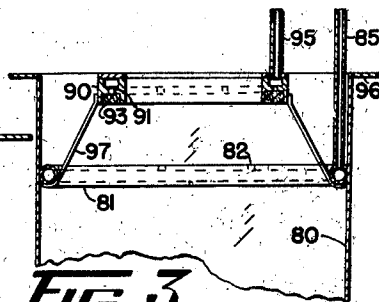


FIG. 3

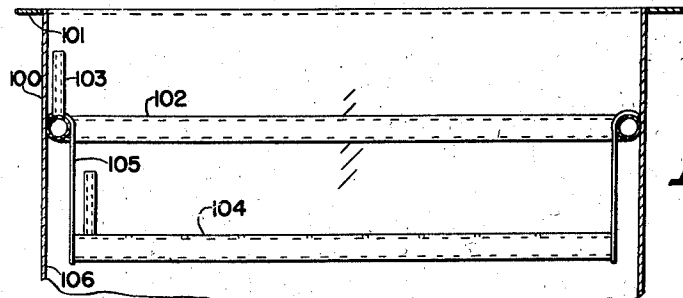


FIG. 4

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2,828,076

AIR CONDITIONING APPARATUS

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Application August 1, 1955, Serial No. 525,705

14 Claims. (Cl. 236—13)

This invention relates to air conditioning apparatus and more particularly to apparatus designed to control the mixture and distribution of two different air conditioning mediums into a space to be air conditioned.

Air distribution apparatus in which two different air conditioning mediums are controllably mixed and delivered to a space to be air conditioned have previously been used in air conditioning apparatus, but such units have generally taken the form of blender boxes which are located at or in the space to be air conditioned. These units have been of the self-contained type and are operated to control both temperature and volume of the air delivered.

The subject invention is directed primarily to a simplified duct structure including air conditioned flow controlling means and associated control apparatus which operate as a self-contained unit to control both the volume delivered air and the temperature of the delivered air. This unit may be attached to existing duct structures in which the controlling medium is supplied from a central conditioner and will supply the properly mixed and controlled amount of air conditioning medium to a duct leading to the space to be air conditioned in a simple compact unit which does not require location in the space to be air conditioned.

It is therefore an object of this invention to provide a simplified air conditioned and distributing apparatus.

It is also an object of this invention to provide a simplified and improved air conditioned flow apparatus or valve in a duct structure.

It is further an object of this invention to provide a simplified and improved control apparatus for a self-contained air distributing unit.

These and other objects of this invention will become apparent from a reading of the attached description together with the drawings wherein:

Figure 1 is a schematic view of our improved air distributing apparatus;

Figure 2 is a section view of the apparatus of Figure 1 through the valve to disclose the details of the same;

Figure 3 is a plan view of an improved air pressure sensor for the distributing apparatus; and

Figure 4 is a second embodiment of the pressure sensor of our improved air distributing apparatus.

As it will be seen in Figure 1, our improved air distributing apparatus is comprised of a generally Y-shaped duct structure unit generally indicated at 10 having a pair of inlet portions 11 and 12 located in the bifurcated portion of the duct structure and a common outlet portion indicated at 13. The inlet portions of the duct structure are adapted to be connected to trunk lines of an air conditioning structure indicated at 14 and 15, respectively, which trunk lines carry the air conditioning medium from a centrally located heat exchange or exchangers. Similarly the output portion of the duct structure 13 is adapted to be connected through suitable means such as a duct and grill 16 to discharge into the space to be air conditioned.

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Positioned in the portions of the duct structure 11 and 12 are a pair of flow control means which are best shown in Figure 2 as comprising a centrally located V-shaped weir section 20 attached at its extremities to the walls of the duct structure and extending transversely thereof. Positioned to either side of the V-shaped or wedged shaped weir member is an aperture in the duct structure over which is positioned a circular flexible diaphragm indicated at 21 and 22 respectively in Figure 2. The diaphragms are held in position over the apertures by means of a semi-spherically shaped cover member indicated at 23 and 24, respectively, which are suitably secured to the duct structure by screw means indicated at 25 and 26, respectively, which screw means together with the clamping of the cover hold the diaphragms in place over the apertures such that they may cooperate with the weir to control the flow of air conditioning medium through the respective portions of the duct structure.

