Feb. 28, 1961 M. W. BENNETT 2,972,941

AIR DISTRIBUTION SYSTEMS AND APPARATUS

Filed Jan. 14, 1960

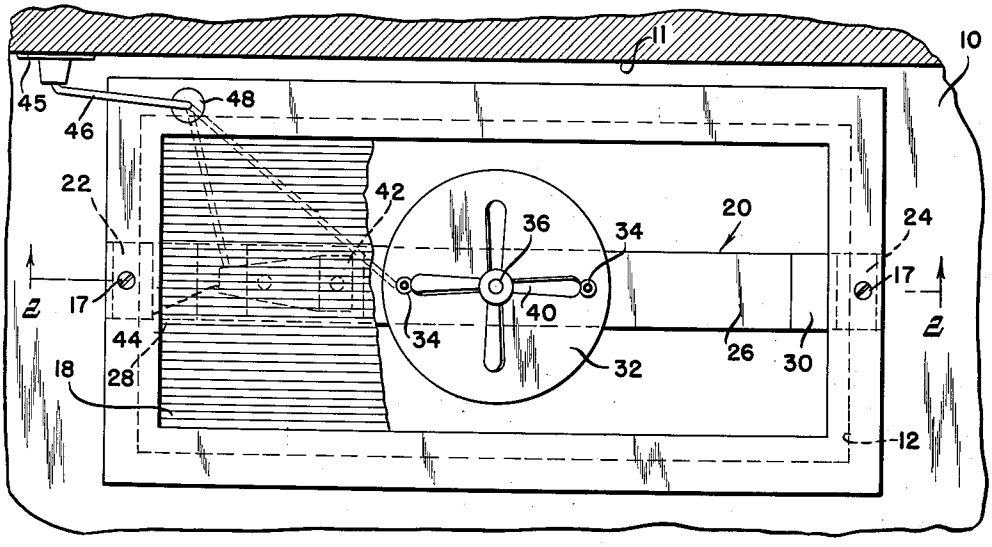


Fig. 1

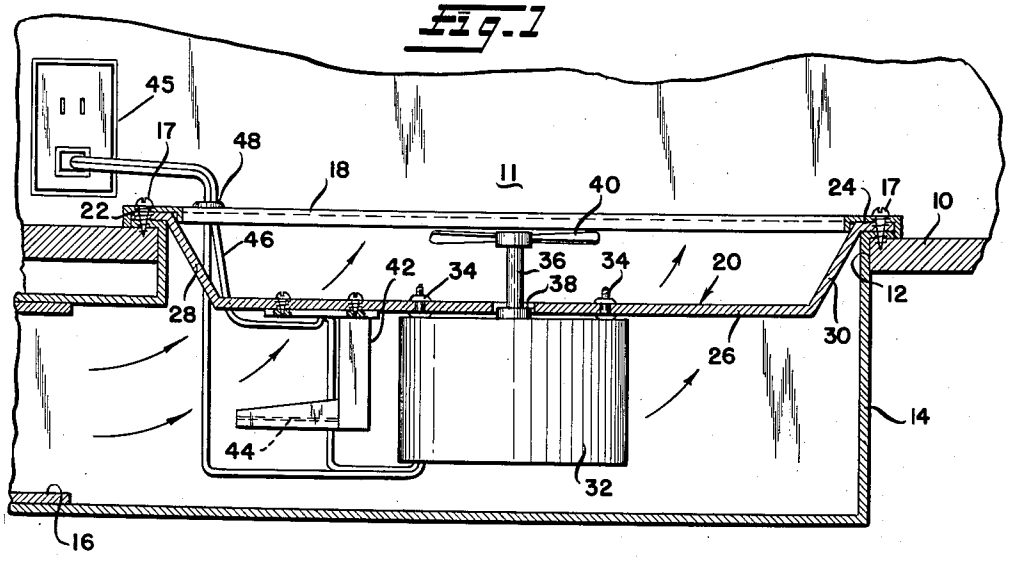


Fig. 2

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United States Patent Office 2,972,941
Patented Feb. 28, 1961

2,972,941

AIR DISTRIBUTION SYSTEMS AND APPARATUS

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Filed Jan. 14, 1960, Ser. No. 2,514

2 Claims. (Cl. 98—101)

This invention relates to forced air domestic or commercial heating or heating and cooling systems and more particularly to auxiliary air delivery units for such systems.

In the last twenty years, the forced air heating system has completely dominated the domestic heating field principally because it can be installed at a cost less than half the cost of competing systems and because it is compatible with air conditioning. For convenience, both heating systems and heating and cooling systems will be referred to in the specification and claims as "air conditioning systems." Because of the widespread use of forced air air conditioning systems and strong competition in the field, tremendous investments have been made in developing and refining such systems over the years. Nevertheless, presently known systems do not provide uniform heating or cooling for all portions of the house. Particular difficulties are encountered in the rambler, ranch type and split level homes which comprise the bulk of present construction. Usually the deficiency is limited to one room.

