Aug. 26, 1969 A. J. T. HAEGENS 3,463,391

AIR DUCT ASSEMBLY, PARTICULARLY FOR A STABLE OR THE LIKE

Filed April 24, 1968 2 Sheets-Sheet 1

FIG. 1

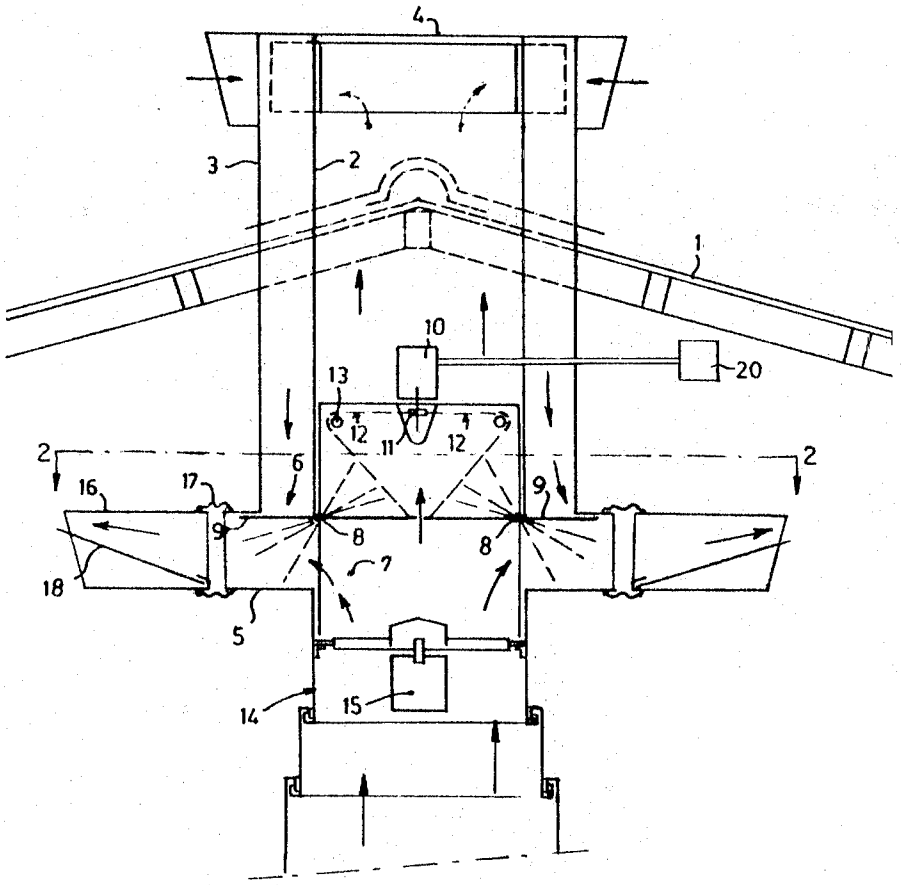

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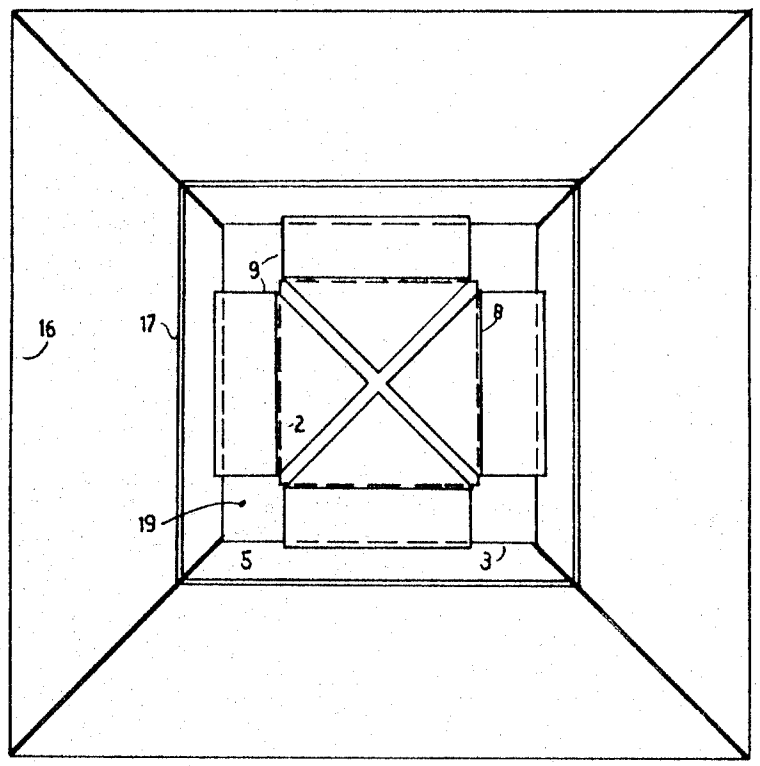
FIG. 2



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AIR DUCT ASSEMBLY, PARTICULARLY FOR A STABLE OR THE LIKE

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ABSTRACT OF THE DISCLOSURE

An air duct assembly for replenishing air in a stable or the like while removing warm air therefrom, and/or recirculating warm air in the stable, in variable proportions and in a continuous manner, said assembly being mounted centrally in the roof of the stable and being controlled by a temperature regulator. The assembly includes a pair of vertical coaxial tubes extending through the roof of the stable and valving means for controlling the volume of air drawn in through and expelled out from such tubes.