The space between the cover members 23 and 24 and the diaphragms 21 and 22 provide two chambers on the back sides of the diaphragms into which a portion of the air conditioning medium in the duct structure will be fed for the purpose of operating the diaphragms. As is indicated in Figure 2, a conduit or pipe 30 extends through an aperture in the leading face of the weir, the conduit extending out of the duct structure and having a restriction indicated at 31 therein with branch paths indicated at 33 and 34, respectively, which lead to the respective chambers of the diaphragms, positioned in the inlet portions 12 of the duct structure.

It will be appreciated that the valve or flow control mechanism positioned in the inlet portion 11 of the duct structure is identical in detail to that shown in Figure 2 for the inlet portion 12. Thus the centrally located weir 40 has a pair of diaphragms associated therewith of which a part of diaphragm 42, and diaphragm 43 is shown in Figure 1 for the upper diaphragm of this flow control unit and a cover member 44 associated therewith to provide an upper chamber with a similar construction on the under side of the duct structure and cooperating with the weir 40. The weir has a centrally located conduit 50 associated therewith having a restriction 51 therein with the conduit connected by means of branch pipes 52 and 53 which lead to the upper and lower chambers behind the diaphragms to provide a passage for the portion of the air conditioning medium to one side of the diaphragms to urge the diaphragms against the weir and control the flow of the air conditioning medium through the inlet portion 11 of the duct structure. This valve unit is also held in assembly relationship with the covers (only one of which is shown) secured to the duct structure by suitable means such as screws 55.

As shown in Figure 1, the conduit 30 for the flow control means associated with the inlet portion 12 is connected to a controller indicated generally at 60. This controller is shown schematically as mounted on a bracket indicated at 61 which is positioned away from the duct structure for clarification purposes but would be normally mounted on top of the duct structure or suitably attached in any position on the duct structure for support purposes. The controller 60 is a velocity controller having a pair of diaphragms 63 and 64 therein which are positioned in and suitably secured to a casing 65 of the controller. A centrally located diaphragm 66 forms a pair of chambers with the diaphragms 63 and 64 with the diaphragm 63 having a nozzle associated therewith common to the conduit 30. Also positioned within the casing 65 and against the diaphragm 63 is a spring means indicated at 67 which cooperates with the diaphragm to position the same with respect to the nozzle and control the pressure in the conduit 30 and hence in the chambers behind the diaphragms 21 and 22 of the flow

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control means for conduit or inlet portion 12 of the duct structure. The areas within the casing 65 and to either side of the diaphragms 63 and 64 on the opposite sides of the chambers formed by the diaphragms 63, 64 and 66 are vented to the atmosphere as indicated by the vents 69 and 70. Similarly, the diaphragms 63, 64 and 66 are connected together by a suitable shaft or pin indicated at 73 such that the resultant movement caused by a pressure differential and the resultant force from the spring 67 will be imparted to the diaphragm 63 to control its position in respect to the nozzle on the conduit 30 to control the air bleed from and against the pressure within the chambers. In Figure 1 the chamber formed by the diaphragms 63 and 66 is connected through a conduit 75 to an impact pressure sensor located in the output portion of the conduit 13. Similarly the chamber formed by the diaphragms 64 and 66 is connected by means of a conduit 76 to a static pressure sensor positioned in the duct portion 13 of the duct structure. These two pressures sense or provide a signal proportional to total flow of the air conditioning medium through the outlet portion of the duct structure to maintain a constant volume of discharge of the air conditioning medium to the space to be air conditioned. Also included on the case 65 is an adjusting knob 77 which is connected through suitable linkages indicated at 78 to the spring 67 within the case to adjust the control point of the relay 60. The details of the velocity sensing portion or pick-up portion for the relay will be best seen in the embodiments shown in Figures 3 and 4. It should be noted that the actual controller 60 is largely conventional in nature and is shown schematically for simplicity purposes.

