

Aug. 13, 1935.

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2,011,421

BOOSTER FAN

Filed Sept. 11, 1933

2 Sheets-Sheet 2

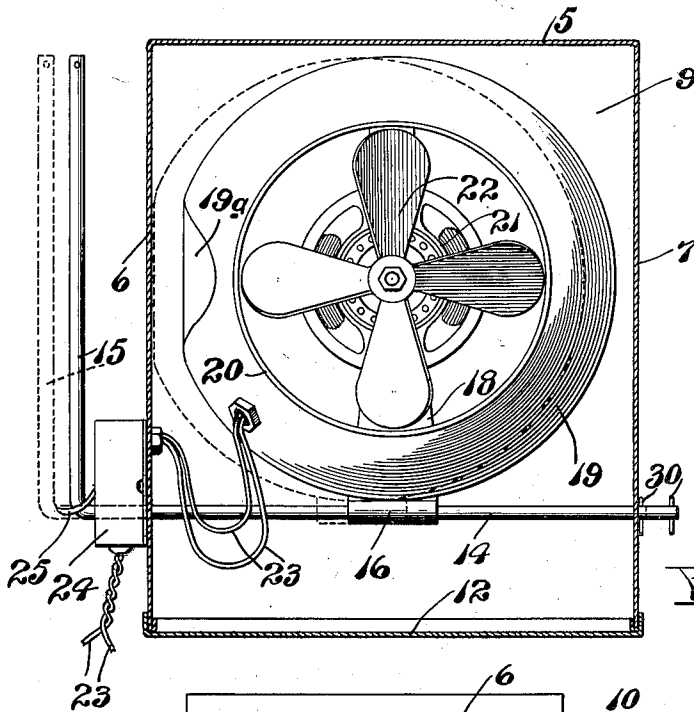


Fig. 3.

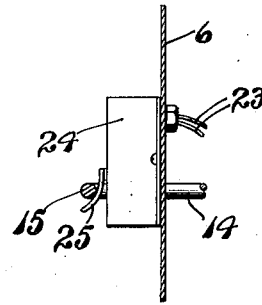


Fig. 6.

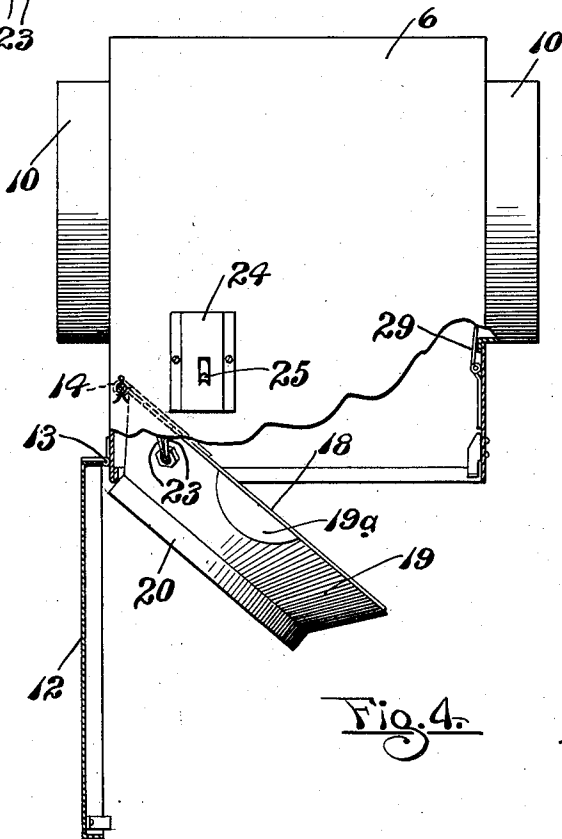


Fig. 4.

