HEAT EXCHANGER

FIELD OF INVENTION

The present invention relates to combustion system, heat storage and heat release for combustion or other processes in connection with combustion, heat storage and heat release.

BACKGROUND OF INVENTION

Boiler has been currently designed to allow one or the combination of three forms of heat exchange namely heat conduction, heat convection and heat radiation. Among which, heat radiation is normally capable of exchanging heat at a proportion of 60% which is considered to be most effective when compared to other methods. The heat radiation is similar to the transfer of heat caused by the sun's radiation through air, space the earth's atmosphere and eventually to materials in solid or liquid form.

However, for the boiler adapted for industrial use, it is still necessary to further develop the boiler to the extent that the performance in heat exchanger is improved and the level of the required fuel is decreased. With the development, the pollution to be caused by use of boiler should also be decreased. There are industrial need and demand for improvement of boiler currently designed to allow heat exchange in terms of effectiveness in exchanging heat for water and reducing fuel for combustion, as well as minimizing pollution from combustion taken place in the boiler.

SUMMARY OF INVENTION

It is therefore the objective of the invention to provide an apparatus for sustaining and releasing heat for boilers, which consists heat sustaining materials, the frames for covering at least a certain parts of the boiler. The frame is preferably in cylindrical circular or polygonal shape. The surface of the frame is configured to the installment of the said heat sustaining materials. The apparatus further includes a ventilation control mechanism for improving and managing the performance of the apparatus.

The said frame may comprise a plurality of small frames connected to each other. Said small frame can be disconnected in order to adjust the size of the overall frames for accommodating the size of boiler which may be different depending on the case by case basis. This is to enhance effectiveness and provide ease of installation, and also to avoid any potential damages due to the variation in shape and size of boiler to be applied with.

The apparatus is characterized in that a plurality of heat sustaining materials preferably in the form of plate, are closely placed on the surface of the frame. The frame can be further installed with the vertical or horizontal boiler.

In one aspect, the porosity of surface of heat sustaining materials may be varied. The shape of materials can also be provided in several forms including, triangular, rectangular, polygonal, curved or cylindrical plate. The said plates can then be installed with the frame which is made of heat resistant materials capable of the usage in the temperature of up to 800° C. The frame can have multiple connected layers of surface. For multilayer surface, a space is provided between each layer in order to allow installation and arrangement of heat sustaining materials, and achieve a desired level of appropriate heat exchange between each layer. It is also preferable that the porosity of the heat sustaining materials located at the layer closer to the boiler is greater than that of the other layer.

In another aspect, heat sustaining materials and frame can be altogether manufactured as a part of the frame surface in order to avoid subsequent installations of materials to the frame.

In another aspect, the frame is configured to include a plate at one and in order to control the direction of flame and the corresponding air circulation. This is to ensure that heat from the burner is circulated distributed throughout the frame. The frame can also be assembled to a base for supporting the boiler.

With the aforementioned characteristics, the apparatus for sustaining and releasing heat for boilers, this allows efficient heat exchange and the effective use of fuel and energy for combustion. The said apparatus also provides ease of installation in accordance with the characteristic of boiler and increase the space for the sustaining of heat before the heat is distributed into the fire tube.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 - demonstrating installment location in combustion chamber or large fire tube in fire-tube boiler, and installment location in water-tube boiler or one-through boiler.

FIG. 2 – demonstrating the overlapping of heat sustaining plates in case of overlapping layers.

FIG 3 – demonstrating the assembly pattern and shapes of heat sustaining plates as assembled to the supporting frame.

FIG 4 – demonstrating characteristics of supporting frame for heat sustaining plates which are divided into short series.

FIG 5 – demonstrating the assembly and attachment of heat sustaining materials together.

FIG 6 – demonstrating the structure of the invention in the event that the frame and heat sustaining materials are produced and installed as one piece.