In Figure 3 it will be seen that the pick-up for the impact and static pressures are mounted on a separate sleeve member to be inserted into the duct structure as indicated in Figure 3 at 80 or suitably secured to the existing duct structure on the inner periphery thereof. The pick-up device includes a first annular tube 81 having a plurality of orifices 82 on the downstream side thereof which orifices are considerably smaller than the inner dimensions of the tube and serve to provide an average of the static pressure around the inner periphery of the duct structure. Connected to the tubular member 81 is a take-off tube 85 which is also of a larger diametrical dimension than the orifices 82 in the tube 81. The take-off stem 85 would be connected to the conduit 76 as shown in Figure 1. Positioned downstream of the tube 81 is a second tubular member or sensing element 90 having an annular passage therein and a plurality of orifices indicated at 91 on the upstream surface thereof with a suitable channel member surrounding the orifices on the upstream face of the tube to mount and position a filter indicated at 93 over the surface of the orifices. As in the tube 81, the orifices 91 are considerably smaller than the inner dimensions of the tube or structure 90. The structure 90 also includes a take-off tube 95 connected to the tube 90 and having a dimension larger than the impact pressure orifices 91. The filter 93 serves to prevent dirt and dust from clogging the impact pressure orifices and the distribution of the orifices about the member 90 would provide an average impact pressure in the collector tube 95 which would be connected to the conduit 75 leading to the relay 60 in Figure 1. The tube 90 is supported on the tube 81 by means of a plurality of wires or supporting members 97 through suitable attachment means such as welding or soldering.

As was indicated in Figure 3, the velocity pick-up or sensing head may be mounted in its own sleeve with a suitable flange 96 attached thereto to be positioned in the end portion 13 of the duct structure and suitably secured thereto or the tubular members 81 and 90 may be mounted within the structure independent of a sleeve through suitable means not shown. It will also be noted that the impact pressure tube is of a smaller diametrical dimension and is positioned downstream of the static

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pressure tube to provide a slight Venturi effect to obtain the sensing of the impact pressure at or near the central portion of the duct structure while providing a more accurate sensing of this pressure differential.

While the particular sensing elements are shown as cylindrical or circular in configuration, it will be appreciated that this apparatus may be shaped to conform to any shape of duct structure. In Figure 4, this arrangement is shown in a slightly modified form and is designed to fit a generally rectangular duct configuration. Here again the apparatus is shown as mounted on a sleeve or supporting portion 100 having a flange 101 with a static pressure tube indicated as a generally rectangular form of tubular cross section 102 with the static pressure orifices on the downstream side thereof and the tubular member being secured to the support 100 through suitable means such as soldering. The tubular form also includes or has attached thereto a take-off pipe 103. In this embodiment, the impact pressure tube is a centrally located single tube mounted through supports indicated at 105 with the tube 105 having its extremity sealed by the supports 104. A plurality of spaced orifices on the upstream side thereof communicate with the interior of the tubular portion 104 to which is attached the take-off pipe 106 in a conventional manner. In this arrangement the sleeve 100 may be mounted through the flanges 101 to the duct structure or the apparatus may be mounted independently within the duct structure through suitable means not shown. In this arrangement the impact pressure sensing tube is located downstream of the static pressure tube and centrally thereof to provide again a slight Venturi effect and take an average sampling of the impact pressures at the center of the duct structure.

The flow control means in the inlet portion 11 through its conduit 50 is connected to a relay means or controller indicated generally at 110 which unit is substantially the same as that disclosed schematically in the relay unit 60. The relay 110 has a case 111 divided by a plurality of diaphragms 112, 113 and 114 to provide two chambers between the diaphragms which are connected by a suitable rod 115 with the diaphragm 114 cooperating with a nozzle 116 at the extremity of the conduit 50 to control the pressure at the air conditioning medium within the chambers of the flow control means. The case 111 is vented at 120 and a spring 121 cooperates with the diaphragm 120 to move the same relative to the nozzle 116. In this unit the chamber formed by the diaphragms 112, 113 is connected by means of the conduit 125 to a static pressure sensor in the inlet portion of the duct structure upstream of the flow control means and the chamber formed between the diaphragms 113 and 114 are connected by means of a conduit 126 to the impact pressure sensor similarly positioned upstream of the flow control means in the duct portion 11. The area within the case 111 and between the wall of the case in the diaphragm 112 is connected by means of a conduit 130 to a thermostat indicated schematically or generally at 131, the thermostat to be located within the space to be air conditioned and responding to room temperature thereof for the purpose of controlling the temperature of the air conditioning medium discharged through the outlet portion 13 of the duct structure. Thermostat 131 is of bleed type which is provided with a source of controlling medium by means of a branch passage 140 connected to the conduit 50 on the downstream side of the restriction 51 and connected through a pressure regulator indicated generally at 142 attached to the case 111 of the relay 110 and communicating with the chamber between the diaphragm 112 and the wall of the case 111. The pressure regulator is conventional in form utilizing a spring 145 acting against a diaphragm 146 to control a valve passage between the diaphragm and a portion of the case and allow a portion of the air conditioning medium to flow into the above mentioned chamber to which the thermostat is connected to apply a pressure to this side of the diaphragm.

