March 29, 1966 C. E. BUNN 3,242,846

AIR CONTROL MECHANISM

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FIG. 1

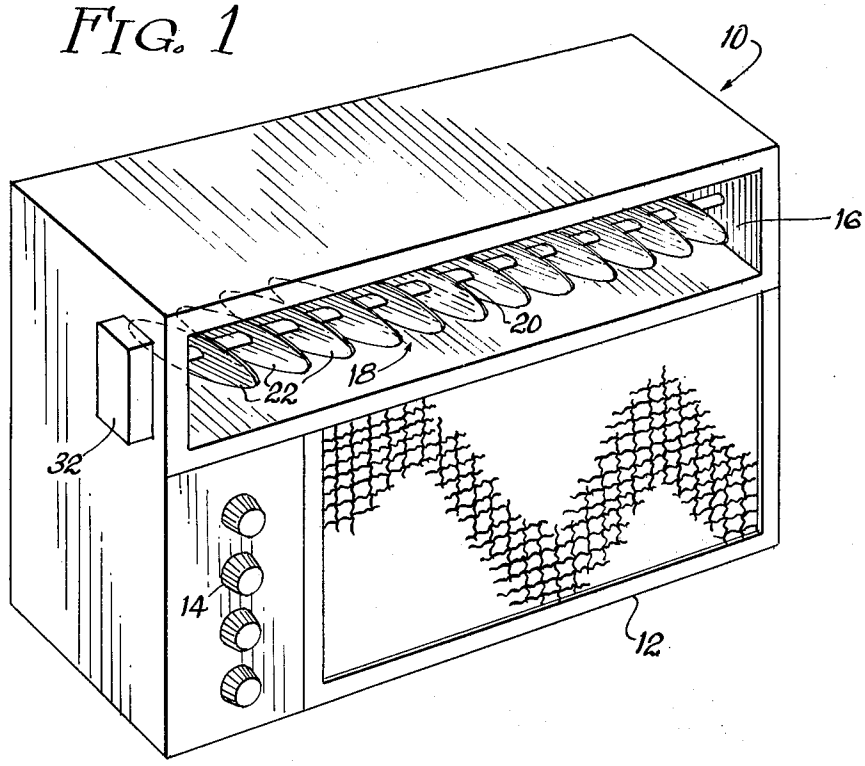
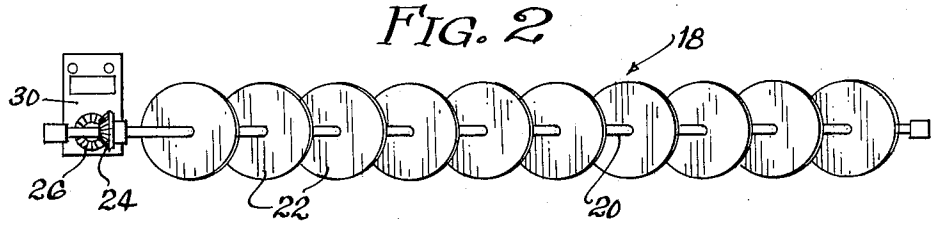