DETAILED DESCRIPTIONS OF THE PREFERRED EMBODIMENT

The preferred embodiment is shown as in Figure 1 in which it is installed in the outlet of large fire tube or combustion chamber (2) of the boiler or other apparatus that requires heat for its operation. The overall characteristic is cylindrical tube comprising of

- Structure or Frame (21) supporting heat sustaining materials (11) manufactured from heat resistant materials having the same heat tolerance. The two columns of bases are provided at one side of the frame for accommodating the support and installation with the boiler.
- Heat sustaining materials (11) in form of plates are installed on the surface of the cylinder. Said materials are heat sustaining materials capable of air and heat ventilation for heat exchange in the form of convection and radiation. These plates may be provided in square, curved and cylindrical shapes.
- The number of layers of heat sustaining materials can be one or multiple as shown in Figure 2 in order to increase the performance in the heat exchange process. The numbers of layers maybe varied depending on the size of the tube (2) and burner (8) used in boiler.

- Heat sustaining materials (11) which is the closest to the boiler is slightly larger that the burner (8) and distributed along the length of the fire tube or combustion chamber (2) of the boiler. Heat will accumulate at the first, innermost layer (11) and the subsequently transfer to the second layer which is outer layer by convection and radiation. The subsequent layer will further transfer heat to the other external layers. Therefore, heat is distributed throughout the entire combustion chamber, the heat then will be circulated and transferred to the wall of fire tube (2) and fire tube (3) for continuous heat exchange as shown in Figure 1 and 2.

- The air flows through the front of the fire tube (2) and transfers heat toward fire tube (3). Such air may be air from stack or one from other sources i.e. air blower (4,5) as shown in Figure 1

- Frame can be divided into a series of short frames in order to prevent any damage from the expansion of materials due to the heat. Said small frames can be assembled until desirable length is acquired for the use according to the size of the fire tube (2) of the boiler. Heat sustaining materials can be loaded as shown in Figure 4 and Figure 5.

- Plate positioned at one end of the cylindrical shape, (if any) is used for controlling the direction of the flame to the extent that the flame is directed to the side surface of cylinder, thereby causing flame circulation along the side surface and allowing the continuous exchange of heat by radiation.

Alternately, the frame for installment of heat sustaining materials can be in triangular cylindrical or polygonal shape.

In other form of the invention, heat sustaining material can be manufactured as one part of surface of frame as shown in Figure 6.

The present invention can effectively reduce the use of fuel resource through a better heat exchange in form of heat radiation and the reduction of heat loss. This assists in manufacturing and stabilizing the temperature in combustion chamber stable, thereby preventing any change.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present

invention includes both combinations and sub-combinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.

CLAIMS

1. Heat exchanger for boiler consists of

Heat sustaining materials (11)

Frame (21) having a solid surface bounded by at least three plains or a circular surface elongated along a certain part of boiler wherein said surface is configured to support the installation of a plurality of heat sustaining material and be attached with ventilation controlling means.

characterized in that said heat sustaining materials are porous and are substantially positioned adjacent to each other on the surface of the frame (21), which is equipped to the boiler.

2. Heat exchanger for the boiler as recited in Claim 1 wherein the apparatus comprises supporting bases for installation of the apparatus with the boiler.

3. Heat exchanger as recited in any of the above Claims wherein porous heat sustaining materials are varied in term of sizes and configured to have different porosities.

4. Heat exchanger as recited in any of the above Claims wherein the porous heat sustaining materials are principally made of ceramic, and is in form of square or curved plate.

5. Heat exchanger as recited in any of the above Claims wherein the frame is hollow and made of heat resistant materials.

6. Heat exchanger as recited in any of the above Claims wherein the plurality of surfaces of the hollow frame are used support the installation of a plurality of heat sustaining materials thereby forming more than one layer of surfaces which are spaced apart from each other and the boiler.

7. Heat exchanger for boiler as recited in Claim 6 wherein the porosity of the porous heat sustaining materials being located at the layer closest to the boiler is greater than those of the outer layer.

