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(73) Proprietor: **Brown, Ronald James**
134 McFaddens Road
Christchurch (NZ)

(72) Inventor: **Brown, Ronald James**
134 McFaddens Road
Christchurch (NZ)

(74) Representative: **Orr, William McLean et al**
Haseltine Lake & Co Hazlitt House 28
Southampton Buildings Chancery Lane
London WC2A 1AT (GB)

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Description

This invention relates to a heat exchange unit and more particularly relates to a heat exchange unit which can be used in both industrial and home situations to provide heated air and/or heated water.

A known heat exchange unit is that described in DE—A—2 260862 which incorporates a boiler mounted within a housing, the boiler having a means for heating air and water and being described as a gas heater. The steam outlet in the top of the boiler is connected to condenser tubes in which steam produced condenses before it flows back under the action of gravity to the boiler. The latent heat of condensation given up by the condensing steam is collected by surrounding the condenser with air. A disadvantage of this construction is the need to provide for the boiler additional equipment in the form of a flue as well as a gas supply with its attendent fire risk problems. This adds considerably to the overall costs and installation costs of the boiler. In this construction the heating of air, which is ducted for use, relies on a conduit being connected to the container for carrying the steam to the coiled heat exchanger placed in the air flow. A degree of heat loss can occur in this conduit and therefore the effectiveness of the boiler is decreased. Another disadvantage appears to be the lack of an automatic means for maintaining a necessary level of heat exchange medium in the boiler. If such a means is not included disastrous consequences might occur.

Another known heat exchange unit is that described in CH—A—514818. This specification relates to a combination air heating and hot water supply apparatus. In this unit a heated vessel is sited within an insulated housing. The vessel is spaced from the inner wall of the housing. The housing has an inlet for supply air and an outlet for withdrawing heated air after it has passed over the outer wall of the vessel. Above the vessel may be a tubular heat exchanger connected by tubes to the vessel. This unit is a pressurised electrically heated unit and as such is not a true boiler in which steam, for heating, is produced. The flow of water in the tubes between the vessel and heat exchanger therefore is stated to be controlled by a flow valve. Again no direct heat exchange occurs and the efficiency of the unit is reduced accordingly. The unit is only a water heater and as such cannot be used to additionally heat a second air supply or water.

Yet another known heat producing apparatus is that described in FR—A— 2188805. This apparatus is designed for heating and the production of hot water. The function of the apparatus is to provide either hot water, hot air or both: The apparatus has a cylindrical furnace operated by a commercial burner the heat from the flame, via a baffle, of which contacts a lower face of a reservoir for water. The exhaust gases pass above the reservoir through the tubes where they are collected in a fume box from which it is exhausted via a flue. A fan drives air between the cylinder wall and the boiler and up past the reservoir to be heated after which it is ducted for use. The water supply to the reservoir is from above. By varying the operation of the fan hot water, hot air or both are created. In this construction there is no provision for using any steam produced to supply via condensation tubes an additional heat source and additionally the device requires a burner with its attendent problems of combustion gas disposal.

An object of the present invention is to provide a heat exchange unit which may be used in a home or industrial situation, which heat exchange unit provides from a single source of heat a supply of heated air and/or a supply of heated water.

A further object of the present invention is to provide a heat exchange unit which offers to the public a useful alternative choice.

Further objects and advantages of the present invention will become apparent from the following descriptions.

According to the invention there is provided a heat exchange unit incorporating a boiler mounted within a housing, the boiler having means for heating air and water, and having a steam outlet in the top thereof through which steam can flow to a condenser in which the steam gives up its latent heat of condensation while the steam condenses and before it flows back under gravity to the boiler; characterised in that the boiler is electrically operated and has extending therethrough at least one air tube arranged so that air drawn or blown therethrough is heated by the boiler before it passes from the housing through an outlet; a supply tank is connected to the boiler to maintain a desired water level within the boiler; and means is provided to surround the condenser with air or water to be heated by collecting the latent heat of condensation of the condensing steam.

The housing within which the boiler is mounted can be provided with a series of baffles or scoops which direct the flow of drawn or blown air so that it passes through successive levels of air tubes through the boiler before being passed over the boiler and out the outlet in the housing.