Experience has established that prior to the present invention the problem of obtaining proper distribution of air to all rooms of the dwelling could be solved, if at all, only by recourse to a complicated, expensive damper system. This expedient has not proved satisfactory since it cannot be depended upon to provide the desired results without a prohibitively expensive control installation. Further, in many cases, the inability of the system to provide adequate heating or cooling for one or more rooms can be determined only by actual experience with the system in operation. It is then too late to install the needed dampers except at prohibitive cost.

With the foregoing considerations in mind, it is the principal purpose and object of the present invention to provide improvements in distribution systems for forced air air conditioning systems which provide optimum air distribution to all rooms in the house served by the system.

It is a further object to provide improved air distribution units which, despite their unique effectiveness, are of simple, inexpensive construction and which may be readily installed in a matter of minutes by the individual home owner.

It is also an object to provide improved air distribution units which replace the conventional air outlet register and which do not require space in the room in addition to that occupied by the original register.

It is an additional object of the present invention to provide improved air flow booster units which operate automatically in conjunction with the main heating and cooling systems, to supplement the latter as required.

It is a further object of the present invention to provide novel air distribution systems which are used in conjunction with a main air conditioning system which increase the overall efficiency of the main system by utilizing otherwise wasted energy.

In carrying out these and other objects, the present invention provides an air flow booster assembly comprising a grill and an electrically driven fan, the operation

of which is controlled by a thermostat positioned to sense the temperature of the air in the adjacent stack head. The booster unit of the present invention is a self-contained assembly, which can be installed simply and quickly without special tools or techniques as a replacement for the existing air distribution register. Thus the air distribution units of the present invention can be installed without occupying additional space in the room and without altering the appearance of the original installation.

Additional objects and advantages will become apparent as the description proceeds in connection with the accompanying drawings in which:

Figure 1 is a front elevation of the air distribution unit of the present invention with parts broken away to show details of construction; and

Figure 2 is a transverse longitudinal section taken along line 2—2 of Figure 1.

The air distribution unit of the present invention is a unitary assembly which is installed as a replacement for the conventional air outlet register through which air is delivered to a room from a conventional central forced air air conditioning system. Accordingly, the unit may be installed in the floor, the wall or the ceiling of the room depending upon the design of the existing central system and the associated duct work. For convenience the floor, side walls and ceiling of a room will be termed "walls" in the specification and claims.

For present purposes the unit is shown positioned in the floor **10** of a room adjacent a wall **11**. The floor has a rectangular opening **12** surrounding the outlet of the stack head **14** which conventionally is a sheet metal elbow secured to the terminus of the sheet metal duct **16** leading to the plenum chamber of the central air conditioning unit. In accordance with conventional practice, a rectangular ornamental grill or register is detachably secured to the floor **10** by a pair of screws **17** to cover the opening **12**.

In accordance with the present invention this grill is replaced by an assembly comprising an identical grill **18** together with the associated mechanism now to be described.

A relatively thin gauge metal mounting strip **20** extends longitudinally of the grill **18** and is provided with flat end tabs **22** and **24** welded to the respective imperforate marginal ends of the grill **18**, the tabs **22** and **24** being connected to a flat central mounting portion **26** by legs **28** and **30**, respectively. A fractional horsepower motor **32** is supported on the mounting section **26** by a pair of rubber shock mounts **34** so the motor shaft **36** projects forwardly toward the grill **18** through an opening **38** in the mounting strip **20** which is preferably located at the geometric center of the grill **18**.

Mounted on the outer end of the shaft **36** preferably immediately adjacent the inner surface of grill **18** is a fan **40**. The motor and fan are carefully selected to provide a desired predetermined air flow from the stack head **14** into the room. For example, in a typical case the motor **32** is a $\frac{1}{100}$ horsepower motor having the normal r.p.m. of 1500. With a motor of this size, it has been determined that if the fan **40** is 4" in diameter approximately 200 cubic feet per minute will be delivered to the room. If higher air flows are desired a 5" fan can be substituted to provide 260 cubic feet per minute or a 6" fan can be utilized to provide 300 cubic feet per minute.

Since the fans are readily interchangeable, the selection of the desired size will in most cases depend upon the preference of the individual home owner. While, because of the utilization of the long mounting strap **20**, the rubber shock mounts **34** and the small capacity motor **32**, the unit is practically inaudible, it has been found that the noise level of the unit can be held to an absolute minimum by utilization of the largest fan consistent with

room requirements since the use of the larger fan reduces the r.p.m. of the motor to some extent.