8. Heat exchanger as recited in any of the above Claims wherein the frame comprises a plurality of frames which can be disassembled.

9. Heat exchanger as recited in any of the above Claims wherein the apparatus further comprised a plate located at one end of the frame for controlling the direction of flame.

10. Heat exchanger as recited in any of the above Claims wherein the apparatus can be used with a horizontal or vertical boiler.

11. Heat exchanger as recited in any of the above Claims wherein heat sustaining materials can be manufactured as a part of the surface of the frame.

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BACKGROUND OF INVENTION

Boiler has been currently designed to allow one or the combination of three forms of heat exchange namely heat conduction, heat convection and heat radiation. Among which, heat radiation is normally capable of exchanging heat at a proportion of 60% which is considered to be most effective when compared to other methods. The heat radiation is similar to the transfer of heat caused by the sun's radiation through air, space the earth's atmosphere and eventually to materials in solid or liquid form.

However, for the boiler adapted for industrial use, it is still necessary to further develop the boiler to the extent that the performance in heat exchanger is improved and the level of the required fuel is decreased. With the development, the pollution to be caused by use of boiler should also be decreased. There are industrial need and demand for improvement of boiler currently designed to allow heat exchange in terms of effectiveness in exchanging heat for water and reducing fuel for combustion, as well as minimizing pollution from combustion taken place in the boiler.

SUMMARY OF INVENTION

It is therefore the objective of the invention to provide an apparatus for storing and releasing heat for boilers, which consists heat sustaining materials, the frames for covering at least a certain parts of the boiler. The frame is preferably in cylindrical circular or polygonal shape. The surface of the frame is configured to the installment of the said heat sustaining materials. The apparatus further includes a ventilation control mechanism for improving and managing the performance of the apparatus.

The said frame may comprise a plurality of small frames connected to each other. Said small frame can be disconnected in order to adjust the size of the overall frames for accommodating the size of boiler which may be different depending on the case by case basis. This is to enhance effectiveness and provide ease of installation, and also to avoid any potential damages due to the variation in shape and size of boiler to be applied with.

The apparatus is characterized in that a plurality of heat sustaining materials preferably in the form of plate, are closely placed on the surface of the frame. The frame can be further installed with the vertical or horizontal boiler.

In one aspect, the porosity of surface of heat sustaining materials may be varied. The shape of materials can also be provided in several forms including, triangular, rectangular, polygonal, curved or cylindrical plate. The said plates can then be installed with the frame which is made of heat resistant materials capable of the usage in the temperature of up to 800° C. The frame can have multiple connected layers of surface. For multilayer surface, a space is provided between each layer in order to allow installation and arrangement of heat sustaining materials, and achieve a desired level of appropriate heat exchange between each layer. It is also preferable that the porosity of the heat sustaining materials located at the layer closer to the boiler is greater than that of the other layer.

In another aspect, heat sustaining materials and frame can be altogether manufactured as a part of the frame surface in order to avoid subsequent installations of materials to the frame.

In another aspect, the frame is configured to include a plate at one and in order to control the direction of flame and the corresponding air circulation. This is to ensure that heat from the burner is circulated distributed throughout the frame. The frame can also be assembled to a base for supporting the boiler.

With the aforementioned characteristics, the apparatus for storing and releasing heat for boilers, this allows efficient heat exchange and the effective use of fuel and energy for combustion. The said apparatus also provides ease of installation in accordance with the characteristic of boiler and increase the space for the sustaining of heat before the heat is distributed into the fire tube.

Brief Description of the Drawings

FIG. 1 - demonstrating installment location in combustion chamber or large fire tube in fire-tube boiler, and installment location in water-tube boiler or one-through boiler.

FIG. 2 – demonstrating the overlapping of heat storage/release plates in case of overlapping layers.

FIG 3 – demonstrating the assembly pattern and shapes of heat storage/release plates as assembled to the supporting frame.