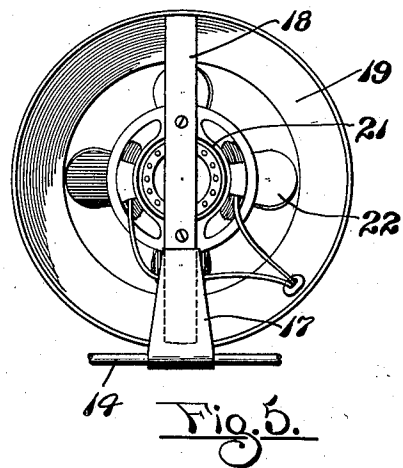


Fig. 5.

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UNITED STATES PATENT OFFICE

2,011,421

BOOSTER FAN

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Application September 11, 1933, Serial No. 688,869

8 Claims. (Cl. 126—110)

This invention relates to a booster fan adapted to be installed in the length of a furnace warm air pipe.

In heating buildings with warm air furnaces, warm air pipes lead from the enclosing casing around the radiator, combustion chamber and firepot of the furnace, serving to carry the warmed or heated air to different rooms in the building. It is many times desirable that the flow of heated air to a room shall be greater than what would normally flow under the circulation caused by heating the air, and the present invention is directed to a novel construction which may be installed in the length of a furnace pipe and operated to draw the warm air from the furnace casing and impel it to the room to which the furnace pipe leads, whereby the room is supplied with a greater amount of heated air than it would otherwise receive.

A booster fan of this type or character does not need to be operating all of the time that the furnace is in operation, and one object or purpose of the present invention is to provide means for moving the fan to an inoperative position and at the same time automatically cause its cessation of movement. Other objects and purposes are to provide a simple, practical, durable and effective construction of the type noted, and one in which ready access to the fan and to the electric motor which drives the same may be had for inspection and repair. And a still further object of the invention is to provide a means for utilizing the booster fan for circulating cool air, in the warmer months of the year, drawing it from the cooler air of the basement and projecting it into the room to which the furnace pipe, in which the fan is installed, leads.

An understanding of the invention for the attainment of the ends stated, as well as many others not at this time enumerated, may be had from the following description, taken in connection with the accompanying drawings, in which,

Fig. 1 is an elevation illustrating the installation of the booster fan unit of my invention in a furnace warm air pipe.

Fig. 2 is an enlarged vertical section taken lengthwise of the fan unit.

Fig. 3 is a vertical transverse section there-through.

Fig. 4 is a side elevation of said fan unit, with parts broken away, illustrating the manner in which the fan and the motor drive therefor may be rendered accessible for inspection or repair.

Fig. 5 is a rear elevation of the fan and its motor

and the Venturi housing in which it is located, and

Fig. 6 is a fragmentary vertical elevation showing the manner in which an electric switch for cutting the current to the electric motor is automatically operated upon turning the fan to a lower inoperative position.

Like reference characters refer to like parts in the different figures of the drawings.

The furnace may be of any conventional construction, having an enclosing casing 1 from which a plurality of warm air pipes 2 are led laterally and upwardly, each to a register 3 in a room of the house which is to be heated by the furnace, the register being above the floor 4 as shown, though the type or character of register, whether it be vertical or horizontal, is of no importance insofar as the present invention is concerned.

The booster fan unit of my invention includes in its construction a hollow casing of rectangular parallelepiped form having a top 5, parallel sides 6 and 7 and parallel front and back 8 and 9, from each of the latter of which a short pipe sleeve 10, having the same diameter as the diameter of the warm air pipe 2, projects. A section of the warm air pipe 2 may be removed and the casing described inserted in its place with the ends of the parts 10 in substantially abutting relation with the ends of the pipes 2. The apparatus is secured in place by clamping bands 11 which pass around and overlap the adjacent end portions of the parts 2 and 10 as shown in Figs. 1 and 2. As shown in Fig. 2, these bands 11 are welded to the sleeves 10 only near their bottom portions, thus permitting the sleeves to be bent or sprung outwardly easily during the installation of the apparatus.

The lower side of this casing is closed by a bottom 12 hinged at one side by means of hinges 13 whereby the bottom may be moved to a closed position and held therein by suitable latch means, or it may be turned to open position as shown in Fig. 4. It will be noted that the central axis of the pipes 2 and 10 is located above the central horizontal plane of the casing described so that there is a considerable portion of the chamber below the lower sides of the pipes 2 and 10, the purpose of which will be hereafter described.

