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E. S. CORNELL, JR

2,218,700

AIR RELEASE VALVE

Filed Sept. 3, 1938

Fig. 1.

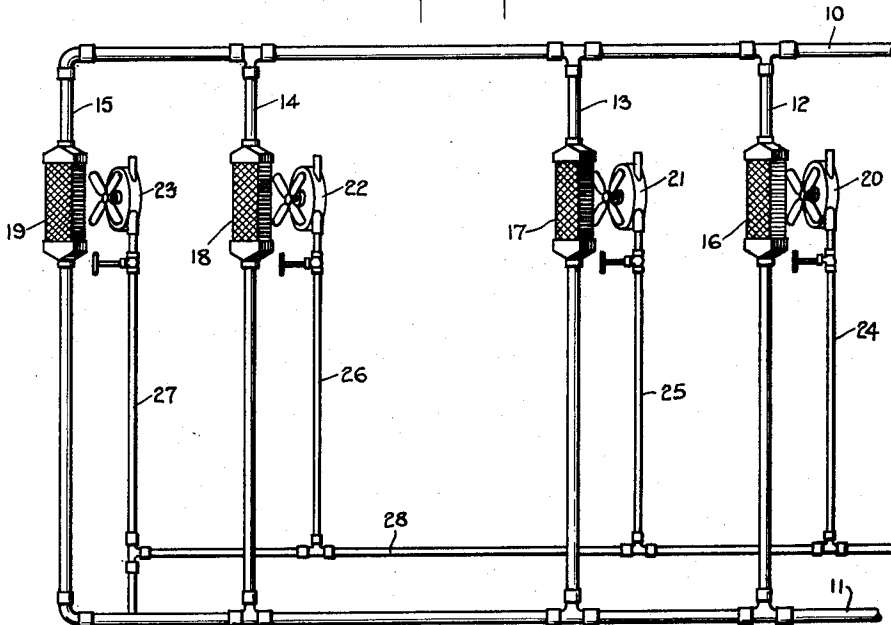


Fig. 2.

Fig. 3.

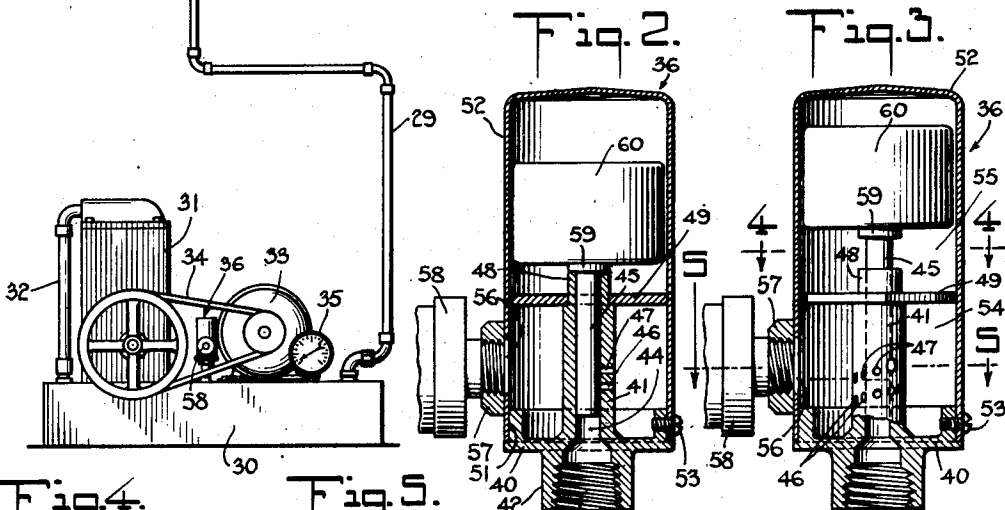
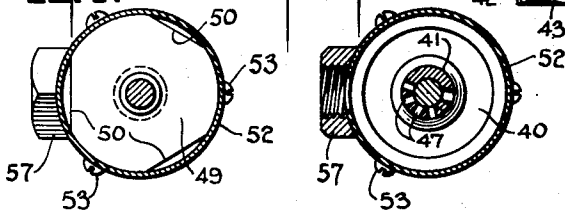


Fig. 4.

Fig. 5.



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2,218,700

AIR RELEASE VALVE

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Application September 3, 1938, Serial No. 228,276

3 Claims. (Cl. 137—53)

My present invention relates to valves, and more particularly to an improved air release valve.

My present invention is capable of general application as an air release valve, and is particularly adapted for use in connection with air pressure supply systems for delivering motive power to fan motors utilized in a heating system, such for example as the improved heating system described and claimed in my co-pending application, Serial No. 171,539, filed October 28, 1937, and entitled Closed thermal system.

In systems for supplying air under pressure as a motive power for fan motors for heating systems there is the usual air compressor, prime mover, and storage tank for the air, and in such tank is stored air under a stated pressure which is found advantageous for use in connection with the aforesaid fan motors. The capacity of the prime mover and compressor is ordinarily rated sufficient to supply air at the stated pressure to all of the air motors, assuming the said air motors to be operating simultaneously.