FIG. 2



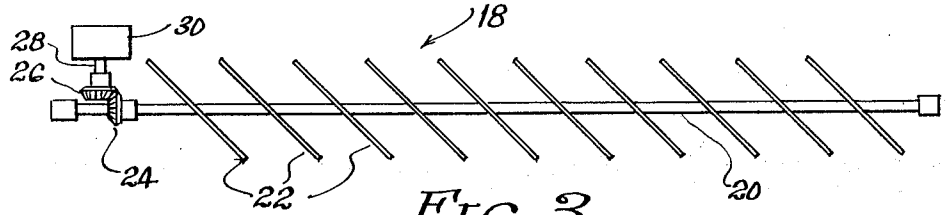


FIG. 3

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FIG. 4

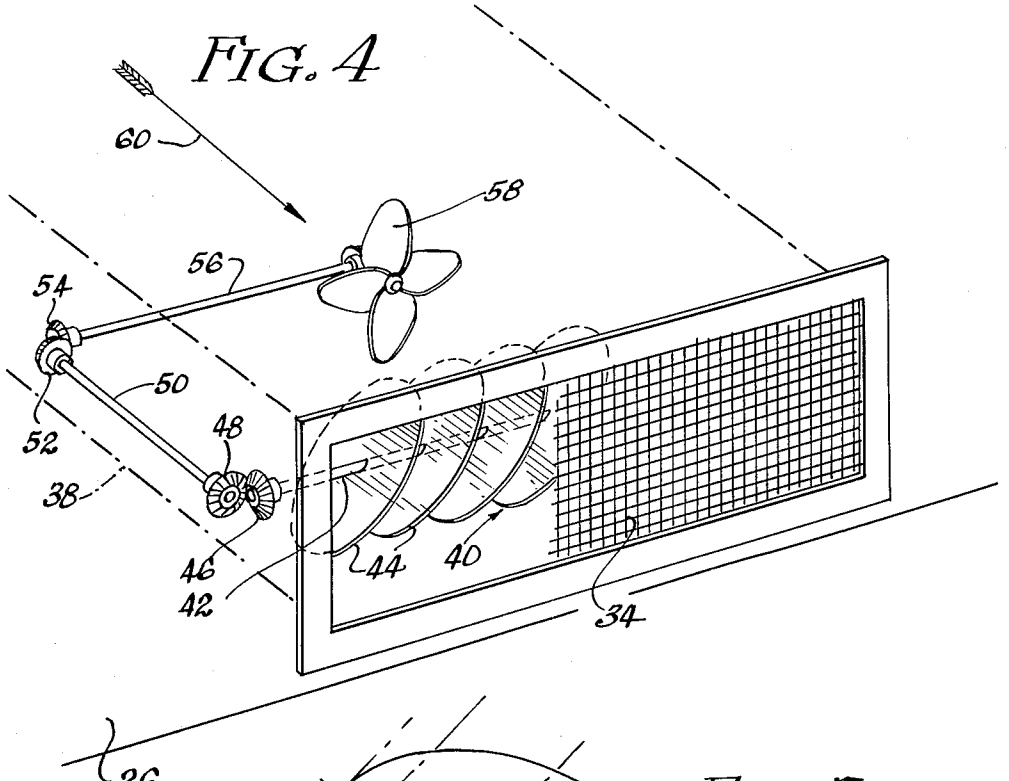
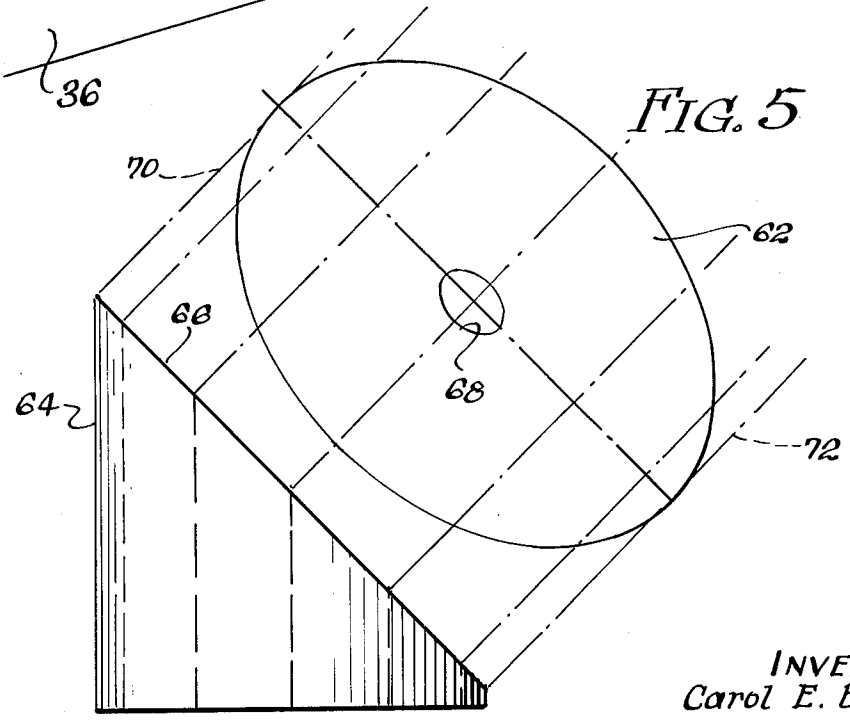


FIG. 5



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AIR CONTROL MECHANISM

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4 Claims. (Cl. 98—40)

This invention relates to mechanisms for use in combination with systems employed for controlling the condition of air. In particular, the instant invention involves a unique distributing mechanism which is adapted to be employed in conjunction with air conditioners and heating units whereby uniform distribution of the air output in such systems can be achieved.

