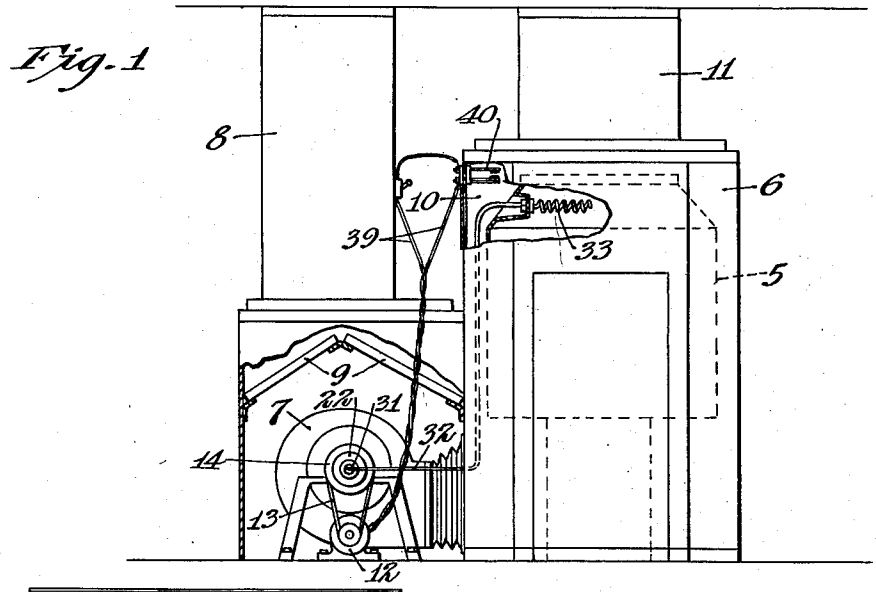
May 16, 1939. C. H. PETERS 2,158,250

AIR CONDITIONING SYSTEM

Filed Jan. 17, 1938

Fig. 1



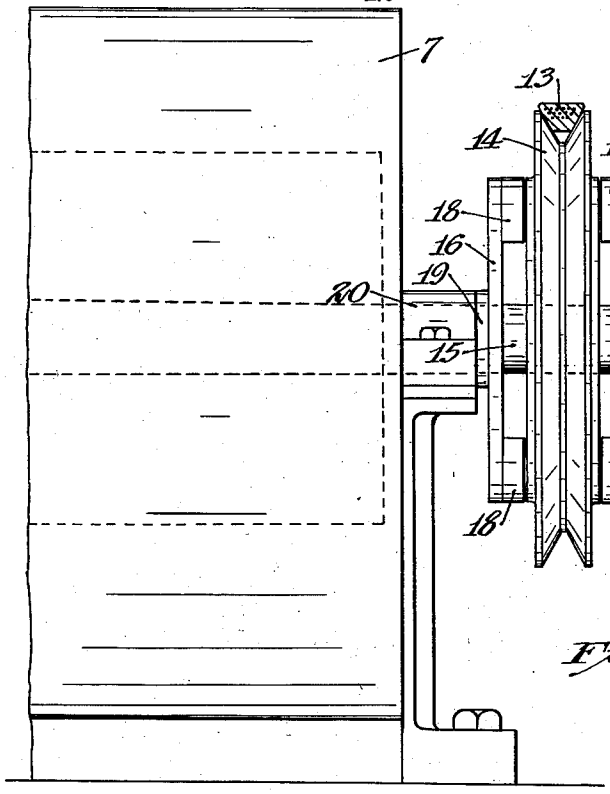


Fig. 2

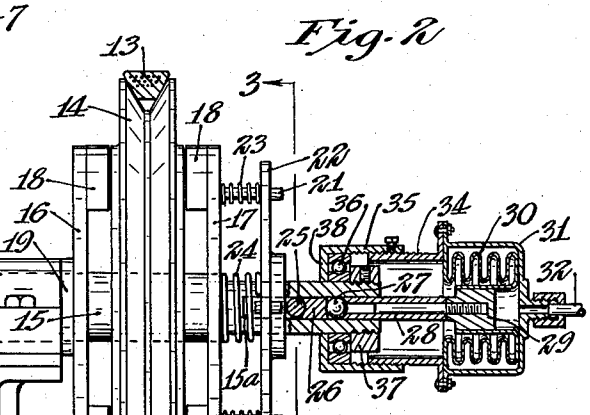
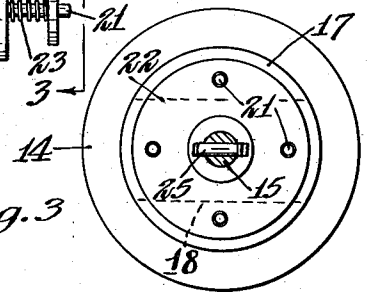


Fig. 3



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Patented May 16, 1939 2,158,250

UNITED STATES PATENT OFFICE

2,158,250

AIR CONDITIONING SYSTEM

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Application January 17, 1938, Serial No. 185,273

8 Claims. (Cl. 236—10)

It is an object of this invention to provide a novel air conditioning system in which the velocity and volume of air supplied to the hood or plenum chamber is progressively changed through a wide range of values in proportion to the temperatures in such hood or chamber.

Another object is to provide in an air conditioning system a multiple speed drive for the blower or fan under control of a single heat responsive element in the plenum chamber or hood.

A further object is to provide in an air heating system novel mechanism for automatically changing the speed of the fan or blower to correspond accurately to the changes in the temperature of the air in the plenum chamber or hot air duct and thereby conserve heat and power, simplify the control mechanism and eliminate objectionable drafts of cold air from the outlet ducts.

The present invention secures important economies and eliminates a number of the disadvantages resulting, in prior air conditioning systems known to me, from the intermittent operation of the blower. Ordinarily the blowers are operated either at a constant speed throughout the entire range of heating temperatures in the plenum chamber or at speeds which depend on manual control or a plurality of electrical controls which stop and start the fan motor. With the controls heretofore available the heated air must be stored up in the casing and plenum chamber of the heating unit until such air reaches a temperature which is sufficiently elevated to cause the starting of the blower and thereafter the latter operates at constant speed during a substantial range of temperatures in the plenum