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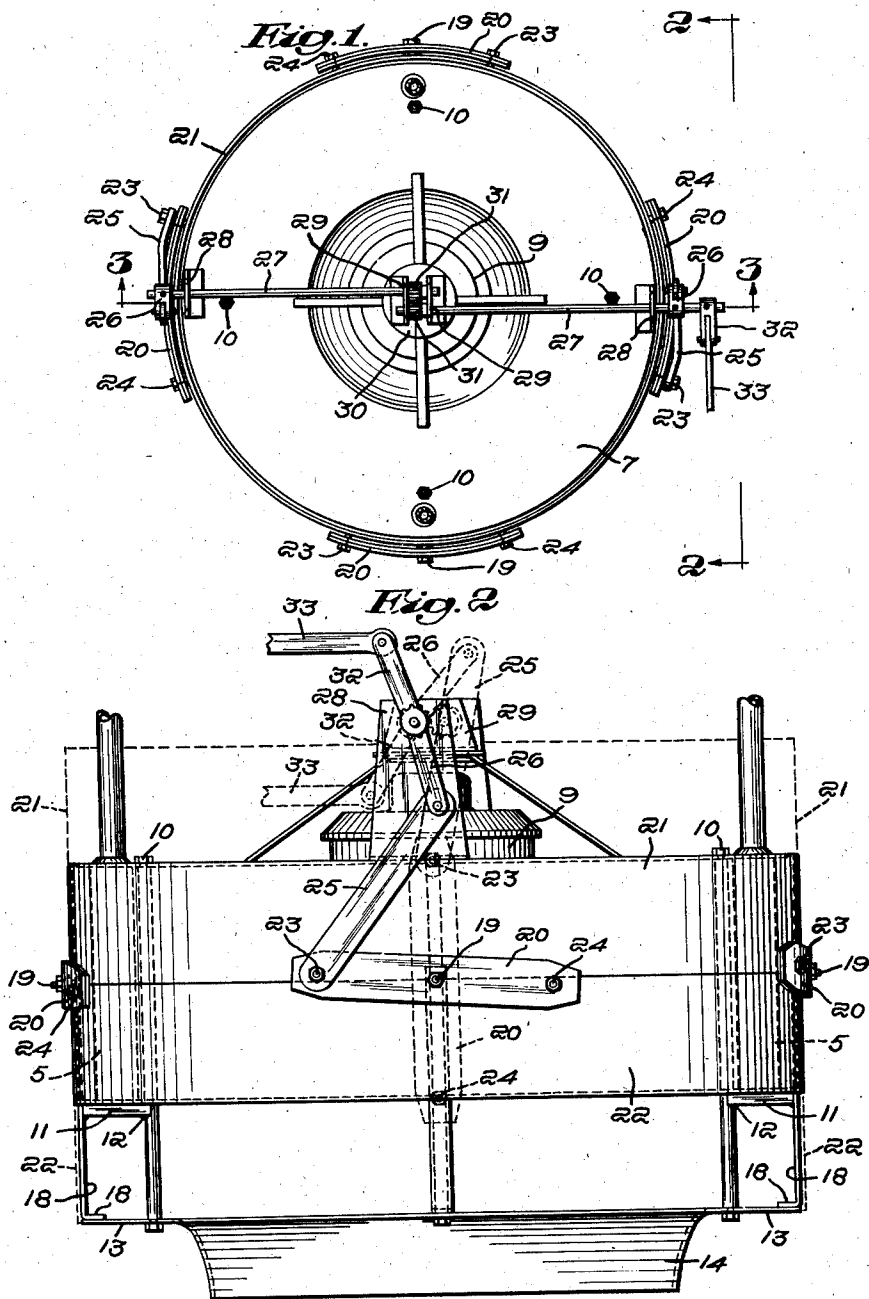
G. R. GOLDTHWAITE

