July 14, 1959 J. R. DAVIS 2,894,728

MULTI-ZONE AIR CONDITIONING UNIT

Filed Feb. 6, 1957 2 Sheets-Sheet 1

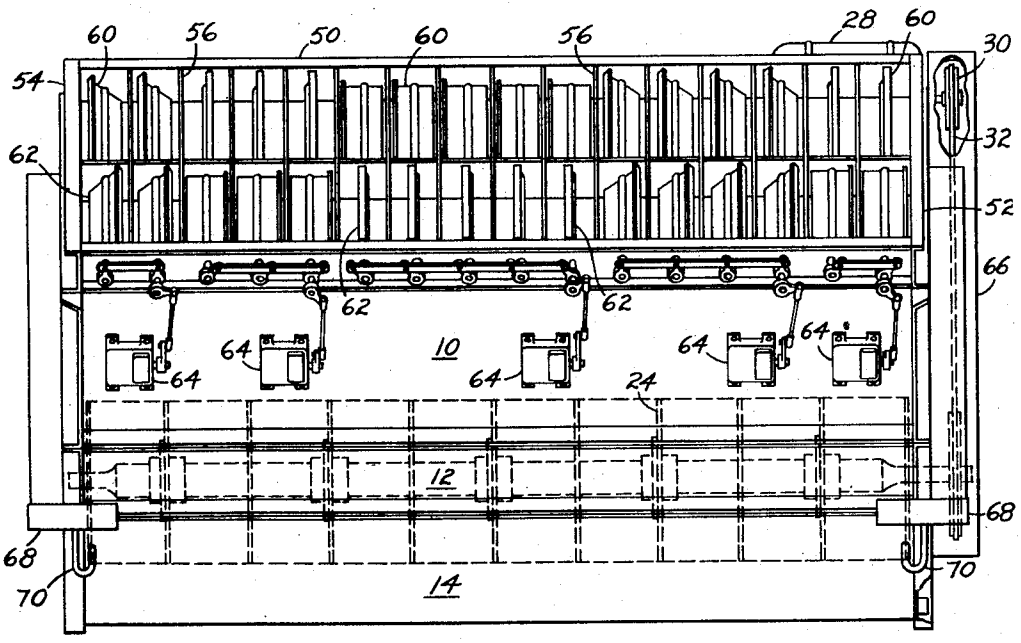

Fig. 1.

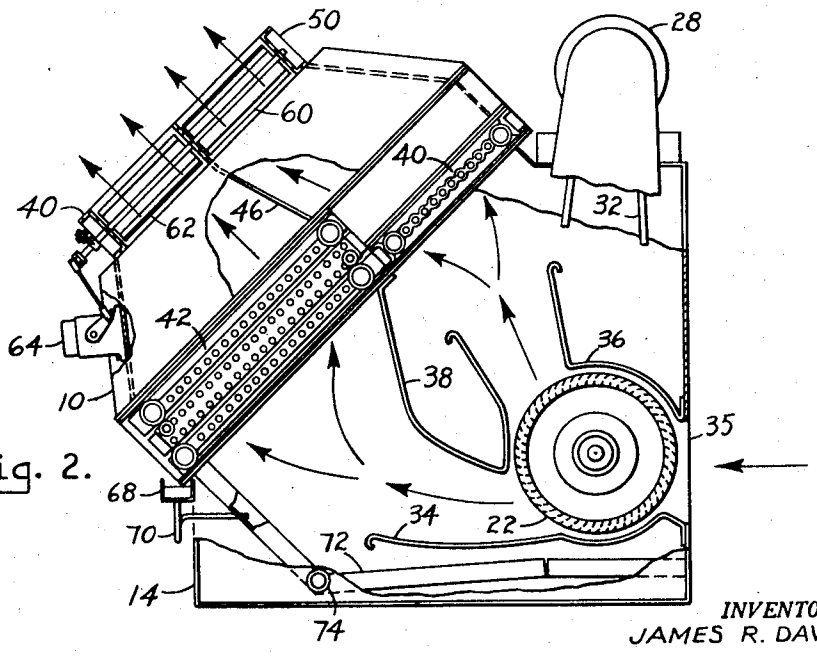

Fig. 2.