One of the major problems confronting manufacturers of air conditioners and other systems employing moving streams of air involves proper distribution of the air. In the case of air conditioners which provide for cooling of the air, there is a substantial tendency for the cold air streams to concentrate in a particular path. This can be extremely annoying for anyone situated in the direct path, and it also severely limits the efficiency of the construction. Forced air heating systems suffer from similar problems since the hot air streams are directed in a more or less confined path and, therefore, some locations are subject to overheating while others do not properly benefit from the system.

The use of baffles is well known in systems of the type described. For example, in Crowle et al. Patent No. 2,853,935, there is disclosed a system of baffles which serve to direct air passing out of an air conditioner. With the use of such arrangements, the cold air streams are directed in accordance with the desires of individuals located near the air conditioning unit so that such individuals will not be directly in the path of a cold air stream. Nevertheless, a system of this nature still confines the air flow to a specific locality and, therefore, uniform distribution cannot be achieved.

It is an object of this invention to provide a system for controlling the distribution of air which will achieve uniform movement of the air into an enclosure without concentrating the air in a particular path.

It is a further object of this invention to provide a control mechanism for uniformly distributing air which is particlularly suitable for use in conjunction with air conditioners and forced air heating systems.

It is a still further object of this invention to provide a control mechanism of the type described which is inexpensive from a manufacturing standpoint, and which can be readily integrated into conventional conditioning systems whereby the advantages of the individual can be achieved without undue expense.

These and other objects of this invention will appear hereinafter and for purposes of illustration, but not of limitation, specific embodiments of this invention are shown in the accompanying drawings in which:

FIGURE 1 is an elevational view of an air conditioner modified in accordance with the concepts of this invention;

FIGURE 2 is a plan view of the specific control mechanism employed in the operation of this invention;

FIGURE 3 is a front elevational view of the mechanism of FIGURE 2;

FIGURE 4 is a perspective view partly cut away illustrating the incorporation of the mechanism of this invention in a forced air heating system; and,

FIGURE 5 is a detailed illustration of a disc member employed in the practice of this invention.

The system of this invention generally relates to a control mechanism which is adapted to be associated with means designed for directing streams of air into an enclosure. With reference to the following disclosure, it will be appreciated that the mechanism of this invention can be associated with air conditioners which direct air

into rooms or other enclosures, large or small. The mechanism can also be associated with conventional forced air heating equipment or with any other systems which provide for the directing of moving streams of air from an outlet into a space adjacent the outlet.

The specific control mechanism comprises a shaft which extends across the outlet into the enclosed space. A plurality of flat elliptical discs are attached to the shaft with the plane defined by the surface of each disc being angularly positioned with respect to the axis of the shaft. Drive means are connected to the shaft for constantly rotating the elliptical discs whereby the stream of air passing through the outlet is distributed in accordance with the position of the discs.

The mechanism of this invention is arranged whereby substantially all of the air stream must pass between discs before entering into the space around the outlet. The discs are preferably designed so that the peripheral edges thereof will move closely adjacent the surfaces defining the walls of the outlet. With this arrangement, no significant amount of air can pass outside the controlling influence of the discs.

The combination of the elliptical shape of the discs and their angular distribution provides a unique effect from the standpoint of air distribution. The rotation of the shaft upon which the discs are mounted causes a constant change in position of the respective discs whereby the air stream is constantly changing its direction so that there is no single concentrated stream of air which could prove uncomfortable or inefficient. The elliptical shape contributes to the uniformity since proper disposition of the respective discs prevents any change in the spacing between the peripheral edges of the discs and the walls of the outlet opening despite the fact that the discs are constantly rotating.