chamber. Some of the principal disadvantages and inefficiencies of such systems are: heat losses from unnecessarily high stack and casing temperatures, intermittent blowing of air from the registers at higher or lower temperatures and velocities than are necessary or desirable, noise of frequent starting of the motor driving the blower, loss of electric power from frequent starting of the blower under full load, override of desirable room temperatures because of high bonnet temperatures at the time the thermostat becomes operative to cut off the heat supplied in the combustion chamber and unnecessarily complicated, expensive and delicate control mechanisms and blower motor.

My invention will be best understood by reference to the accompanying drawing in which:

Figure 1 is an end elevation showing my invention as applied to a heating system, portions of the casing of the latter being removed to show parts otherwise concealed;

Fig. 2 is a part side elevation and part section showing my variable speed control for the blower and heat responsive mechanism for operating the control, and

Fig. 3 is a section taken on the line 3—3 of Fig. 2.

In Fig. 1 a furnace of common type is indicated generally by the numeral 5 and the heater casing by the numeral 6. Communicating with the lower portion of the casing is a blower 7 which receives the air from a return or inlet duct 8 having filters 9 for removing dust and the like in accordance with air conditioning systems in common use. The conditioned air from the casing 6 passes to a plenum chamber 10 and thence into the outlet duct 11.

Power for driving the blower 7 is supplied by an electric motor 12 and is applied through a belt 13 to a driven pulley 14 which is revoluble on the blower shaft 15. Keyed to the shaft 15 and free for limited movement along this shaft is a clutch disk 17 and another disk 16 is fixed on the shaft 15 adjacent to a thrust collar 19. Each of these disks has secured to its face adjacent to the pulley 14 a plurality of friction shoes 18 adapted to engage the pulley for operatively connecting it to the shaft 15. A bearing 20 for the blower shaft is provided adjacent to the thrust collar 19.