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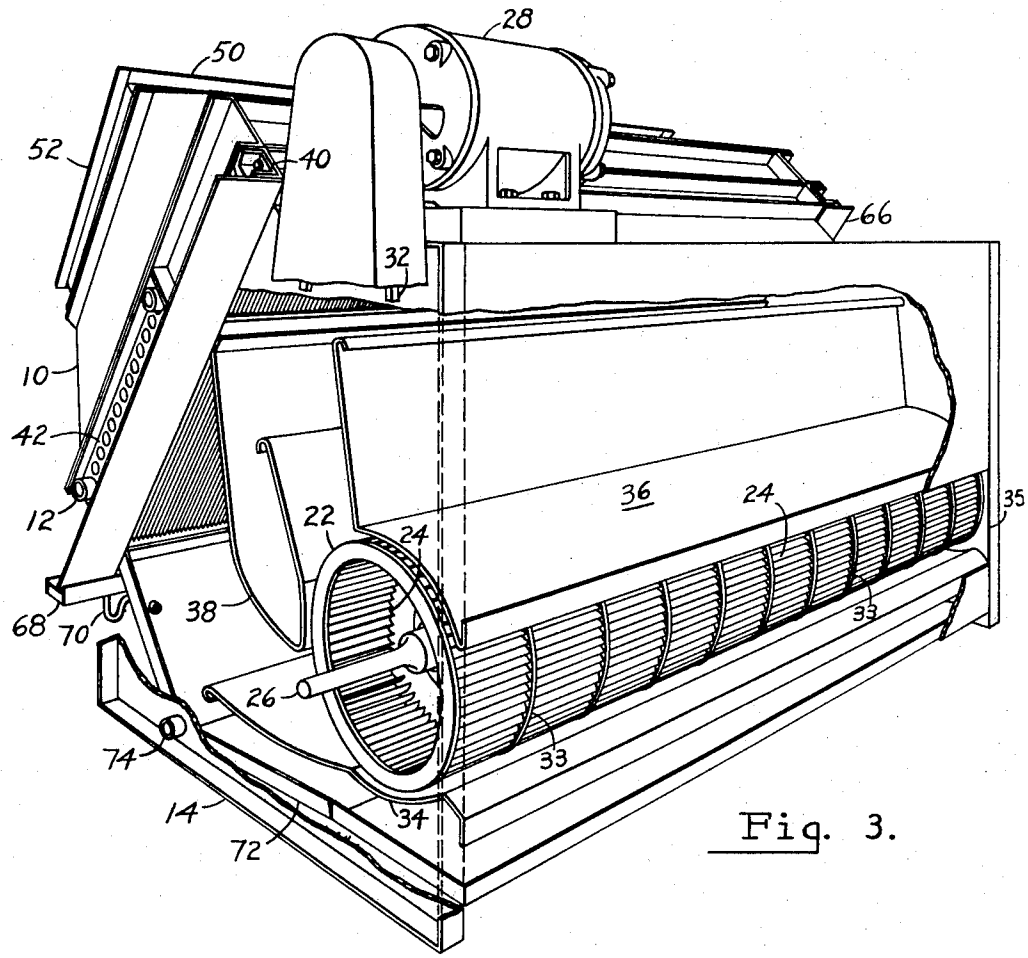

Fig. 3.

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MULTI-ZONE AIR CONDITIONING UNIT

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3 Claims. (Cl. 257—9)

This invention relates to air conditioning units and more particularly to air conditioning units having a heating coil, a cooling coil, dampers for varying the amount of heated and cooled air passing through each of a plurality of outlet openings and a fan for moving air through the unit.

It is an object of this invention to provide an arrangement of the fan, coils, and passageways which will effectively divide the air into two separate streams so that the mixing of air from one stream to another is substantially eliminated regardless of the position of the dampers. Mixing of the two streams of air with a resulting loss in capacity and control has been a problem with prior units of this type. In prior units when the dampers were positioned for 100% cold air the effect of the heating coil would reduce the cooling capacity as much as 5 to 10 percent.

It is another object of the invention to provide a fan which is easily manufactured and assembled in the unit and which is particularly adapted to cooperate with the other elements of the unit in accomplishing the function of the unit.

Other objects and advantages of the invention will become apparent as the specification proceeds to describe the invention with reference to the accompanying drawings in which:

Fig. 1 is a view in elevation of the outlet side of the unit of this invention;

Fig. 2 is an end elevational view of the unit with portions of the casing broken away to show the interior construction;

Fig. 3 is a perspective view with portions of the casing broken away to show the interior construction.

Referring now to the drawings, the unit has a damper section 10, a coil section 12, and a fan section 14. The sections 10, 12, and 14 fastened together in any suitable manner as by bolts not shown.

A cross-flow fan wheel 22 having forwardly curved blades 24 is secured to a shaft 26 which is suitably supported in bearings at the ends of the unit and rotatably driven from a motor 28 through a motor pulley 30 and a belt 32. The fan wheels 22 have a plurality of spaced hub plates 33 for supporting the fan wheel 22 on the shaft 26 along its length. Air enters the fan wheel 22 through an opening 35 in the fan section 14. The air is discharged from the fan wheel 22 between the block-offs 34 and 36. Block-offs 34 and 36 define the discharge area and prevent reverse flow of air from the discharge side to the inlet side of the fan wheel 22. A divider 38 extends from end to end of the fan section 14 and from the coil section 12 to close proximity with respect to the fan wheel 22 to divide the air discharged from the fan wheel 22 into two separate streams one of which flows through the heating coil 40 and the other of which flows through the cooling coil 42.