2,295,991

HEAT EXCHANGE APPARATUS

Filed Sept. 14, 1940

2 Sheets-Sheet 1



Inventor:
George R. Goldthwaite
by Robert J. Palmer
Attorney

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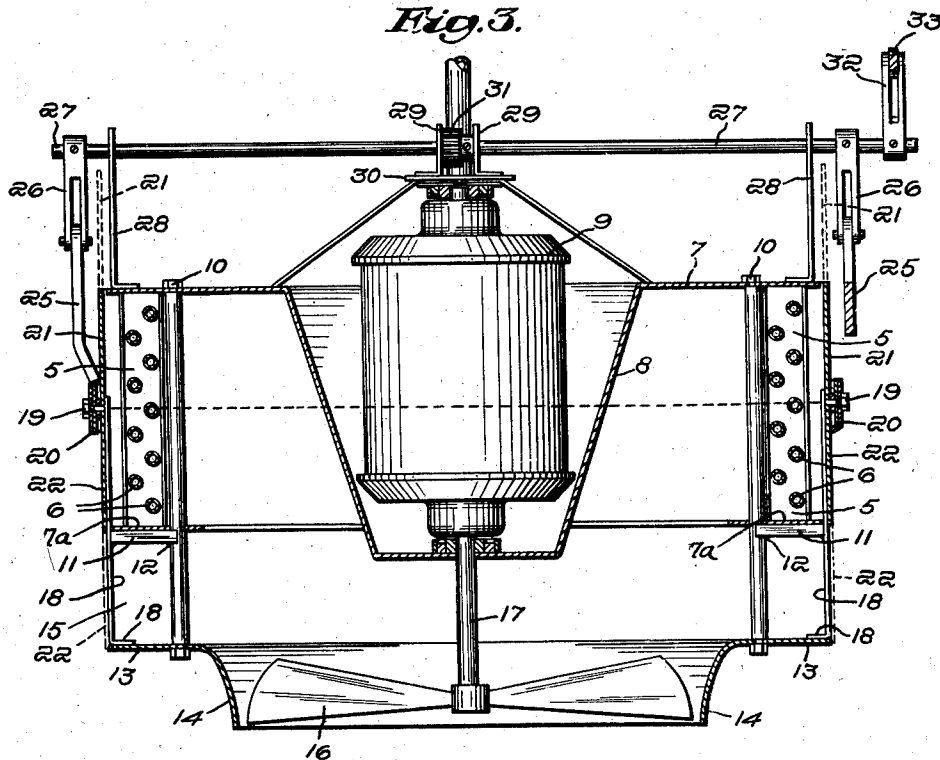
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Fig. 3.



Inventor:

George R. Goldthwaite

by Robert J. Palmer
Attorney

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HEAT EXCHANGE APPARATUS

George E. Goldthwaite, South Easton, Mass., assignor to B. F. Sturtevant Company, Boston, Mass.

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5 Claims. (Cl. 257-137)

This invention relates to heat exchange apparatus and relates more particularly to dampers for projection type heat exchangers.

Projection type heaters are now being widely used for heating industrial and other spaces. They usually consist of annular or rectangular finned tube radiators to which are fitted propeller fans which draw air through the radiators and project it into the space to be heated. Such heaters are usually mounted overhead the space to be heated with the heated air blown downwardly. Temperature control has heretofore been accomplished by varying the speed of the fans and by adjustment of the steam supply. Adjustment of the fan speed is not desired since constant volume air circulation gives best results and thermostatic control of steam valves in high pressure systems is not satisfactory.

This invention provides a projection type heater with a recirculated air passage adjacent its radiator. Two cylindrical dampers in one embodiment, surround the radiator of the heater and in one extreme position fit snugly together around the radiator to close off the passage of air therethrough while at the same time they completely uncover the recirculated air passage. In the other extreme position, the dampers are separated to uncover the radiator and to close off the recirculated air passage. The air entering the recirculated air passage bypasses the radiator. Between the two extreme positions the dampers may be adjusted to provide any desired mixture of heated and unheated air. With the dampers controlled by hand or as is preferred, by a thermostat, the temperature in the space served may be more evenly controlled, by the tempering effect of the recirculated air, while at the same time due to the recirculated air passing through the fan, increased air movement and better distribution of the air is obtained.