Studs 21 are rigidly fastened to the disk 17 and project in parallel relation to the shaft 15. These studs fit loosely in holes in a disk 22 which is slidable along the shaft 15 to compress springs 23 confined on the studs 21. Another coiled spring 24 is confined on the shaft 15 between the disk 22 and an annular shoulder on the shaft. By this arrangement the effective driving force transmitted from the pulley 14 to the shaft 15 may be regulated merely by thrusting the disk 22 toward the pulley with varying degrees of pressure.

To actuate the disk 22, I provide a pin 25 extending at right angles to the shaft 15 and movable in longitudinally extending slots 15a formed in the shaft. As shown in Fig. 3, the ends of the pin 25 project from the shaft 15 to engage the disk 22. The shaft 15 is drilled axially and slidable in the axial bore is a seat 26 for a ball 27 which is operated by a plunger 28. This plunger is attached at its outer end to a head 29 fixed to a flexible bellows 30 and operable by fluid pressure in a casing 31. An expansible fluid of

common or suitable type is confined in the casing and in a small pipe 32 and coil or helix 33 mounted in the plenum chamber 10. The bellows 30 is of the type which is contracted by increases of pressure in the fluid contained in the casing 31.

Secured to the casing 31 is a supporting tube 34 which is threaded externally to engage a relatively adjustable sleeve 35 containing an anti-friction bearing 36. This bearing is confined between a collar 37 threaded on the extremity of the shaft 15 and a flange 38 formed on the sleeve 35. Suitable set screws are threaded in the sleeve 35 and collar 37 to secure them in any adjusted position relative to the tube 34 and shaft 15 respectively.

Electric circuit wires for the motor 12 are indicated by the numeral 39 in Fig. 1 and in accordance with the present practice the motor circuit may be controlled by a heat responsive switch located in the plenum chamber so that the blower motor is operated only when the temperature in the plenum chamber exceeds a predetermined minimum, such for example, as 105 degrees Fahrenheit. In Fig. 1 the heat responsive switch in the plenum chamber is shown diagrammatically and indicated by the numeral 40.

Operation

I prefer to maintain the blower motor 12 in operation continuously whenever the temperature in the plenum chamber exceeds a predetermined minimum of say 100 to 110 degrees Fahrenheit. My thermostatic control for the variable speed blower drive is so arranged that when the motor 12 is started the pressure exerted by the shoes 18 on the pulley 14 is insufficient to operate the blower. The spring 24, bearing against the shoulder on the shaft 15, exerts sufficient pressure toward the right (Fig. 2) to relieve the pressure exerted on the springs 23 by the bellows 30 in the opposite direction under the starting condition of plenum temperature. Thus the motor 12 is started without load. As the temperature rises in the plenum chamber, the bellows 30 are contracted by the progressively increasing fluid pressure in the casing 31 and the plunger 28 is actuated to the left as seen in Fig. 2 to gradually compress the springs 23 and 24 and thereby increase the pressure of the shoes 18 upon the pulley 14. As the friction between the shoes 18 and pulley 14 becomes great enough to turn the shaft 15 through the disks 16 and 17, the latter, together with the studs 21 and disk 22, are rotated while the casing 31, bellows 30, plunger 28, tube 34 and sleeve 35 are held against rotation by the pipe 32. The anti-friction bearing 36 carries the radial load and also transmits the endwise thrust toward the right (Fig. 2) to the collar 37. The end thrust from the bellows 30 in the reverse direction is transmitted through the anti-friction ball 27 to the seat 26 and pin 25 and thence to the disk 22. Some slippage occurs between the shoes 18 and pulley 14 throughout the entire range of blower speeds up to the point where a predetermined maximum temperature is reached in the plenum chamber, when the shaft 15 is driven at the full pulley speed. As the load is proportional to the speed of the blower, this causes the blower shaft 15 to be driven at speeds which are proportional to the temperature in the plenum chamber. The apparatus is preferably designed so that the maximum blower speed is reached when a plenum chamber temperature of about 200 degrees Fahrenheit is reached.

Merely by adjusting the position of the threaded sleeve 35 on the tube 34 the thrust exerted by the bellows 30 through the plunger 28 may be regulated to cause the blower to start when the desired temperature is reached in the plenum chamber. The springs 23 and 24 exert sufficient pressure to return the bellows to their initial or low temperature position after each period of blower operation.