Thus the relay 110 includes a portion responsive to velocity of flow or flow through the inlet portion 11 of the duct structure which pressure differential acts against the spring 121 to control the flow from the nozzle 116 on the conduit 50 to vary the pressure applied to the diaphragms of the flow controlling means in the inlet portion 11 of the duct structure and hence the flow of air conditioning medium therethrough. Simultaneously the thermostat 131 will operate as a reset mechanism or a second controlling condition which will act on the diaphragm 112 to urge the diaphragm 114 against the nozzle 116 to control the positions of the flow controlling means in response to temperature of the space to be air conditioned. The pressure regulator 142 is included in this control branch to compensate for variations in pressure in the flow controlling medium.

In operation, the subject air conditioning and distributing apparatus is generally adapted to be connected to a double duct air conditioning system in which air conditioning medium in the form of tempered air of two different temperatures is conveyed from a central heating plant or heat exchangers along a duct work to be supplied to a plurality of units to be air conditioned. This improved duct structure with its associated valving means is adapted to be connected at its inlet portions respectively to the supply ducts of the air conditioning apparatus to proportion the amount of temperate air from each of the sources to a common outlet portion which is adapted to be connected to an individual space unit to be air conditioned. The valves or flow control means within the inlet portions of the duct structure are of the self-contained type made integral with or adapted to be assembled on existing duct structures. Generally the control apparatus responding to velocity of flow at one of the inlet portions and reset by temperature is adapted to be connected to the warm air supply and a portion of this warm air supply is utilized for operating the valve means and the associated control apparatus. The flow control means for the cold air duct or the opposite inlet portion is controlled by a relay which is operated in proportion to total flow through the outlet portion of the duct structure or the total flow into the space to be air conditioned. The improved sensing apparatus provides for taking an average of static and impact pressures within the duct portions where they are located to provide a resultant signal which is independent of turbulence or individual variations within the duct portions. In this manner a true and accurate control is obtained for a constant volume delivery of air to the space to be air conditioned and/or more accurate control is obtained as to the resultant temperature of the air to be supplied to the space to be air conditioned. Shown schematically in Figure 1 and associated with the outlet portion of the duct structure is a noise filter 150 designed to eliminate or prevent the noise of turbulence of the air from becoming objectionable in the space to be air conditioned. This filter is of a conventional type and is shown in Figure 1 schematically for simplicity purposes.

In considering this invention it should be remembered that the present disclosure is intended to be illustrative only and the scope of the invention should be determined only by the appended claims.

I claim as my invention:

1. Valve apparatus including a Y-shaped duct structure the bifurcated portion of which is adapted to be connected to a double duct air conditioning system and the opposite extremity of which is adapted to be connected to a space to be air conditioned, a centrally located weir positioned in each of the bifurcated portions of said duct structure, diaphragm means positioned in said duct structure on either side of said weir for cooperation with said weir to close the passages through said duct structure to the opposite extremity thereof, an orifice positioned in each weir and connected through a passage to a chamber on the opposite side of said diaphragms from said weir,

valve means connected to said passages of said orifice for each weir for venting said passages to the atmosphere, motive means for operating each of said valve means, means responsive to flow through one of said bifurcated portions of Y-shaped duct structure for controlling one of said motive means of said valve means associated with the diaphragms located in said one of said bifurcated portions of said duct structure, means responsive to the temperature of the space to be air conditioned for controlling co-jointly with said flow responsive means said one of said motive means, and means responsive to the total flow through the other extremity of said Y-shaped duct structure for controlling the motive means of the valve means associated with the diaphragms in the other of said bifurcated portions of said duct structure.