An object of the invention is to move recirculated air with the fan of a projection type heat exchanger and to vary the proportions of the recirculated air to the air heated in the heat exchanger for adjusting the temperature of the air supplied into the space served.

The invention will now be described with reference to the drawings of which:

Fig. 1 is a plan view looking downwardly upon one embodiment of a projection type heater incorporating this invention;

Fig. 2 is an elevation view along the lines 2-2 of Fig. 1, and

Fig. 3 is a sectional view along the lines 3-3 of Fig. 1.

The heater illustrated includes the annular radiator 5 which contains the finned tubes 6 which may be supplied through the usual inlets and outlets with heating fluid from a convenient source for heating the air.

The upper plate 7 extends across the upper ends of the radiator 5 and has the dished portion 8 which projects into the radiator for receiving the fan motor 9. The lower annular plate 7a extends across the lower ends of the radiator 5.

The bolts 10 extend through the plates 7 and 7a and through the four plates 11 at the lower ends of the radiator, which lower plates are welded at 12 to the bolts 10 and serve to support the weight of the radiator. The bolts 10 also extend through the fan shroud plate 13 which is substantially spaced from the annular plate 7a for providing the recirculated air passage 15 into the fan 16 which is attached to the lower end of the motor shaft 17. The central portion of the lower plate 13 is cut out to form a central opening and its inner edges are shaped to form the shroud 14 for the fan 16.

The outer edges of the plates 7 and 7a form an inlet to the radiator 5 and the outer edges of the plates 7a and 13 form the inlet to the recirculated air passage 15, the two inlets being parallel and their faces extending circumferentially around the axis of the fan 16 in lines extending parallel to the axis of the fan whereby the cylindrical dampers to be described, may be moved axially in contact with the outer edges of the plates 7, 7a and 13 to close or partially close one of the inlets while correspondingly opening or partially opening the other of the inlets as will be described.

The straps 18 are welded to the lower plate 13 and to the plate 11 and extend above the plate 11 and receive the bolts 19 which form pivots for the damper adjusting spring members 20.

The cylindrical dampers 21 and 22 are attached at 23 and 24 respectively to the ends of the damper adjusting members 20 and in the position shown by the full lines of Figs. 2 and 3 are fitted snugly together to form in effect a single cylinder extending around the radiator 5 and closing off the air inlets to the radiator. The dampers 21 and 22 have cut-away portions on their inner edges for receiving the bolts 19 so that the bolts do not prevent intimate contact

between the remainder of the inner edges of the dampers.

The damper adjusting members 20 are connected by the links 25 and 26 at the outer ends of the rods 27 which are supported in the brackets 28 which are attached to the upper plate 7, and in the brackets 29 which are attached to the upper motor support 30. The inner ends of the rods 27 terminate in the gears 31 which mesh for providing simultaneous revolution of both rods through the movement of the adjusting lever 32 which is attached to the outer end of one of the rods. The lever 32 is adapted to be connected by the lever 33 to a suitable thermostatic control which acts when the temperature of the air is too high to adjust the dampers to admit more recirculated and less heated air to the fan, and when the temperature of the air is too low, to adjust the dampers to admit less recirculated and more heated air to the fan, as will be described.

As shown by the full line of Figs. 2 and 3 and as described in the foregoing, the dampers 21 and 22 are in position to close off movement of air through the radiator 5 and completely to open the recirculated air passage 15 below the radiator so that upon rotation of the fan 16, recirculated air is drawn in through the passage 15 in a path by-passing the radiator 5 so that unheated air is supplied into the space below the fan.