When all of the air motors are not in operation at any one time it is desirable that means be employed for relieving the pressure in the air storage tank at a rate commensurate with the rate at which excess air is delivered to the tank from the compressor. Under ordinary circumstances it is preferable, during the season when heat is being supplied to a building or the like, to have the prime mover and air compressor in operation at all times in order that the air motors that operate the fans for circulating the heated air through the building may be ready to be put into operation at any instant and therefore some means of relieving the pressure is imperative, and some means for relieving the air to a degree in accordance with the number of air motors in operation at any one time is desirable.

My present invention contemplates an air release valve for use in an air compressor system for operating any one or all of a plurality of air motors simultaneously and which will act to release air in excess of a stated pressure gradually and in accordance with the number of air motors out of service at any one time.

The principal feature of my invention therefore is an improved air release valve.

Another feature of my invention is an improved air release valve for relieving the air pressure in an air storage tank in accordance with the rate of feed of air thereto.

A further feature of my invention is an improved air release valve for use in an air storage

system for releasing air under pressure at a rate commensurate with the number of air motors out of service at any one time.

Other features and novel features of the construction and arrangement of parts comprising my device will appear as the description of the invention progresses.

In the accompanying drawing,

Fig. 1 illustrates diagrammatically a heating system for a house or other building structure in which the air is circulated through the heat exchange means by fan motors operated by compressed air from a central point;

Fig. 2 is a vertical sectional elevation of an air release valve embodying my present invention and adapted for use in a system illustrated in Fig. 1 and showing the air valve in closed position;

Fig. 3 is a vertical section, partly in elevation, of the valve shown in Fig. 2;

Fig. 4 is a sectional plan view taken on the line 4—4 of Fig. 3, and

Fig. 5 is a sectional plan view taken on the line 5—5 of Fig. 3.

Referring to the drawing, there is shown in Fig. 1 a portion of a heating system supplied with heat medium from a central point, such system comprising the feed pipe 10 leading from the central heating plant (not shown), the return pipe 11 and laterals 12, 13, 14, 15 etc., leading from the feed pipe 10 to the return pipe 11. Each of the laterals 12, 13, 14, 15, etc. has arranged therein heat exchange devices 16, 17, 18, 19, etc. respectively, the heat exchange devices being thus fed with heated medium from the feed pipe 10, and such heated medium passes thence downwardly into the return pipe 11, the character of the heated medium being changed by the withdrawal of heat therefrom as it passes through the heat exchange devices referred to.

For more efficient operation of a system of this type there is associated with each of the heat exchange devices, 16, 17, 18, 19, etc. an air motor 20, 21, 22, 23, etc., respectively. Such air motors are connected through pipes 24, 25, 26, 27, etc., respectively, to a feed pipe 28 which is connected to the discharge pipe 29 of an air storage tank 30 where air under suitable pressure is stored and by means of which the air motors 20, 21, 22, 23, etc., are operated.

In the drawing the storage tank 30 is utilized as a base for an air compressor 31, connected by pipe 32 to the tank 30, a prime mover, as an electric motor 33, driving the air compressor 31 through the medium of a belt 34. Also the tank 30 is supplied with a gauge 35 for indicating the

degree of pressure of the air within the tank, and with an air release valve designated generally by the reference numeral 36 and forming the subject matter of the present invention.

5 Preferably the capacity of the compressor 31 running at normal speed is capable of providing sufficient air at desired pressure to supply the air motors 20, 21, 22, 23, etc., simultaneously, and yet maintain the desired pressure of air within
10 the storage tank 30. Where one or more of the aforesaid air motors is not operated the pressure within the storage tank 30 will gradually increase, the increase in pressure per unit of time being proportional to the number of air motors out of
15 operation during such interval of time. The air release valve of my present invention is designed to take care of this condition and to maintain within the storage tank 30 the desired pressure of air at all times regardless of the number of air
20 motors that are out of commission simultaneously.

Such an air valve is shown in Figs. 2, 3, 4 and 5, and referring to such figures there is shown a valve base 40 having a cylinder 41 formed integral therewith. A boss 42 formed on the lower end of
25 the base 40 is internally threaded, as indicated at 43, and by means of which the base 40 may be screwed into association with a nipple (not shown) leading to the interior of the storage tank
30 30. The cylinder 41 is axially bored and lapped as indicated by the reference numeral 44 to receive as a sliding fit a piston 45.

Intermediate the upper and lower end of the cylinder 41 is provided two-rows of perforations each row being arranged on a helix and the
35 helices being arranged one above the other. The lowermost helix has a plurality of holes 46 and extends through an angle substantially greater than 180° about the periphery of the cylinder 41. The second row of holes, designated by the reference numeral 47, lies in the helix above the
40 first row, and the first hole of such second row is directly above the first hole of the first row 46. The last hole of the second series of holes 47 is substantially larger than any of the other
45 holes. In the actual air release valve as made, and under conditions to satisfy the demand for air in proportion to the number of air motors 20 to 23 inclusive, respectively, in operation, the diameter of the rows of the holes in the rows 46,
50 and 47 is substantially .049 inch, with the exception of the last hole in the second row 47, and such hole is substantially .125 inch in diameter.