The supply tank can be connected to the electrically heated boiler by a pipe through which water can pass to maintain the water level within the boiler and supply tank at a predetermined level. The end of the pipe can be arranged to allow a back flow of heated water from the boiler to the supply tank to heat the water therein.

The steam outlet in the upper end of the boiler can be connected to a coil or to a series of tubes so that steam can flow therethrough to condense before being returned to the boiler. The condenser coil or tubes can be fitted within a hot water storage reservoir which is heated by

the latent heat or evaporation given up by the condensing steam.

The steam outlet to the coil or tubes can alternatively be mounted within a suitable casing provided with air inlets so that air can surround the coil or tubes to be heated, the heated air being allowed to flow via convection through outlets in the casing to heat the area in which the casing is situated.

The outlet from which heated air is blown or drawn can be connected to ducting to transfer the heated air to wherever it is required within a building.

Further aspects of the present invention which should be considered in all its novel aspects will become apparent from the following descriptions.

Embodiments of the present invention will be described with reference to the accompanying drawings in which:

Figure 1: shows a section through the line I—I of the exchange unit shown in Figure 2;

Figure 2: shows a section taken on the line II—II through the heat exchange unit shown in Figure 1; and

Figure 3: shows a plan view of an example of housing in which the boiler of the heat exchange unit can be mounted.

The heat exchange unit according to the present invention can be used in a number of situations, for example, in the home or in an industrial situation. The present invention can, for example, be used as a substitute for an open or closed type fire.

The example of heat exchange unit shown includes an electrically operated boiler generally indicated by arrow 1. The boiler is mounted within a box shaped housing 2. The boiler 1 and the outer housing 2 are preferably constructed from sheet metal materials. The boiler 1 has at least one electrically operated heating element 3 therein and has on an end wall thereof a thermostat (not shown). In the example shown the housing 2 has in an end wall 4 thereof an inspection cover 5 which allows access to the heating elements 3 and thermostat for repair and/or maintenance purposes. The end wall of the housing can also have mounted thereon an on/off switch and/or an appropriate fuse or fuses as required by the Electrical Wiring Regulations. It is also envisaged that the floor, walls and top of the housing 2 can be formed as a cavity wall (not shown) within which is positioned insulation so as to reduce loss of heat therefrom.

The water level A within the boiler 1 is maintained by a flow of water from a supply tank 7. The water level A within the boiler 1 and supply tank 7 are the same and are governed by a ball cock valve 8 (Figure 3). The flow of water between the supply tank 7 and the boiler 1 is by way of the connecting pipe 9. The supply tank 7 can include an overflow pipe 10.

The boiler 1 has extending therethrough a number of air tubes 11 (shown dotted in Figure 1) through which air can pass to be heated by the hot water within the boiler 1. In the example of boiler 1 shown there are three levels of air tubes 11 with six tubes 11 in each level. The open ends 12 of the tubes 11 can be seen in Figure 3. The boiler 1 can include a drain pipe 13.

The boiler 1 when operating is a main source of heat, and the flow of hot air can be controlled by a double bladed tangential fan 14 which draws or pushes air into inlet pipes 15. The inlet pipes 15 direct air in the direction of the arrows (Figure 1) through the first level of air tubes 11 against a baffle 17 at the other end of the housing 2 which baffle directs the flow to the middle level of air tubes back to the first end of the housing 2 above the inlet pipes 15 to a second baffle 17 which directs the flow to the upper level of air tubes 11 at the other end of which is a baffle 17 which directs the air over the top 18 of the boiler 1 to the outlet 16. The outlet 16 from the housing 2 can be connected to ducting (not shown) to transfer the heated air to wherever it is required within a buiding. Alternatively the outlet 16 can be a series of apertures or louvres near to the upper edge of the housing 2 to allow air to be blown into the space or room in which the housing 2 is situated.

The flow of air around the boiler 1 can be in the direction of the arrows shown in Figure 1, that is, the cold air is initially blown through the inlet pipes 15 and through successive levels of the air tubes 11 before the air passes up and over the top 18 of the boiler and through the outlet 16.