2. Valve apparatus including a Y-shaped duct structure having a bifurcated portion which is adapted to be connected to a double duct air conditioning system and an opposite extremity which is adapted to be connected to a space to be air conditioned, a centrally located double-faced weir positioned in each of the bifurcated portions of said duct structure, apertures in said duct structure on either side of said double-faced weir, diaphragm means positioned over said apertures in said duct structure to cooperate with the respective faces of said weir, cover means positioned over said diaphragm means and secured to said duct structure securing said diaphragms in place and providing a variable chamber by means of which said diaphragms are made to cooperate with said weir to provide a flow control means through said bifurcated portions of said duct structure, an orifice positioned in each weir and connected through a passage to the chambers associated with said diaphragms to provide a self-contained means for operating the diaphragms and controlling the air flow means through the duct structure, valve means connected to the passages of each orifice for each weir for venting said passages to the atmosphere, motive means for operating each of said valve means, means responsive to flow through one of said flow control means for controlling one of said motive means of said valve means associated with the diaphragms of the flow control means, means responsive to temperature of the space to be air conditioned for controlling co-jointly with said flow responsive means said one of said motive means, and means responsive to total flow through the other extremity of said Y-shaped duct structure for controlling the motive means of the valve means associated with the flow control means in the other of said bifurcated portions of said duct structure.

3. Valve apparatus including a Y-shaped duct structure having a bifurcated portion which is adapted to be connected to a double duct air conditioning system and an opposite extremity which is adapted to be connected to a space to be air conditioned, a centrally located double-faced weir positioned in each of the bifurcated portions of said duct structure, apertures in said duct structure on either side of said double-faced weir, diaphragm means positioned over said apertures in said duct structure to cooperate with the respective faces of said weir, cover means positioned over said diaphragm means and secured to said duct structures securing said diaphragms in place and providing a variable chamber by means of which said diaphragms are made to cooperate with said weir to provide a flow control means through said bifurcated portions of said duct structure, an orifice positioned in each weir and connected through a passage to the chambers associated with said diaphragms to provide a self-contained means for operating the diaphragms and controlling the air flow means through the duct structure, valve means connected to the passages of each orifice for each weir for venting said passages to the atmosphere, motive means for operating each of said valve means, means responsive to the

velocity of flow of air conditioning medium through one of said flow control means in said Y-shaped duct structure for controlling one of said motive means of said valve means associated with the diaphragms of said one of said flow control means, means responsive to the temperature of the space to be air conditioned for controlling co-jointly with said velocity responsive means said one of said motive means, and means responsive to total velocity flow through the other extremity of said Y-shaped duct structure for controlling the motive means of the valve means associated with the flow control means in the other of said bifurcated portions of said duct structure.

4. Valve apparatus including a Y-shaped duct structure having a bifurcated portion which is adapted to be connected to a double duct air conditioning system and an opposite extremity which is adapted to be connected to a space to be air conditioned, a centrally located double-faced weir positioned in each of the bifurcated portions of said duct structure, apertures in said duct structure on either side of said double-faced weir, diaphragm means positioned over said apertures in said duct structure to cooperate with the respective faces of said weir, cover means positioned over said diaphragm means and secured to said duct structures securing said diaphragms in place and providing a variable chamber by means of which said diaphragms are made to cooperate with said weir to provide a flow control means through said bifurcated portions of said duct structure, an orifice positioned in each weir and connected through a passage to the chambers associated with said diaphragms to provide a self-contained means for operating the diaphragms and controlling the air flow means through the duct structure, valve means connected to the passages of each orifice for each weir for venting said passages to the atmosphere, motive means for operating each of said valve means, pressure responsive means responsive to flow through one of said flow control means in said Y-shaped duct structure for controlling one of said motive means of said valve means associated with the diaphragms of said one of said flow control means, means responsive to the temperature of the space to be air conditioned for controlling co-jointly with said flow responsive means said one of said motive means, and pressure responsive means responsive to total flow through the other extremity of said Y-shaped duct structure for controlling the motive means of the valve means associated with the flow control means in the other of said bifurcated portions of said duct structure.