A horizontal rock shaft 14 extends through the casing adjacent the rear side 9 and below the lower side of the pipes 2. At one end, adjacent the side 6, it is turned at right angles making a crank arm 15 therefor. The fan unit per se

is mounted on the rock shaft 14 within the hollow casing described. One end 16 of a bar 17 is bent or formed into a clasping roll or eye around the rock shaft 14 and permanently secured thereto.

5 The bar 17 extends from the rock shaft 14 and is permanently secured to a second bar 18 which in turn carries a Venturi-like housing for a fan. The housing has a frustro-conical section 19, the larger end of which is toward the rear side 9 of the housing, and terminates in a short cylindrical section 20 the diameter of which is slightly less than the diameter of the pipes 2 and 10. When the connecting bars 17 and 18 are in vertical position as shown in Fig. 2, this Venturi housing 15 has its longitudinal axis in coincidence with the axis of the pipes 2 and 10 so that air may pass freely from the furnace casing through the first section of the pipe 2 and thence through the Venturi housing to the chamber of the casing described, and therefrom to the other section 2 which leads to the register 3.

20 An electric motor is carried on the bar 18 and on its shaft a fan 22 is secured the diameter of which is slightly less than the cylindrical portion 20 of the Venturi structure. It has been found essential for best results that the plane of rotation of the fan 22 be located coincident with the end of the frustro conical section 19 of the Venturi structure or in other words that the plane of rotation of the fan and the plane in which the cylindrical portion 20 and the frustro conical portion 19 join be coincident. This location of the fan relative to the Venturi structure reduces recirculation of the air to a minimum and causes the fan to circulate the air most directly parallel with its axis.

25 Circuit wires 23 connect with the motor winding and pass therefrom through an opening in the conical section 19 of the Venturi housing, and thence through the side 6 of the casing to a switch box 24 which is interposed in the length of the wires 23 and secured for support to said side 6. Normally the switch within the switch box closes automatically by spring action.

30 An operating finger 25 for the switch extends outwardly beyond a side of the switch box 24 into the path of movement of the crank rod or handle 15. By turning the part 15 from its upper nearly vertical position, as shown in Fig. 1, to its lower nearly horizontal position as shown in dotted lines in Fig. 1, the part 15 engages and moves the finger 25 and automatically operates the switch to break the circuit and stop the motor from driving the fan.

35 It is evident that by reason of the connection of the bar 17 to the rock shaft 14 a turning of the crank handle 15 from one position to the other as described carries the fan and the housing around it from its vertical position, shown in full lines in Fig. 2, to a dotted line position also shown in Fig. 2. In the latter position the fan and the Venturi housing therefor are located in the lower chamber space of the casing below the lower side of the pipe sections 2 and 10. In such position the fan is automatically stopped and air may pass from the furnace casing 1 through the pipe 2 and thence to the room, the same as though the booster fan construction or my invention was not installed in the length of the pipe.

40 The installation shown in Fig. 1 illustrates the device located in a horizontal pipe although it may be understood that the device may also be installed in an inclined pipe. When installed in an inclined pipe the Venturi structure, combined

with the motor and fan located in operative position, will not be sufficiently inclined so that the preponderance of weight relative to the supporting shaft 14 will retain the parts by gravity in such position but the center of gravity will be so positioned relative to the supporting axis as to cause downward movement of the fan structure at all times when it is free to so move.

5 When the device is installed in a substantially horizontal pipe, as illustrated, it will be seen that gravity tends to move the venturi and fan and motor structure to inoperative position. A chain 27 is provided to raise it and maintain it in operative position and when the chain is released the device will move by gravity to its operative position. The chain 27 engages holding means 28 as clearly shown in Fig. 1.