It is a feature of the present invention that the operation of the fan and motor is controlled in response to the operation of the main air conditioning system. For this purpose a thermostatic switch 42 is provided in the motor circuit. This thermostat is a commercially available item and, for example, may be a unit presently manufactured by the Minneapolis Honeywell Regulator Company and identified as the L4028 fan control.

The temperature sensitive element of the switch assembly 42 is a bi-metallic strip 44 which is positioned well behind the face of the grill 18 and directly in the path of the air as it enters the stack head. In a typical case it will be positioned approximately 2" behind the surface of the grill 18. In this position it is directly sensitive to the temperature of the air passing through the stack head and is influenced to a minimum degree by the temperature of the air in the room and is well away from any metallic elements. The power leads 46 for the motor pass outwardly through a rubber grommet 48 in the grill 18 and lead to any convenient wall socket such as that shown at 45.

To install the assembly it is necessary to remove only the two screws 17 holding the original grill in place, to insert the assembly into the stack head and replace the two screws. When the unit is plugged in, it is then ready for completely automatic operation. In practice, the thermostatic switch 42 is set so the motor and fan are operated when the temperature of the air passing through the stack head 14 reaches approximately 105° F. and the motor and fan are automatically cut off when the temperature in this region falls to 95° F. Accordingly, the fan and motor operate only during operation of the main system and for the short period following the cessation of operation of the main system. The continuation of operation for the motor 32 after the blower associated with the main central unit stops improves the efficiency of the entire system since the hot or cold air which would otherwise be trapped in the furnace plenum chamber and in the duct immediately adjacent the plenum chamber is delivered to the room.

It is also contemplated that the unit will be used during the cooling cycle. Preferably this is accomplished by replacing the thermostat with a double contact thermostat of a type also manufactured by the Minneapolis Honeywell Regulator Company which produces the same high temperature on or off cycle and additionally turns the motor 32 on when the temperature falls to 50° F. and switches the motor off when the temperature rises to 65° F. With this type of installation, the unit is completely automatic and requires no attention from the home owner once it has been installed. Alternately, a pair of conventional thermostats may be utilized, one controlling the high temperature operation and one controlling the low temperature operation. In this event, a two position switch will be included in the motor circuit and placed in an accessible location on the front of the grill 18 to switch either one or the other of the two thermostats into the motor circuit.

From the foregoing it will be apparent that the objects of the present invention have been attained by the provision of a simple, inexpensive auxiliary air distribution unit which functions automatically to provide additional heating or cooling air in the exact quantity and at the precise point required by a particular installation.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A self-contained unitary auxiliary air distribution unit for use with a central forced air air-conditioning system having air ducts terminating in stack heads having outlets substantially flush with a wall surface of a room, said outlets being provided with a normal register detachably held in place by retaining means comprising a substantially flat register grill of the same frontal area and shape as said normal register and having a solid peripheral rim and a central perforate grill portion, said register grill being held in place at said outlet substantially flush with said wall surface by said retaining means, a mounting strap rigidly secured to said register at the rear side thereof, said mounting strap being bent away from said register to provide a mounting portion spaced from said register, an electric motor, means securing the forward portion of said motor to said mounting portion of said mounting strap, a fan driven by said motor and disposed between said motor and said register and adjacent the rear surface of said register, an electric cord connected to said motor and extending through an opening in said register for connection to an electric outlet in said room, a thermostat, means rigidly mounting said thermostat on said register at the rear side thereof directly in the path of air passing through said stack head, said thermostat being connected in said electric cord for selectively energizing and de-energizing said motor in response to changes in the temperature of the air passing through said stack head.

2. A self-contained unitary auxiliary air distribution held in place by retaining means at an air outlet flush with the wall surface of a room, said outlet being provided at the terminal portion of a stack head formed at the end of a duct of an intermittently operated central forced air air-conditioning system, said unit comprising a substantially flat register grill of the same frontal area and shape as said normal register and having a solid peripheral rim and a central perforate grill portion, said register grill being held in place at said outlet substantially flush with said wall surface by said retaining means, a mounting strap rigidly secured to said register at the rear side thereof, said mounting strap being bent away from said register to provide a mounting portion spaced from said register, an electric motor, means securing the forward portion of said motor to said mounting portion of said mounting strap, a fan driven by said motor and disposed between said motor and said register and adjacent the rear surface of said register, an electric cord connected to said motor and extending through an opening in said register for connection to an electric outlet in said room, a thermostat, means rigidly mounting said thermostat on said register at the rear side thereof directly in the path of air passing through said stack head, said thermostat being connected in said electric cord for selectively energizing and de-energizing said motor in response to changes in the temperature of the air passing through said stack head.

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