5. In an air conditioning system, a duct structure having a pair of inlet portions connected to a common outlet portion the inlet portions being adapted to be connected respectively to a pair of ducts carrying two different air conditioning mediums which are to be proportionally mixed and exhausted to a space to be air conditioned from the common outlet portion, flow controlling means positioned in each of said inlet portions and being formed by a centrally located weir positioned therein and a pair of flexible diaphragms located over apertures in said duct structure on opposite sides of said weir and cooperating with said weir, cover means positioned over each of said diaphragms forming chambers with said diaphragms, conduit means connected to each weir and to said chambers for each of said flow controlling means to direct a portion of the flow of air conditioning medium to the chamber to urge the diaphragm against the weir and operate the flow controlling means, valve means for controlling the pressure of the air conditioning medium in the chamber to control the operation of the flow controlling means, motive means for operating said valve means for each of said flow controlling means, a first tubular member mounted in one inlet portion of said structure upstream of the flow control means therein and on the inner periphery of said

duct structure having a plurality of spaced orifices on the downstream side thereof and a take-off pipe connected to the tubular member, a second tubular member located downstream of said first tubular member and upstream of said flow controlling means, said second tubular member being centrally located within said duct structure and having a plurality of spaced orifices on the upstream side thereof and a take-off pipe connected to said second tubular member, means connecting said first and second take-off pipes to said motive means of one of said flow control means for controlling the valve associated therewith in one of said inlet portions of said duct structure, a similar pair of first and second tubular members positioned in the outlet portion of said duct structure and including take-off pipes respectively connected to said motive means controlling the valve means associated with the other of said flow controlling in the other inlet portion of said duct structure, and means responsive to temperature of the space to be air conditioned connected to said first named valve means to simultaneously control the valve means associated therewith.

6. In an air conditioning system, a duct structure having a pair of inlet portions connected to a common outlet portion the inlet portions being adapted to be connected respectively to a pair of ducts carrying two different air conditioning mediums which are to be proportionally mixed and exhausted to a space to be air conditioned from the common outlet portion, flow controlling means positioned in each of said inlet portions and being formed by a centrally located weir positioned therein and a pair of flexible diaphragms located over apertures in said duct structure on opposite sides of said weir and cooperating with said weir, cover means positioned over each of said diaphragms forming chambers with said diaphragms, an aperture in the upstream face of said weir connected to said chamber to direct a portion of the flow of air conditioning medium to said chamber to urge the diaphragms against the weir and provide a self-contained actuator, valve means for controlling the pressure of the air conditioning medium in the chamber to control the operation of the flow controlling means, motive means for operating said valve means for each of said flow controlling means, a first tubular member mounted in one inlet portion of said duct structure upstream of the flow control means therein and on the inner periphery of said duct structure having a plurality of spaced orifices on the downstream side thereof and a take-off pipe connected to the tubular member, a second tubular member located downstream of said first tubular member and upstream of said flow controlling means, said second tubular member being centrally located within said duct structure and having a plurality of spaced orifices on the upstream side thereof and a take-off pipe connected to said second tubular member, means connecting said first and second take-off pipes to said motive means of one of said flow control means for controlling the valve associated therewith in one of said inlet portions of said duct structures, a similar pair of first and second tubular members positioned in the outlet portion of said duct structure and including take-off pipes respectively connected to said motive means controlling the valve means associated with the other of said flow controlling in the other inlet portion of said duct structure and pressure regulating means connected to said conduit for the aperture in said weir, and means responsive to the temperature of the space to be air conditioned connected to the pressure regulating means and connected to said first named motive means to control simultaneously therewith the valve means associated therewith.