The boiler 1 has in the top 18 thereof a steam outlet 19 through which steam flows to condenser tubes or coils 21 in which the steam may condense giving up its latent heat of evaporation to the material surrounding the condenser tubes or coils 21. The condensed water returning to the boiler through the return pipe 20. The return pipe 20 can have therein a pressure relief tube 22 draining back to the supply tank 7.

The condenser tubes or coils 21 can be surrounded for example as shown in Figure 1 by water in a hot water storage tank 23. The tank 23 can be provided with additional heating elements (not shown) as required for use during the summer when the boiler 1 is not in use or when an extra supply of hot water is required The storage tank 23 is provided with a supply outlet and inlet and insulation in known manner.

As an alternative to the example shown the steam outlet 19 from the boiler 1 can be connected to a radiator or to a series of coils (not shown) within a casing which acts as a radiator heater. The casing has air flowing therethrough or therearound so that the area in which it is sited is heated by convection.

In use the boiler 1 according to the present invention can be fitted to supply at least heated air/and or hot water in the manner described.

Thus by this invention there is provided a heat exchange unit for use in a home or industrial situation which provides from a single source a supply of heated air and/or a supply of heated water.

Claims

1. A heat exchange unit incorporating a boiler (1) mounted within a housing (2), the boiler having means for heating air and water, and having a steam outlet (19) in the top thereof through which steam can flow to a condenser (21) in which the steam gives up its latent heat of condensation while the steam condenses and before it flows back under gravity to the boiler; characterised in that the boiler (1) is electrically operated and has extending therethrough at least one air tube (11) arranged so that air drawn or blown therethrough is heated by the boiler (1) before it passes from the housing (2) through an outlet (16); a supply tank (7) is connected to the boiler (1) to maintain a desired water level within the boiler (1); and means (23) is provided to surround the condenser (21) with air or water to be heated by collecting the latent heat of condensation of the condensing steam.

2. A heat exchange unit as claimed in claim 1, characterised in that the housing (2) within which the boiler (1) is mounted has a series of baffles or scoops (17) which direct the flow of drawn or blown air so that it passes through sucessive levels of air tubes (11) through the boiler (1) before it is passed over the top of the boiler and from the outlet (16) in the housing (2).

3. A heat exchange unit as claimed in claim 1 or 2, characterised in that the connection between the supply tank (7) and the electrically heated boiler (1) is a pipe (9) arranged to allow a back-flow of heated water from the boiler (1) to the supply tank (7) to heat the water therein.

4. A heat exchange unit as claimed in claim 3, characterised in that the end of the pipe (9) within the supply tank (7) extends to a point near to the base of the supply tank (7).

5. A heat exchange unit as claimed in any one of the preceding claims, characterised in that condenser tubes or coils (21) are placed within a hot water reservoir (23) which is heated by the latent heat of condensation given up by the condensing steam.

6. A heat exchange unit as claimed in claim 1, characterised in that the condenser (21) is arranged within a casing (23) through which air can circulate so that air can surround the condenser and be heated, the heated air being allowed to flow from air outlets, louvres or the like in the casing (23) to allow the heated air to heat the area in which the casing (23) is situated.

7. A heat exchange unit as claimed in any one of the preceding claims, characterised in that the outlet (16) from which heated air is blown or drawn is connected to ducting to transfer the heated air to where it is required within a building.

8. A heat exchange unit as claimed in any one of the preceding claims, characterised in that the boiler (1) is constructed from a heavy gauge metal material and the housing (2) within which it is mounted, is constructed from a lighter gauge sheet metal material.

9. A heat exchange unit as claimed in claim 8, characterised in that the housing (2) has a wall (4) thereof as inspection cover (5) which allows access to heating elements (3), fan (14) and thermostats therein.

10. A heat exchange unit as claimed in any one of the preceding claims, characterised in that the housing (2) is formed as a cavity wall within which a layer of insulation material is fitted.