The damper section 10 has a wall 46 for separating the two air streams. A pair of spaced channels 48 and 50 extend from end to end of the damper section 10 and

channels 52 and 54 extend across the ends of channels 48 and 50 to form therewith a rectangular opening. A plurality of zone partitions 56 divide the opening defined by channels 48, 50, 52 and 54 into a plurality of zone openings. Shafts 58 are pivotally mounted in channels 48 and 50 and in wall 46. Warm air dampers 60 and cold air dampers 62 are mounted on shafts 58 in such positions that the dampers 60 are inclined at an angle of 90° with respect to dampers 62 so that when one set of dampers is fully closed the other set is fully open. The ducts to the zones of the building may be constructed to select a desired number of zone openings. For instance starting at the left in Figure 1, the first two zone openings have their dampers arranged for connection of one zone duct, and the next three zone openings have their dampers arranged for connection of a second zone duct. The dampers which serve each zone duct are connected in a common and well known manner by suitable cranks and links to one of damper motors 64 as is clearly shown in Figure 1.

Secured to each end of the unit is a condensate shield 66 which has its lower end extending into a condensate drain cup 68. The condensate which drips from the ends of the cooling coil 42 is conducted by the condensate shield 66 into the condensate drain cup 68. Each drain cup 68 has a trap drain pipe 70 which conducts condensate to the main drain pan 72. A drain pipe 74 from the main drain pan 72 is adapted to be connected to the sewer.

Although a unit having one fan has been shown and described, it should be understood that units having more than one fan are contemplated. While we have described preferred embodiments of our invention, we contemplate that many changes may be made without departing from the scope or spirit of our invention and we desire to be limited only by the claims.

I claim:

1. An air conditioning unit comprising a rectangular casing, one end of said casing having a longitudinal rectangular inlet opening extending substantially the entire length of said one end of said casing, a cross-flow fan wheel in said casing, means rotatably mounting said cross-flow fan wheel on said casing, said cross-flow fan wheel having its length greater than its diameter and being positioned adjacent the inlet opening in said one end of said casing and having its major axis extending substantially the entire length of the inlet opening, a first block-off member secured to said casing and extending inwardly from one side of said inlet opening and surrounding a portion only of the periphery of said cross-flow fan wheel along substantially its entire length, a second block-off member secured to said casing and extending inwardly from the other side of the inlet opening and surrounding a second portion of the periphery of said cross-flow fan wheel along substantially its entire length, a partition secured to said casing and extending between the sides of said casing to form with said casing two air passageways, said partition extending substantially to the periphery of said cross-flow fan wheel at a portion of the periphery between and spaced from said first and said second block-off members to divide the air delivered from said cross-flow fan into two streams, a heating coil secured to said casing and being positioned in one of said passageways and a cooling coil secured to said casing and being positioned in the other of said passageways.

2. An air conditioning unit comprising a rectangular casing, one end of said casing having a longitudinal rectangular inlet opening, a cross-flow fan wheel in said casing, means rotatably mounting said cross-flow fan wheel on said casing, said cross-flow fan wheel having its length greater than its diameter and being positioned

adjacent the longitudinal rectangular inlet opening in said one end of said casing with the major axis of said cross-flow fan wheel substantially parallel to the major axis of the longitudinal rectangular inlet opening, a first block-off member secured to said casing and extending inwardly from one side of said inlet opening and surrounding a portion only of the periphery of said cross-flow fan wheel along substantially its entire length, a second block-off member secured to said casing and extending inwardly from the other side of the inlet opening and surrounding a second portion of the periphery of said cross-flow fan wheel along substantially its entire length, a partition secured to said casing and extending between the sides of said casing to form with said casing two air passageways, said partition extending between the sides of said casing to form with said casing two air passageways, said partition extending substantially to the periphery of said cross-flow fan wheel at a portion of the periphery between and spaced from said first and said second block-off members to divide the air delivered from said cross-flow fan into two streams, a heating coil secured to said casing and being positioned in one of said passageways, a cooling coil secured to said casing and being positioned in the other of said passageways, and dampers adjustably mounted in said casing in both of said passageways, and means for adjustably positioning said dampers to vary the volume rates of air flow through each of said passageways.

3. An air conditioning unit comprising a rectangular casing, one end of said casing having a longitudinal rectangular inlet opening, a cross-flow fan wheel in said casing, means rotatably mounting said cross-flow fan wheel on said casing, said cross-flow fan wheel being positioned adjacent the inlet opening with its axis of rotation parallel to the plane of said inlet opening, a

first block-off member secured to said casing and extending inwardly from one longitudinal side of said inlet opening and surrounding a portion only of the periphery of said cross-flow fan wheel along substantially its entire length, a second block-off member secured to said casing and extending inwardly from the other longitudinal side of said inlet opening and surrounding a second portion of the periphery of said cross-flow fan wheel along substantially its entire length, said first block-off member and said second block-off member each having a vane portion extending outwardly with respect to the cross-flow fan wheel to guide the air discharged from said cross-flow fan wheel, a partition secured to said casing and extending between the sides of said casing to form with said casing two air passageways, said partition extending substantially to the periphery of said cross-flow fan wheel, said partition being between and spaced from the vane portions of said first and second block-offs, said partition being inclined with respect to the vane portions of said first and second block-off members to provide diverging discharge ducts, a heating coil secured to said casing and being positioned in one of said passageways and a cooling coil secured to said casing and being positioned in the other of said passageways.

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