10 Thus the device may readily be operated by a person in the room to be heated by manipulating the chain 27 and when the parts are moved to operative position the crank arm 15 releases the lever 25 of the switch 24 permitting the switch to close and causing the fan motor to operate the fan which operation will continue so long as the device is in its raised operative position but when lowered by operation of the chains the crank arm 15 will reengage the switch lever 25 and break the fan circuit causing the fan to cease operation and at the same time the fan and Venturi structure will lie within the lower part of the casing 5 as illustrated in dotted lines in Fig. 2 where it will not interfere with natural circulation of air through the pipe 2 and the upper portion of the casing 5.

15 If desired, the shaft 14 may be located at the opposite side of the casing, thus positioning the Venturi structure, when in its upper position, immediately adjacent the outlet pipe whereby a slightly better circulation of air is had. The Venturi structure gravitates downwardly from this position in the same manner as previously set forth.

20 A hinged supporting bar or tongue 29 is carried at the inner side of the side 8 of the casing described so that the Venturi housing for the fan may be properly supported when in its inoperative position as shown in Fig. 2. It is desirable at times that the fan and the housing therefor be lowered to a still lower position than that shown in Fig. 2, that is, projected partially outside of the casing. It will be noted that two cotter pins 30, spaced apart from each other, extend through one end portion of the rock shaft 14 (see Fig. 3). When it is desired to lower the fan and its housing to the position shown in Fig. 4 the inner cotter pin 30 is withdrawn and the rock shaft and the parts attached thereto moved laterally or to the dotted line position shown in Fig. 3 this carrying the crank arm or rod 15 outside of the switch finger 25. Then by turning the supporting tongue 29 to an upper position, as in Fig. 4, the fan and its motor and housing around it may be lowered through the open lower side of the casing the bottom 12 having been turned to the position in Fig. 4, whereupon ready examination and access to the fan and its motor may be had. The housing section 19 is formed at one side, as at 19a, to permit the longitudinal movement of shaft 14 and the attached parts.

25 From the foregoing description it is evident that a very practical and serviceable booster fan construction, adapted to be readily installed in the length of any selected furnace pipe is provided.

The ease with which the fan unit is dropped out of the air course passing through the furnace pipe so as not to obstruct the same, coupled with the automatic stopping of the fan is a very desirable and practical feature of the present invention. The Venturi construction of the immediate fan housing aids very materially to the efficiency of the fan, obviating back air currents and eddies.

This construction, while primarily of use in boosting the flow of heated air from a furnace to a room, is also very useful in the warmer months when the furnace is not operating for circulating cooler air from the basement to the rooms. This can be done by merely dropping the bottom 12 to the dotted line position shown in Fig. 1, leaving the fan in its operative position, whereupon the fan will serve to siphon cool air from the basement. It is also conceived that the device may be installed and practically utilized in the cold air return pipe of the heating system and when so used it has the effect of increasing the air circulation by blowing in a direction toward the furnace jacket which results in greater heating efficiency of the furnace. The installation of the unit is simple and easy, consisting merely of removing a section of the warm air pipe 2, placing the unit in the space formerly occupied by said section and clamping it in place by use of the clamping bands 11.

The invention is defined in the appended claims and is to be considered comprehensive of all forms of structure coming within their scope.

I claim:

1. A construction of the class described adapted to be interposed in the length of a furnace warm air pipe comprising, a casing having a top, vertical sides and a vertical front and back, a bottom hingedly connected to said casing to close the lower side thereof, sleeves connected to the front and back and extending therefrom in axial alignment, a horizontal rock shaft passing through the sides of said casing, a Venturi fan housing secured to said rock shaft and comprising a frustro-conical section and a short cylindrical section, an electric motor mounted within said housing, a fan driven by said motor within the housing, and a releasable latch for the housing carried by the front of said casing, whereby the housing with the attached motor and fan may be turned to a lower horizontal position and supported by said latch or may be turned to a still lower position and projected partially outside of said casing on release of the latch and opening said bottom, as specified.

2. A construction containing the elements in combination defined in claim 1, combined with manually operable means for turning the fan, motor and housing to upper operative or lower inoperative positions, and means for automatically stopping the motor when turned to lower position and for starting it when turned to upper position.