Nowadays it has become accepted practice to attempt to maintain the air temperature in large chicken houses, stables and other animal houses at a constant value. For this purpose, it is customary to provide in the side wall of a chicken house or the like a number of air ducts, each of which is divided in two parts by means of a horizontal partition. At the inner side of each air duct a substantially vertical tube open at both ends is connected, the lower part of which is provided with a blower. In this tube a double valve hinged on a horizontal shaft is arranged which, in a first extreme position, shuts off both parts of the air duct, the connection between both parts of the vertical tube lying respectively above and below the transversely joining air duct then being opened, so that the blower will blow the warm air sucked in from the lower part of the interior of the house to the upper part thereof. In the other extreme position this valve opens both parts of the air duct, but in this position both parts of the vertical tube are separated from each other and each communicates with one of the parts of the air duct. The air sucked in by the blower is then blown outwards, and, as a consequence of the negative pressure caused thereby, cold air will flow in through the other part of the air duct and the upper part of the tube. In the intermediate positions of the valve, some cold air is drawn in and also a circulation of warm air takes place, the ratio between both depending on the position of the valve.

Such a construction has its limitations. Since the air ducts are provided in a side wall of the animal house, the warm air drawn in along the bottom as well as the cold air flowing in at the upper side have to bridge a rather large distance if the opposite side of the house is to be effectively covered. Therefore, a large velocity of air is necessary, and this causes strong air currents and attendant dust, sand, chicken food, feathers and the like whirling up. This may be prevented by providing larger numbers of air ducts at both sides of the building, but that is uneconomical.

It is an object of the present invention to provide an improved air duct assembly for the purposes indicated above without the limitations of present systems. The assembly of this invention is mounted in the roof, and, preferably, substantially in the median plane of the house, and it comprises two vertical coaxial tubes, the inner one serving for discharging, and the interspace between both

tubes serving for supplying air. The inner tube is extended by a downwardly directed vertical tube in which a blower is provided, and above this blower the outer tube is joined by a number of substantially horizontal ducts. In the junction to each of these ducts a double valve with a horizontal pivot axis is provided. In the vertical position of the valve, one part thereof closes a passage between the duct in question and the inner tube, and, in the horizontal position of the valve, a passage is closed between the interspace between both tubes and the transverse duct in question. In the latter position, the other part of each part of each valve partially closes the passage through the inner tube. The latter valve parts are formed in such a manner that they together close the passage through the inner tube almost completely and do not hinder each other when rotating around their pivoting axes.

This, in accordance with the present invention, the warm air may be drawn in from the middle of the interior space of the house, and the cold air and/or the circulated warm air is blown in symmetrically from the middle. Accordingly, a uniform distribution is possible with a relatively small velocity of the air currents. A downwardly directed blower tube may therefore be extended to the immediate vicinity of the floor, since because of the low-velocity air utilized, no dust, sand, feathers and food will be carried along or blown about.

For simultaneously operating the valves, preferably four of which are provided in the walls of a square or rectangular inner vertical tube, the ends of the valve parts swinging in the inner tube may each be connected to an actuating rope or cable, which are then fastened to a common winch. More particularly, this winch is vertically positioned in the axis of the inner tube, and is preferably driven by an electric step-by-step motor controlled by a temperature regulator. The valves are made heavier at one end or are biased by means of springs so that the actuating cables are always tensioned.

The parts of the valves lying in the interspace between the tubes are preferably arranged such that when in their horizontal position this interspace is not completely closed, so as to insure a minimal ventilation.

Preferably the transverse ducts used for the distribution of the air blown in are connected to the outer vertical tube by means of articulated or flexible joints in order to enable an optimal adjustment of the air currents. In these joints or in such transverse ducts, baffles may be provided which may be adjustable if desired.

The invention will now be elucidated in detail by reference to the drawing, in which:

FIG. 1 is a central vertical section of an air duct assembly according to the invention; and

FIG. 2 is an overhead section along the line II—II of FIG. 1, showing the valves in a closed position.

The air duct apparatus shown, which is placed in the center of a roof 1, comprises an inner tube 2 and an outer tube 3 which are coaxially arranged, and preferably have a square or rectangular cross-section. Atop these tubes a hood 4 is provided, in order to prevent rain from entering, which hood is constructed so that the expelled warm air cannot be sucked in again immediately.