Revendications

1. Ensemble d'échange de chaleur comportant un générateur (1) monté dans une carrosserie (2), le générateur présentant des moyens pour chauffer l'air et l'eau et présentant, en tête, une sortie de vapeur (19) par laquelle la vapeur peut passer dans un condenseur (21) dans lequel la vapeur abandonne sa chaleur latente de condensation en condensant et avant de retourner par gravité au générateur; caractérisé en ce que le générateur (1) est à commande électrique et qu'à travers lui s'étend au moins un tube à air (11) disposé de façon telle que l'air aspiré ou refoulé à travers lui soit chauffé par le générateur (1) avant de passer, depuis la carrosserie (2), par une sortie (16); en ce qu'un réservoir d'alimentation (7) est relié au générateur (1) pour maintenir dans le générateur (1) un niveau d'eau désiré; et en ce que des moyens (23) sont prévus pour entourer le condenseur (21) d'air ou d'eau à chauffer en recueillant la chaleur latente de condensation de la vapeur qui se condense.

2. Ensemble d'échange de chaleur selon la revendication 1, caractérisé en ce que la carrosserie (2) dans laquelle est monté le générateur (1) comporte une série de chicanes ou déflecteurs (17) qui dirigent le flux d'air aspiré ou refoulé de façon à le faire passer à travers des niveaux successifs de tubes à air (11) à travers le générateur (1) avant qu'il ne passe en tête du générateur et ne sorte par la sortie (16) prévue dans la carosserie (2).

3. Ensemble d'échange de chaleur selon la revendication 1 ou la revendication 2, caractérisé en ce que la liaison entre le réservoir d'alimentation (7) et le générateur électrique de chaleur (1) est une conduite (9) disposée pour permettre un retour de l'eau chauffée provenant du générateur (1) vers le réservoir d'alimentation (7) pour chauffer l'eau qui s'y trouve.

4. Ensemble d'échange de chaleur selon la revendication 3, caractérisé en ce que l'extrémité de la conduite (9) qui se trouve dans le réservoir d'alimentation (7) s'étend jusqu'à un

point proche de la base du réservoir d'alimentation (7).

5. Ensemble d'échange de chaleur selon l'une quelconque des revendications précédentes, caractérisé en ce que les tubes ou serpentins (21) du condenseur sont placés à l'intérieur d'un réservoir d'eau chaude (23) chauffé par la chaleur latente de condensation dégagée par la chaleur en se condensant.

6. Ensemble d'échange de chaleur selon la revendication 1, caractérisé en ce que le condenseur (21) est disposé dans un carter (23) à travers lequel l'air peut circuler de sorte que l'air peut entourer le condenseur et se réchauffer, l'air chauffé pouvant passer, par des sorties, des jalousies ou autres du carter (23) pour permettre à l'air chauffé de chauffer la zone dans laquelle est situé le carter (23).

7. Ensemble d'échange de chaleur selon l'une quelconque des revendications précédentes, caractérisé en ce que la sortie (16) à partir de laquelle l'air chauffé est refoulé ou aspiré est reliée à des gaines pour transférer l'air chauffé là où il est nécessaire dans un bâtiment.

8. Ensemble d'échange de chaleur selon l'une quelconque des revendications précédentes, caractérisé en ce que le générateur (1) est construit en matériau métallique de forte épaisseur et en ce que la carrosserie (2) dans laquelle il est monté est construite en un matériau métallique type tôle d'épaisseur plus faible.

9. Ensemble d'échange de chaleur selon la revendication 8, caractérisé en ce que la carrosserie (2) présente une de ses parois (4) sous forme de couvercle d'inspection (5) permettant d'accéder aux éléments chauffants (3), au ventilateur (14) et aux thermostats qui s'y trouvent.

10. Ensemble d'échange de chaleur selon l'une quelconque des revendications précédentes, caractérisé en ce que la carrosserie (2) est faite d'une paroi creuse dans laquelle est placée une couche de matériau isolant.