3. A construction of the class described adapted to be interposed in the length of a furnace warm air pipe comprising, a casing having a bottom hingedly connected to said casing to close the lower side thereof, a horizontal rock shaft passing through said casing, a Venturi fan housing secured to said rock shaft and comprising a frustro-conical section and a short cylindrical section, an electric motor mounted within said housing, a fan driven by said motor within the housing, and a releasable latch for the housing car-

ried by the said casing, whereby the housing with the attached motor and fan may be turned to a lower horizontal position and supported by said latch or may be turned to a still lower position and projected partially outside of said casing on release of the latch and opening said bottom, as specified.

4. In combination with a furnace pipe adapted to extend from a furnace casing, of a casing having a lateral extension and an opening leading into said lateral extension, a cover for said opening, said casing being interposed in the length of the pipe, a fan mounted for change of position and provided with supporting means for one position in which it is located in alinement with the furnace pipe, another in which it is in the lateral extension and below the lower side of said pipe, and a third in which it is swung partly through the opening in said casing, and means for manually moving the fan to any of said positions.

5. A construction of the class described adapted to be interposed in the length of a furnace pipe comprising, a casing having a bottom hingedly connected to said casing to close the lower side thereof, a horizontal rock shaft passing through said casing, a housing secured to said rock shaft and open at both ends, an electric motor mounted on said housing, a fan driven by said motor within the housing, and releasable means for the housing carried by the said casing, whereby the housing with the attached motor and fan may be turned to a lower horizontal position and supported by said releasable means or may be turned to a still lower position and projected partially outside of said casing on release of the releasable means and opening said bottom, as specified.

6. In a construction of the class described, an enclosing casing provided with ducts at opposite sides for connecting the same to sections of a furnace warm air pipe, thereby disposing the casing in the length of said pipe, a rock shaft slidably extending through the casing and adapted for axial movement to two predetermined positions, an electric motor and a fan driven thereby carried on and supported by the rock shaft whereby it may be positioned substantially between the said ducts and substantially at right angles to the axis of one duct and also swung downwardly, an arm extending from the rock shaft, an electric circuit for the motor, a switch in said circuit, and means for opening said switch located in the path of movement of said arm on the rock shaft when the same is in one of its predetermined positions and is rocked downwardly to thereby operate the switch to open the circuit and stop the motor, the arrangement of the several elements being such that no contact is had between the rock shaft arm and the means for opening the switch when the rock shaft is in its other predetermined position.

7. A construction of the class described adapted to be interposed in the length of a furnace pipe comprising, a casing having a bottom hingedly connected to said casing to close the lower side thereof, a horizontal rock shaft passing through said casing, a housing secured to said rock shaft and open at both ends, an electric motor mounted on said housing, a fan driven by said motor within the housing, and means for supporting the fan in alinement with the axis of the furnace pipe, said housing with the attached motor and fan being rotatable to a position wherein they are projected partially outside of said casing when the said bottom is opened.

8. A construction of the class described adapted to be interposed in the length of a furnace pipe comprising, a casing, cylindrical sleeves secured to and extending from said casing in substantially axial alinement, said cylindrical sleeves being located near the top of the casing, a pivoted rock shaft passing through the said casing below the lowermost point of the cylindrical sleeves, a fan, an electric motor connected to and driving the fan, and a support for the electric motor connected with said rock shaft, said rock shaft being movable through an arc of substantially 90°, whereby said shaft may be turned to position the fan in alinement with said sleeves or moved to a

lower position below the lower sides thereof, wherein the axis of the fan is perpendicular to the axis of the said sleeves, whereby an absolutely unobstructed passage is had directly through the casing, releasable means for positively maintaining the fan in alinement with said sleeves, means for supporting the fan in its lower position and door means in the casing adjacent the fan when the fan is in its lower position, said door means being capable of being opened regardless of the position of the said fan, and said fan being operable in its lower position to induce a flow of air into the pipe when said door is opened.

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