7. In an air conditioning system, a duct structure having a pair of inlet portions connected to a common outlet portion the inlet portions being adapted to be connected respectively to a pair of ducts carrying two differ-

ent air conditioning mediums which are to be proportionally mixed and exhausted to a space to be air conditioned from the common outlet portion, flow controlling means positioned in each of said inlet portions and being formed by a centrally located weir positioned therein and a pair of flexible diaphragms located over apertures in said duct structure on opposite sides of said weir and cooperating with said weir, cover means positioned over each of said diaphragms forming chambers with said diaphragms, conduit means connected to each weir and to said chambers for each of said controlling means to direct a portion of the flow of air conditioning medium to the chamber to urge the diaphragm against the weir and operate the flow controlling means, valve means for controlling the pressure of the air conditioning medium in the chamber to control the operation of the flow controlling means, motive means for operating said valve means for each of said flow controlling means, a first flow sensor positioned in one of said inlet portions of said duct structure upstream of the flow control means positioned therein and comprising a first tube having a plurality of static pressure orifices and a collector tube associated therewith and a second tube with a plurality of impact pressure orifices and a collector tube associated therewith, means connecting said impact and static pressure collector tubes to said motive means for operating the valve means associated therewith to control the flow control means positioned in said one of said inlet portions of said duct structure, a second flow responsive means positioned in the outlet portion of said duct structure and including a static pressure tube with a plurality of static pressure orifices and an impact pressure tube with a plurality of impact pressure orifices and associated collector tubes for impact and static pressure, means connecting the collector tubes of said second flow control sensor to the other of said motive means operating the valve means associated with the flow control means in the other of said inlet portions of said duct structure, and temperature responsive means positioned in the space to be air conditioned and connected to said first named motive means for adjusting the control point of said motive means.

8. In an air conditioning system, a duct structure having a pair of inlet portions connected to a common outlet portion the inlet portions being adapted to be connected respectively to a pair of ducts carrying two different air conditioning mediums which are to be proportionally mixed and exhausted to a space to be air conditioned from the common outlet portion, flow controlling means positioned in each of said inlet portions, and being formed by a centrally located weir positioned therein and a pair of flexible diaphragms located over apertures in said duct structure on opposite sides of said weir and cooperating with said weir, cover means positioned over each of said diaphragms forming chambers with said diaphragms, conduit means connected to each weir and to said chambers for each of said flow controlling means to direct a portion of the flow of air conditioning medium to the chamber to urge the diaphragm against the weir and operate the flow controlling means, valve means for controlling the pressure of the air conditioning medium in the chamber to control the operation of the flow controlling means, motive means for operating said valve means for each of said flow controlling means, a first flow sensor positioned in one of said inlet portions of said duct structure upstream of the flow control means positioned therein and comprising a first tube having a plurality of static pressure orifices and a collector tube associated therewith and a second tube with a plurality of impact pressure orifices and a collector tube associated therewith, means connecting said impact and static pressure collector tubes to said motive means for operating the valve means associated therewith to control the flow control means positioned in said one of said inlet portions of said duct

structure, a second flow responsive means positioned in the outlet portion of said duct structure and including a static pressure tube with a plurality of static pressure orifices and an impact pressure tube with a plurality of impact pressure orifices and associated collector tubes for impact and static pressure, means connecting the collector tubes of said second flow control sensor to the other of said motive means operating the valve means associated with the flow control means in the other of said inlet portions of said duct structure, pressure regulating means connected to a conduit means of the weir in said one of said inlet portions and supplying an auxiliary source of power, means responsive to the temperature space to be air conditioned connected to said pressure regulating means and said motive means for the flow sensor in said one of said inlet portions to control simultaneously with the flow responsive means the operation of the flow control means in said one of said inlet portions of said duct structure.

9. In an air conditioning system, a duct structure having a pair of inlet portions connected to a common outlet portion the inlet portions being adapted to be connected respectively to a pair of ducts carrying two different air conditioning mediums which are to be proportionally mixed and exhausted through said outlet portion to a space to be air conditioned, a flow control means positioned in each of said inlet portions of said duct structure, means for supplying a working pressure of the air conditioning medium from the inlet portions of said duct structure to said flow controlling means to actuate said flow controlling means and provide a self-contained control, means sensing pressures in one of said inlet portions indicative of the rate of flow therethrough, means operated by the pressures sensed in said one of said inlet portions to control the pressure of the air conditioning medium supplied to the associated flow control means, means responsive to the temperature of the space to be air conditioned to adjust the control point of the pressure operated means associated with said one of said flow control means, means in the outlet portion of said duct structures indicative of total rate of flow therethrough, and means operated by the pressures sensed in said outlet portions of said duct structure to control the working pressure of the air conditioned medium supplied to the other of said flow controlling means to control the operation of the same.