Patentansprüche

1. Wärmeaustauscheinheit mit einem Heizkessel (1), der innerhalb eines Gehäuses (2) montiert ist, wobei der Heizkessel Mittel zum Erhitzen von Luft und Wasser aufweist und einen Dampfauslaß (19) in seinem oberen Teil enthält, durch welchen Dampf zu einem Kondensator (21) strömen kann, in dem der Dampf seine latente Kondensationswärme abgibt, während der Dampf kondensiert und bevor er unter der Einwirkung der Schwerkraft zu dem Heizkessel zurückströmt, dadurch gekennzeichnet, daß der Heizkessel (1) elektrisch betrieben wird, daß sich durch diesen zumindest ein Luftrohr (11) erstreckt, das derart angeordnet ist, daß Luft, die dadurch gefördert oder geblasen wird, durch den Heizkessel (1) erhitzt wird, bevor sie aus dem Gehäuse (2) durch einen Auslaß (16) strömt, daß ein Vorratsbehälter (7) mit dem Heizkessel (1) verbunden ist, um einen gewünschten Wasserstand innerhalb des Heizkessels (1) aufrechtzuerhalten, und daß ein Mittel (23) zum Umgeben des Kondensators (21) mit Luft oder Wasser, die oder das durch Sammeln der latenten Kondensationswärme des kondensierenden Dampfes zu erhitzen ist, vorgesehen ist.

2. Wärmeaustauscheinheit nach Anspruch 1, dadurch gekennzeichnet, daß das Gehäuse (2), innerhalb dessen der Heizkessel (1) montiert ist, eine Reihe von Leitblechen oder Schaufeln (17) hat, die den Stromgeförderter oder geblasener Luft derart richten, daß die Luft durch aufeinanderfolgende Höhenpositionen von Luftrohren (11) durch den Heizkessel (1) strömt, bevor sie über den oberen Teil des Heizkessels und aus dem Auslaß (16) in dem Gehäuse (2) geleitet wird.

3. Wärmeaustauscheinheit nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Verbindung zwischen dem Vorratsbehälter (7) und dem elektrisch beheizten Heizkessel (1) ein Rohr (9) ist, das so angeordnet ist, daß es einen Rückfluß erhitzen Wassers von dem Heizkessel (1) zu dem Vorratsbehälter (7) gestattet, um das Wasser darin zu erhitzen.

4. Wärmeaustauscheinheit nach Anspruch 3, dadurch gekennzeichnet, daß sich das Ende des Rohrs (9) innerhalb des Vorratsbehälters (7) zu einem Punkt nahe dem Boden des Vorratsbehälters (7) erstreckt.

5. Wärmeaustauscheinheit nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß Kondensatorrohre oder -schlangenrohre (21) inerhalb eines Heißwasserspeichers (23) angeordnet sind der durch die latente Kondensationswärme, die durch den kondensierenden Dampf abgegeben wird, aufgeheizt wird.

6. Wärmeaustauscheinheit nach Anspruch 1, dadurch gekennzeichnet, daß der Kondensator (21) innerhalb eines Gehäuses (23) angeordnet ist, durch welches Luft derart zirkulieren kann, daß die Luft den Kondensator umgeben kann und erhitzt werden kann, wobei der erhitzten Luft gestattet wird, aus Luftauslässen, Luftschlitzen oder dergl. in dem Gehäuse (23) zu strömen, um der erhitzten Luft zu gestatten, den Bereich, in dem sich das Gehäuse (23) befindet, zu erwärmen.

7. Wärmeaustauscheinheit nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Auslaß (16), aus dem erhitzte Luft geblasen oder gefördert wird, mit einem Luftführungskanal verbunden ist, um die erhitzte Luft dahin transportieren zu können, wo sie innerhalb eines Gebäudes benötigt wird.

8. Wärmeaustauscheinheit nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß der Heizkessel (1) aus einem dickwandigen metallischen Material hergestellt ist und daß das Gehäuse (2), innerhalb dessen er montiert ist, aus einem dünnwandigerem Blechmaterial hergestellt ist.

9. Wärmeaustauscheinheit nach Anspruch 8, dadurch gekennzeichnet, daß das Gehäuse (2)

eine Wandung (4) mit einem Schaulochdeckel (5) hat, der einen Zugriff zu Heizelementen (3), einem Gebläse (14) und Thermostaten darin gestattet.

10. Wärmeaustauscheinheit nach einem der vorhergehenden Ansprüche, dadurch gekennzeichnet, daß das Gehäuse (2) als ein solches mit einer Hohlwand ausgebildet ist, innerhalb derer eine Lage eines Isolationsmaterials angebracht ist.