The inner tube 2 and the outer tube 3 have a lower end located a certain distance below the roof. In the embodiment shown, four horizontal or transverse ducts 5 join the outer tube 3 near its lower end. These ducts communicate with the interspace between tubes 2 and 3 by means of an aperture 6, and they also communicate with the inner space of the inner tube 2 by means of an aperture 7. On each wall of the inner tube 2 and near the apertures 6 and 7, a horizontal pivot 8 is provided on which a valve 9 is hinged. As appears from FIG. 2, each valve comprises a rectangular and a triangular part. In the

horizontal position of the valve shown in FIG. 1, the rectangular part may close the aperture 6, and in the vertical position the aperture 7 is closed thereby. The triangular parts of the respective valves are shaped in such a manner that, in the horizontal position, the passage through the inner tube 2 is substantially closed.

For operating the valves just described, a step-by-step motor 10 is provided which may drive a winch 11. This winch operates actuating ropes or cables 12 entrained thereover, which are guided over guide rollers 13 and are each connected at one extremity to one of the valves 9. By energizing this motor 10 by means of current pulses provided by a temperature regulator 20, the cables 12 are wound or unwound from the winch. By means of coil springs on the pivots 8 or a suitable weighting of one of the valve halves, the cables 12 are always kept under tension. Of course, it is also possible to operate the valves by hand.

The inner tube 2 is at its lower end extended by a downwardly directed inlet tube 14, which, in the embodiment shown, is composed of telescoping parts so that its length may be adapted to the height of the house. At the upper end of the telescoping inlet tube 14 a blower 15 is provided which may be used to draw air from the lower part of the house upwardly through the tube 14, as shown by the arrows. Depending on the position of the valves 9, this air will be either completely or partially returned through the transverse ducts 5 or else removed to the outside through the inner tube 2. Fresh air from outside is drawn in through the interspace between tubes 2 and 3 and passes through the apertures 6 to the transverse ducts 5.

On the transverse ducts 5, extension pieces 16 may be mounted, which are connected to the transverse ducts 5 by means of hinged or flexible joints 17, and which may be fixed by means of additional parts not shown. Furthermore, guiding baffles 18 may be provided in these extension pieces 16, the position of which baffles being adjustable in order to vary the output flow velocity.

As appears from FIG. 2, the rectangular valve parts do not join each other in such a manner that the apertures 6 are completely closed. The remaining passages 19 ensure a minimum ventilation.

It is of course possible to change the various parts described in many ways. For instance the valves 9 may be shaped triangularly if it is desired to fully close the passages 19. The extension pieces 16 may be fixedly connected to the transverse ducts 5 if an adjustment thereof is not required. The guiding baffles 18 may be omitted if desired, and it is also possible to use extension pieces 16 with such an axial cross-section that the velocity distribution desired is obtained.

In this manner an air duct assembly is obtained which enables a very efficient temperature control and ventilation within the whole space with a minimum of blowers and an air current velocity which is as small as possible.

I claim:

1. An air duct assembly, of the type particularly adapted for use in a stable or the like, comprising: at least two air ducts for transferring warm air from inside the stable to the outside and taking in cold air from outside into the stable, respectively; a pair of open ended passages joining said ducts; a double valve for connecting one such passage to the other in an extreme position of such valve while at the same time closing said ducts in order to direct air taken from inside the stable back to the inside; said valve having another extreme position wherein said passages are connected to one duct and the other duct is opened, in order to direct warm air out of the stable and take in cold air; said duct assembly arranged to be mounted in the roof of the stable and substantially in the longitudinal median plane of such stable; said air ducts comprising a pair of vertical coaxial tubes, the inner one thereof serving for discharging air to the outside and the interspace between both such tubes serving for supplying outside air to the inside of the stable; said inner tube having a downwardly directed extension tube in which a blower is provided; said open-ended passages comprising substantially horizontal duct members joining said outer tube above the height of said blower; said double valve being located at the junction of said horizontal duct members and outer tube and having one set of movable parts which in a first position close a passage between the horizontal ducts and the inner one of said tubes, and which when in a second position close a passage between the interspace of the coaxial tubes and the horizontal duct; said valve having another set of parts which when said one parts thereof are in said second position at least partially close the passage through the inner tube; said other valve parts being formed in such a manner that when they at least partially close the passage through the inner tube they do not hinder each other in their respective operating movements.

2. The assembly of claim 1, wherein said downwardly-directed extension tube has a lower end extremity located substantially below the level of said horizontal duct members.

3. The assembly of claim 1, wherein said extension tube is telescopically extendable.

4. The assembly of claim 1, wherein said inner and outer coaxial tubes have a rectangular cross-section, and wherein the valve parts which move inside the inner tube are triangular.

5. The assembly of claim 1, wherein the ends of said valve parts moving inside the inner tube each are connected to a cable member for actuation thereby, such cables being fastened to a common winch.

6. The assembly of claim 1, wherein said valve parts are moved by temperature-responsive regulator means.

7. The assembly of claim 5, wherein said valves include means for maintaining said cable members under tension at all times.

8. The assembly of claim 1, wherein said one parts of said double valve have a size and shape such that they are precluded from closing the interspace between both tubes completely.

9. The assembly of claim 1, wherein said horizontal ducts are provided with extension pieces which are adjustably connected to such ducts.

10. The assembly of claim 9, wherein at least one of said horizontal ducts or said extension pieces have internal baffles.

11. The assembly of claim 10, wherein said internal baffles are adjustable.

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