Referring now to Fig. 2, the dotted lines of the levers 32 and 25, the adjusting member 20 and the dampers 21 and 22, illustrate the dampers and their adjusting mechanism at the other extreme position, completely closing off the recirculated air passage 15 and completely uncovering in the space between the dampers, the air entrance to the radiator 5. As the mechanism is adjusted the dampers 21 and 22 rotate in opposite directions and move towards or away from each other depending upon the direction of adjustment. Depending upon the direction and the degree of adjustment, the dampers uncover all or a portion of the radiator 5 or all or a portion of the recirculated air passage 15. As the radiator is covered by the dampers, the recirculated air passage is proportionately uncovered and vice versa. Thus any desired mixture of heated and of recirculated air may be provided.

A feature of this invention resides in providing the flexible damper adjusting members 20. Due to the simultaneous rotation of and axial movement of the dampers, these members are distorted during adjustment through being twisted longitudinally. In the embodiment illustrated, the members 20 each consist of two laminations or strips of spring sheet metal, although more laminations or hinged links, or other equivalent flexible connections may be used.

While the radiator 5 has been described as annular, the dampering arrangement according to this invention, could be used with rectangular or other forms of radiators.

While the invention has been described as applied to an air heater, it should be understood that it could be applied to an air cooler. A cooling fluid instead of a heating fluid could be circulated through the radiator 5 if cooling of the air to be passed therethrough, is desired.

While one embodiment of the invention has been described for the purpose of illustration, it should be understood that the invention is not

limited to the exact apparatus and arrangement of apparatus illustrated as modifications thereof may be suggested by those skilled in the art without departure from the essence of the invention.

What is claimed is:

1. In a projection type heat exchanger unit having a centrally disposed fan and a heat exchanger extending around the axis thereof, means forming a circumferentially extending air inlet into said fan, means forming a circumferentially extending air inlet into said exchanger, a pair of cylindrical dampers extending in lines transverse said inlets, attached to said unit, and means for moving said dampers towards and away from each other along lines parallel to said axis for variably opening and closing said inlets.

2. In a projection type heat exchanger unit having a centrally disposed fan and a heat exchanger extending around the axis thereof, means forming a circumferentially extending air inlet into said fan, means forming a circumferentially extending air inlet into said exchanger, a pair of cylindrical dampers extending in lines transverse said inlets, attached to said unit, means forming pivoted flexible connections between said dampers for simultaneous axial movement thereof, and means for rotating said connections, around the pivots thereof, whereby said dampers are rotated and simultaneously moved in axial lines towards and away from each other for variably opening and closing said inlets.

3. In a projection type heat exchanger having a fan, and a hollow heat exchanger arranged symmetrically about the axis thereof, means forming an air passage extending substantially perpendicular to said axis, through said exchanger, into said fan, means forming an air passage adjacent and extending substantially parallel to said passage, by-passing said exchanger, into said fan, slidably mounted damper means extending in lines transverse said passages, and means for moving said damper means for variably opening and closing said passages.

4. In a projection type heat exchanger having a fan, and an annular heat exchanger arranged symmetrically about the axis thereof, means forming an air passage extending substantially radial to said axis, through said exchanger, into said fan, means forming an air passage adjacent said passage and extending substantially radial to said axis, by-passing said exchanger, into said fan, said passages having aligned circumferentially extending inlets, slidably mounted, cylindrical damper means extending in lines transverse said passages, and means for moving said damper means for variably opening and closing said passages.

5. In a projection type heat exchanger having a fan, and a hollow heat exchanger arranged symmetrically about the axis thereof, means forming an air passage extending substantially perpendicular to said axis, through said exchanger, into said fan, means forming an air passage adjacent and extending substantially parallel to said passage, by-passing said exchanger, into said fan, a pair of slidably mounted dampers extending in lines transverse said passages, and means including pivoted rotary means for moving said damper means simultaneously towards and simultaneously away from each other for variably opening and closing said inlets.

GEORGE R. GOLDTHWAITE.