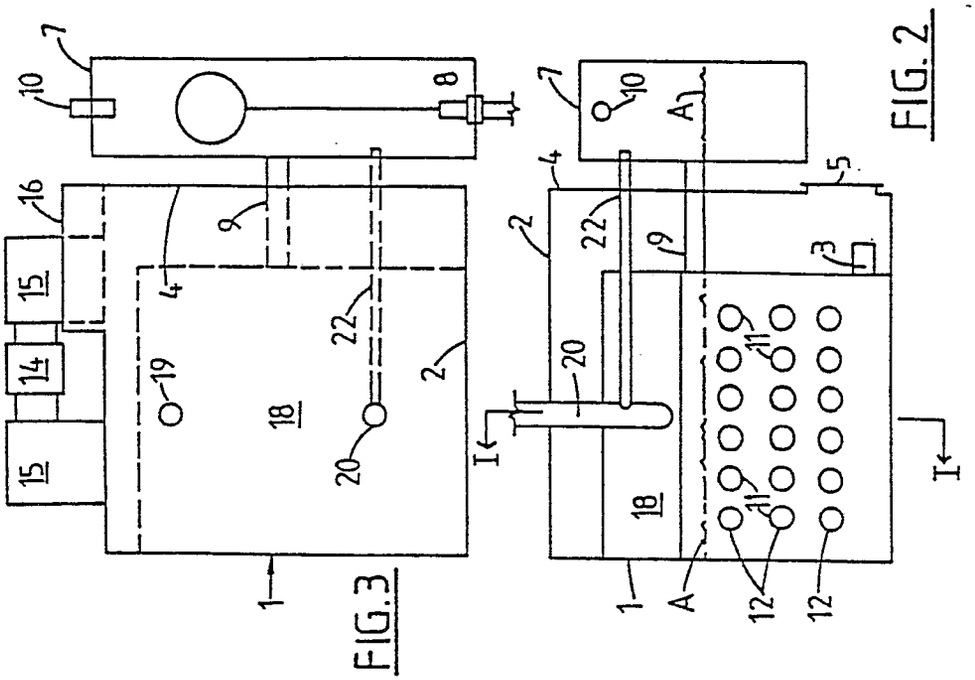

FIG. 3

FIG. 2

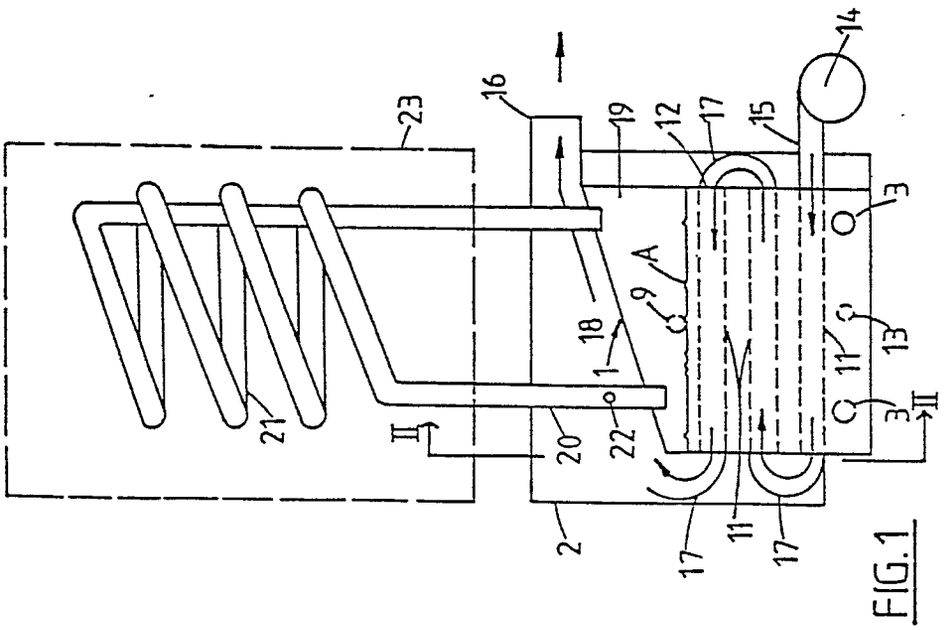

FIG. 1