The cylinder 41 adjacent to its upper end is reduced in diameter as indicated by the reference
55 numeral 48 and on such reduced end is forced a baffle plate 49. Said baffle plate is provided about its peripheral edge with milled off portions 50 for a purpose to be hereinafter described.

The body 40 at its lower end is reduced slightly
60 in diameter, as indicated by the reference numeral 51, to receive as a sliding fit the lower open end of a housing 52, such housing being held in position by a plurality of screws 53. The internal diameter of the housing 52 is slightly greater
65 than the baffle plate 49 and, as will be noted from an inspection of Figures 2 and 3, such baffle plate 49 divides the housing 52 into substantially a lower chamber 54 and an upper chamber 55. The wall of the housing 52 is provided with an opening
70 56 leading from the lower chamber 54 and secured to the housing 52 and surrounding the opening 56 is an internally threaded member 57 and to which may be removably secured a muffler 58.

75 The upper end of the piston 45 is enlarged, as

indicated by the reference numeral 59, and such enlarged upper end cooperates with the upper end of the cylinder to limit the downward movement of the piston in the cylinder bore 44. Normally resting on the top of the enlargement 59
5 and within the chamber 55 is a balancing weight 60 which tends to urge at all times the piston 45 downwardly from the position shown in Fig. 3 to the position shown in Fig. 2.

Assume that the device has been constructed
10 and arranged as above described and is in position on the air pressure tank 30 as shown in Fig. 1, and that all of the air motors 20, 21, 22, 23, etc. are in operation. Under these conditions the pressure within the air pressure tank 30 will be maintained at the desired point and there will be no variation in the indication on the gauge 35.
15 If, however, for example, one of the air motors, as the air motor 20, is shut off the pressure of the air within the storage tank 30 will gradually rise with the result that such increase of pressure, acting on the bottom of the piston 45, will move such piston upwardly from the position
20 shown in Fig. 2 and will bring the end of such piston gradually into position to connect the inside of the pressure tank 30 with the lower chamber 54 in the housing 52. The excess air there-
25 fore, in amount equal to that ordinarily consumed by the air motor 20 when in operation, will be released from the storage tank 30. If, while the air motor 20 is idle, the air motor 21 is also put
30 out of commission there will be a further rise in the amount of air delivered to the pressure tank 30 and such added amount will cause a further rise upward of the piston 45 from the position
35 shown in Fig. 2 and more and more of the holes of the rows 46 will be exposed to permit escape of the excess air from the tank 30 and the number of holes exposed will be in proportion to the number of air motors that are put out
40 of commission.

The balancing weight 60 has a steadying effect on the movement of the piston 45 as without such weight there would be a tendency for the piston
45 45 to "jump" upon the shutting down or starting up of the air motors. The balancing weight 60 acts as a baffle having equal pressure on each side thereof or substantially equal pressure. A variation in the pressure exerted on the end of the piston 45 would, if the piston were unweighted,
50 50 cause a rapid movement in one or the other direction depending on whether the variation in pressure was an increase or decrease. With the weight 60, both because of its weight and because it acts as a baffle, such rapid movement is
55 55 "damped" and, therefore, there is a tendency for rapid movement to be evened out. The air under pressure escaping into the lower chamber 54 of the housing 52 will pass upwardly in the space
60 60 formed by the inner wall of the housing 52 and the milled portions 50 of the baffle plate 49 and therefore there will be pressure exerted on the under face of the balancing weight 60 which also helps to even out the operation of the piston 45.

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. An improved air release valve comprising a body, having means for connecting the same to a container for air under pressure, a cylinder on said body and adapted to communicate with the interior of the air container, a plurality of ports
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arranged in a helix extending through the walls of the cylinder, a piston slidably mounted in the cylinder for controlling said ports and having means for limiting the downward movement thereof in said cylinder, a balancing weight carried on the upper end of the piston, a housing mounted on the body and enclosing the cylinder and balancing weight, and a baffle plate mounted on said cylinder and dividing the housing into two chambers.

2. An improved air release valve comprising a body, having means for connecting the same to a container for air under pressure, a cylinder on said body and adapted to communicate with the interior of the air container, a plurality of ports arranged in a helix extending through the walls of the cylinder, a piston slidably mounted in the cylinder for controlling said ports and having means for limiting the downward movement thereof in said cylinder, a balancing weight carried on the upper end of the piston, a housing

mounted on the body and enclosing the cylinder and balancing weight, a baffle plate mounted on the cylinder and dividing the housing into an exhaust chamber and a balancing chamber.

3. An improved air release valve comprising a body, having means for connecting the same to a container for air under pressure, a cylinder on said body and adapted to communicate with the interior of the air container, a plurality of ports arranged in a helix extending through the walls of the cylinder, a piston slidably mounted in the cylinder for controlling said ports and having means for limiting the downward movement thereof in said cylinder, a balancing weight carried on the upper end of the piston, a housing mounted on the body and enclosing the cylinder and balancing weight, a baffle plate mounted on the cylinder and dividing the housing into an exhaust chamber and a balancing chamber, said chambers communicating with each other.

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