10. In an air conditioning system, a Y-shaped duct structure having a pair of inlet portions connected to a common outlet portion the inlet portions being adapted to be connected respectively to a pair of ducts carrying two different air conditioning mediums which are to be proportionally mixed and exhausted through said outlet portion to a space to be air conditioned, a flow control means positioned in each of said inlet portions of said duct structure, said flow controlling means including a centrally located weir in each of the inlet portions of said duct structure and a pair of diaphragms located in aperture in the duct structures on opposite sides of the weir, means for supplying a working pressure from the flow controlling medium to act on the diaphragms of the flow controlling means to provide a self-contained controller, means sensing pressures in one of said inlet portions indicative of the rate of flow therethrough, means operated by the pressures sensed in said one of said inlet portions to control the pressure of the air conditioning medium supplied to the associated flow control means, means responsive to the temperature of the space to be air conditioned to adjust the control point of the pressure operated means associated with said one of said flow control means, means in the outlet portion of said duct structures indicative of total rate of flow therethrough, and means operated by the pressures sensed in said outlet portions of said duct structure to control the working pressure of the air conditioned

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medium supplied to the other of said flow controlling means to control the operation of the same.

11. In a self-contained valve for an air conditioning medium, a duct structure, a centrally located weir in said duct structure and attached thereto, apertures above and below said weir in said duct structure, a pair of diaphragms positioned over said apertures, cover means positioned over said diaphragms defining a variable chamber therebetween, said diaphragms cooperating with said weir to control the flow of said air conditioning medium through said duct structure, conduit means positioned in said weir and connected to said variable chambers, and means connected to said conduit means and adapted to vent said conduit means to the atmosphere.

12. In a self-contained valve for an air conditioning medium, a duct structure, a centrally located weir in said duct structure and attached thereto, apertures above and below said weir in said duct structure, a pair of diaphragms positioned over said apertures, cover means positioned over said diaphragms securing the same to said duct structure and defining with said diaphragms variable chambers, said diaphragms cooperating with said weir to control the flow of said air conditioning medium through said duct structure, conduit means positioned in said weir and connected to said variable chambers, and means connected to said conduit means and adapted to vent said conduit means to the atmosphere.

13. In a self-contained valve for an air conditioning medium, a duct structure having an inlet and outlet, a centrally located double faced weir positioned in said duct structure and defining said inlet and outlet, aperture means in said duct structure on either side of said double faced weir, diaphragm means positioned over said apertures in said duct structure to cooperate with the faces of said weir to control the flow of air conditioning medium through said duct structure, cover means positioned over said diaphragm means and secured to said

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duct structure securing said diaphragm in said place and providing a variable chamber by means of which said diaphragms are made to cooperate with said weir, an orifice positioned in said weir and connected through a passage to said chambers associated with said diaphragms to provide a self-contained source for operating said diaphragms and controlling the flow of air conditioning medium therethrough, and valve means connected to the passages of the orifice for venting the passage to the atmosphere.

14. In an air conditioning system, a duct structure for carrying an air conditioning medium, flow controlling means positioned in said duct structure to vary the flow of said air conditioning medium therethrough, means for controlling said flow controlling means in said duct structure, a flow sensor positioned in said duct structure upstream of said flow control means and comprising a first tubular member mounted on the inner periphery of the duct structure and having a plurality of spaced orifices on the downstream side thereof and a take-off point connected to the tubular member, a second tubular member located downstream of said first tubular member and upstream of said flow controlling means being centrally located within the duct structure and having a plurality of spaced orifices on the upstream side thereof and a take-off point connected to the second tubular member, and means connecting the first and second take-off pipes of said flow sensor to said controlling means to control said flow controlling means.

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