FIGURE 1 of the drawings illustrates an air conditioning unit **10** which comprises a housing **12** and conventional control knob **14**. An outlet opening **16** is located at the top of the housing, and the mechanism of this invention, generally designated by the numeral **18**, is mounted within this outlet.

As indicated in FIGURES 2 and 3, the mechanism **18** comprises a shaft **20** with a plurality of elliptical discs **22** disposed thereon. Each of these discs is secured to the shaft, and each disc is disposed angularly relative thereto. The shaft is mounted for rotary movement within the housing **12** whereby the discs will present a constantly changing disposition with respect to the outlet.

A bevel gear **24** is secured to the shaft **20** and a second bevel gear **26** is secured to the drive shaft **28** of a small motor **30**. The motor **30** may be mounted within a motor housing **32** attached to the side wall of the air conditioner **10**. Alternatively, the motor may be included within the confines of the side wall.

FIGURE 4 illustrates an arrangement wherein the system of this invention is associated with a forced air conduit. In the particular arrangement illustrated, the system is associated with air outlet grate **34** which is mounted in a wall **36** in a conventional fashion. The air conduit **38** is adapted to be connected in a typical system such as a forced air heating system of the type used in a home or other building.

A mechanism **40** of the type contemplated for use in accordance with this invention is mounted for rotary movement immediately behind the grate **34**. The mechanism includes a shaft **42** having discs **44** secured thereto. A bevel gear **46** is attached to the shaft **42**, and an associated bevel gear **48** is attached to the shaft **50**. Bevel gears **52** and **54** provide driving connection with shaft **56**, and this latter shaft is operatively connected to windmill structure **58**.

In the operation of the system of FIGURE 4, it will be appreciated that the forced air stream **60** will cause rotation of the windmill structure whereby shafts **56** and **50** will be rotated. This rotary movement is then transmitted to the shaft **42** whereby the air stream will be affected by the discs **44**.

It will be noted with respect to FIGURES 1 and 4 that the rotating discs cover virtually the entire opening defined by the respective outlets. This arrangement is desired since there will be very little of the air stream passing through the outlet which is not affected by the discs. A clearance of ⅛ inch between the disc peripheries and the side walls of an outlet will provide an arrangement with no noticeable amount of air flowing free of the influence of the discs.

As previously indicated, the elliptical shape of the discs is quite important with regard to the achievement of the results of this invention. This can best be explained by referring to FIGURE 5 which illustrates a plan view of a disc **62**. In considering this figure, it should be assumed that the disc **62** was cut from the block **64** along the line **66**. Thus, rotation of the disc **62** through 90° will provide a perfect fit of this disc over the face of the block **64** defined along the line **66**. The hole **68** in the center of the disc is provided by disposing a drill at the same angle as the line **66** makes with the vertical axis of the block **64**. In the illustrated embodiment, this angle is 45°.

The disc **62** will inherently operate in accordance with this invention when it is placed on a shaft and disposed at an angle of 45° with respect to the axis of the shaft. When the disc is rotated, the peripheral extent of the disc with respect to the top and bottom walls of the outlet will remain constant. Thus, if the lines **70** and **72** in FIGURE 5 are assumed to correspond with such top and bottom walls, then the disc will always remain in a constant spacing with respect to these walls during rotation. Accordingly, there will be no variation in spacing between the peripheries of the disc and such walls whereby a minimum amount of air will pass through the outlet free of the influence of the discs.

In the preferred form of this invention, discs are manufactured for disposition on a shaft at an angle of about 45°. It has been found, however, that this angle can vary between about 20 and 70° while still achieving the advantageous results of this invention. In order to achieve the desired constant spacing discussed above, the discs employed at any given angle should be equivalent to discs cut from a block at the same angle with respect to the axis of the block as explained with reference to FIGURE 5.

In the preferred form of this invention, the shaft carrying the discs is rotated at about 6 r.p.m. although advantageous results can be achieved with rotation between about 3 r.p.m. and 12 r.p.m. Slower rotations do not sufficiently eliminate a steady flow in one direction while rotations at a higher speed prove inefficient to the extent that an insignificant improvement in results is achieved with a higher energy output. With respect to these speed values, it will be appreciated that the windmill operation described can be readily designed on the basis of the speed and volume of air in a particular forced air system to achieve the desired amount of rotation.