It will be evident that my invention is adapted for use with various types of air heating systems and for cooling systems.

Having described my invention, what I claim as new and desire to protect by Letters Patent is:

1. In an air conditioning system having a plenum chamber and a blower arranged to force air through said chamber, the combination of a substantially constant speed motor, a variable speed drive interposed between said motor and blower to actuate said blower at a multiplicity of different speeds and heat responsive mechanism having a controlling element mounted in said plenum chamber and operative to change said drive to regulate the speed of said blower in accordance with changes in the temperature in the plenum chamber.

2. In an air conditioning system having a plenum chamber and a blower arranged to force air through said chamber, the combination of an electric motor, a variable speed drive interposed between said motor and blower to actuate said blower at a multiplicity of different speeds and heat responsive mechanism having a controlling element mounted in said plenum chamber and a pressure chamber associated with said drive to produce a gradually modulated change in the speed of said blower through said drive throughout the range of speeds from zero to a predetermined maximum speed.

3. The combination in a hot air heating system having a plenum chamber and means for heating air in said chamber, of a blower for forcing air through said chamber, an electric motor, a multiple speed drive for said blower interposed between said motor and blower and adapted to drive said blower at speeds ranging from zero to a predetermined maximum speed and heat responsive mechanism having a control element in said plenum chamber and operatively connected to said drive for actuating the same to drive said blower at various speeds corresponding to the temperatures in said plenum chamber.

4. The combination, in an air conditioning system, of a plenum chamber, a blower for supplying air to said chamber, an electric motor, a friction drive interposed between said motor and blower for driving said blower at speeds ranging substantially from zero to a predetermined maximum and heat responsive mechanism having a control element in said plenum chamber and operatively connected to said friction drive for actuating the same to drive said blower at speeds proportional to the temperature in said plenum chamber.

5. In an air conditioning system having a plenum chamber, electric motor adapted to operate at a substantially constant speed under a widely variable load and a blower arranged to pass air through said chamber, the combination of a blower shaft, a pulley freely revoluble on said shaft and operatively connected to said motor, a friction drive for connecting said pulley to said shaft to actuate said blower at a multiplicity of different speeds, heat responsive mechanism mounted on said shaft and having a controlling element mounted in said plenum chamber and

means operatively connecting said mechanism to said drive to change the speed of said blower through said drive in proportion to changes in the temperature in the plenum chamber.

6. In an air conditioning system, a plenum chamber, an electric motor, a blower for circulating air through said chamber, said blower having a drive shaft, a pulley freely revoluble on said shaft and operatively connected to said motor, a variable friction drive for connecting said pulley to said shaft to drive the blower at a multiplicity of different speeds, heat responsive mechanism having a controlling element mounted in said plenum chamber and an expansible bellows for actuating said drive and a compressible spring operable by said bellows for varying the friction of said drive to gradually change the speed of said blower in response to changes in temperature in the plenum chamber.

7. In an air conditioning system, a plenum chamber, an electric motor, a blower for circulating air through said chamber, said blower having a drive shaft, a pulley freely revoluble on said shaft and operatively connected to said motor, a variable friction drive for connecting said pulley to said shaft to drive the blower at a multiplicity of different speeds, heat responsive mechanism having a controlling element mounted in said plenum chamber and an expansible means for varying the friction of said drive to change the speed of the blower, means operable by said expansible means for varying the friction of said drive and spring means interposed between said expansible means and friction drive for retracting said means and modulating the changes in the speed of said blower in response to changes in temperature in the plenum chamber.

8. In an air conditioning system, a plenum chamber, an electric motor, a blower for circulating air through said chamber, said blower having a drive shaft, a pulley freely revoluble on said shaft and operatively connected to said motor, a variable friction drive for connecting said pulley to said shaft to drive the blower at a multiplicity of different speeds, heat responsive mechanism having a controlling element mounted in said plenum chamber and an expansible bellows, means operable by said bellows for varying the friction of said drive to change the speed of said blower, spring means interposed between said bellows and friction drive for retracting said bellows and modulating the changes in the speed of said blower in response to changes in temperature in the plenum chamber and adjustable means for varying the normal position of the bellows relative to said friction drive.

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