The advantage of the system of this invention over existing systems is readily recognized when put into operation. There is immediately eliminated any sensation with respect to a concentrated flow of air in one direction. As the discs rotate, they are constantly changing the direction of flow both in the vertical and horizontal directions. The constant variation in direction and the wide scope of the arrangement also improves the efficiency of operation since the space which is to be conditioned by the air stream will be maintained in a much more uniform state.

The concepts of this invention can be applied to any type of air conditioning, heating and ventilating systems in both residential and commercial structures. It is also contemplated that the control mechanisms be employed in refrigeration and freezing systems and in combination with many other constructions such as portable room heaters, humidifiers and the like. The system is clearly suitable for any arrangement which involves moving air streams and which can be benefited by uniform distribution of such streams.

A distinct advantage of the instant invention relates to its simplicity from the standpoint of manufacturing costs and from the standpoint of assembly operations. The shaft and discs for a particular mechanism involve extremely simple manufacturing and assembly operations while the motor units employed can comprise any of several conventional low cost constructions. In the case of assembly, many presently available air conditioners can be modified to include this mechanism by merely providing mountings for the shaft and a housing for the motor. Forced air heating vents can be readily adapted for use in accordance with this invention, and it should be noted that independent motor means could be provided in lieu of the windmill construction described. It will also be appreciated that such a windmill construction can also be employed in combination with any type of forced air system.

In speaking of a windmill construction, it is intended that this terminology shall cover various configurations which are adapted to be rotated when engaged by moving streams of air. For example, a system in the form of a water wheel or paddle wheel could easily be employed to achieve the objects of this invention.

A wide variety of sizes for the elements of this invention is contemplated. It is to be noted in this connection that the size depends to a large extent on the size of the outlet with which the mechanism is to be associated. The discs should be cut whereby the peripheral edges thereof will move as close as possible to the top and bottom walls of an outlet. In one form of this invention, discs are cut at an angle or 45° from a three-inch diameter block and a ⅜ inch shaft was employed for mounting 10 of the discs with the center points of adjacent discs being spaced about two inches apart. The spacing of the discs should obviously be such that no free passage for air is provided. Thus, all portions of the air stream should be deflected by the discs to achieve maximum efficiency of operation.

It will be understood that various changes and modifications may be made in the described systems which provide the characteristics of this invention without departing from the spirit thereof particularly as defined in the following claims.

That which is claimed is:

1. In a system for controlling the condition of air in an enclosure wherein at least one stream of air is passed through at least one outlet and directed into the enclosure, the improvement comprising a control mechanism for uniformly distributing the air in said stream throughout said space, said mechanism including a shaft extending transversely across said outlet, means mounting the ends of said shaft for rotary movement, a plurality of flat elliptical discs, means securing each of said discs to said shaft with the axis of said shaft extending through the center points of said discs and with the plane defined by the surface of each disc being positioned at an angle between about 20° and about 70° with respect to said axis, drive means connected to said shaft for constantly rotating said shaft, said drive means comprising a gear means at the end of said shaft adjacent the side of said outlet, and means adjacent the side of the outlet for driving said gear means, said outlet comprising a substantially rectangular cross section and defining rearwardly extending top and bottom walls forming an outlet passage substantially the width of the major axis of said discs whereby

the peripheral edges of said discs move closely adjacent said top and bottom walls with a substantially constant spacing being maintained between said peripheral edges and said walls so that substantially all of said air is affected by said discs for thereby distributing the air into the enclosure in constantly varying directions.

2. A system in acordance with claim 1 wherein the drive means operates to rotate the shaft between 3 and 12 r.p.m.

3. A system in accordance with claim 1 comprising an air conditioner adapted to distribute cool air through said outlet and wherein said drive means comprises a low capacity motor.

4. A system in accordance with claim 1 comprising a forced air heating system, and wherein said drive means

comprises a windmill positioned in the path of said stream with interconnecting gear means between said windmill and said shaft providing the drive connection for said shaft.

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