FIG 4 – demonstrating characteristics of supporting frame for heat storage/release plates which are divided into short series.

FIG 5 – demonstrating the assembly and attachment of heat storage/ release materials together.

FIG 6 – demonstrating the structure of the invention in the event that the frame and heat storage/ release materials are produced and installed as one piece.

DETAILED DESCRIPTIONS OF THE PREFERRED EMBODIMENT

The preferred embodiment is shown as in Figure 1 in which it is installed in the outlet of large fire tube or combustion chamber (2) of the boiler or other apparatus that requires heat for its operation. The overall characteristic is cylindrical tube comprising of

- Structure or Frame (21) supporting heat sustaining materials (11) manufactured from heat resistant materials having the same heat tolerance. The two columns of bases are provided at one side of the frame for accommodating the support and installation with the boiler.

- Heat sustaining materials (11) in form of plates are installed on the surface of the cylinder. Said materials are heat sustaining materials capable of air and heat ventilation for heat exchange in the form of convection and radiation. These plates may be provided in square, curved and cylindrical shapes.

- The number of layers of heat storage/ release materials can be one or multiple as shown in Figure 2 in order to increase the performance in the heat exchange process. The numbers of layers maybe varied depending on the size of the tube (2) and burner (8) used in boiler.

- Heat sustaining materials (11) which is the closest to the boiler is slightly larger that the burner (8) and distributed along the length of the fire tube or combustion chamber (2) of the boiler. Heat will accumulate at the first, innermost layer (11) and the subsequently transfer to the second layer which is outer layer by convection and radiation. The subsequent layer will further transfer heat to the other external layers. Therefore, heat is distributed throughout the entire combustion chamber, the heat then will be circulated and transferred to the wall of fire tube (2) and fire tube (3) for continuous heat exchange as shown in Figure 1 and 2.

- The air flows through the front of the fire tube (2) and transfers heat toward fire tube (3). Such air may be air from stack or one from other sources I.e. air blower (4,5) as shown in Figure 1

- Frame can be divided into a series of short frames in order to prevent any damage from the expansion of materials due to the heat. Said small frames can be assembled until desirable length is acquired for the use according to the size of the fire tube (2) of the boiler. Heat sustaining materials can be loaded as shown in Figure 4 and Figure 5.

- Plate positioned at one end of the cylindrical shape, (if any) is used for controlling the direction of the flame to the extent that the flame is directed to the side surface of cylinder, thereby causing flame circulation along the side surface and allowing the continuous exchange of heat by radiation.

Alternately, the frame for installment of heat sustaining materials can be in triangular cylindrical or polygonal shape.

In other form of the invention, heat sustaining material can be manufactured as one part of surface of frame as shown in Figure 6.

The present invention can effectively reduce the use of fuel resource through a better heat exchange in form of heat radiation and the reduction of heat loss. This assists in manufacturing and stabilizing the temperature in combustion chamber stable, thereby preventing any change.

Thus, the preceding description of various embodiments of heat exchanger was given for purposes of illustration and example. Those skilled in the art will appreciate that the present invention may be carried out in other ways than those specifically set forth herein

without departing from essential characteristics of the invention. The present embodiments are thus to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

CLAIMS

1. Heat exchanger for boiler consists of

Heat sustaining materials (11)

A hollow frame (21) made of heat resistant materials having a solid surface bounded by at least three plains or a circular surface which can elongated along a certain part of boiler wherein said surface is configured to support the installation of a plurality of heat sustaining material and be attached with ventilation controlling means

characterized in that said heat sustaining materials are porous and are substantially positioned adjacent to each other on the surface of the frame (21), which can be installed in the boiler.

2. Heat exchanger for the boiler as recited in Claim 1 wherein the apparatus comprises supporting bases for installation of the apparatus with the boiler.

3. Heat exchanger as recited in any of the above Claims wherein porous heat sustaining materials are varied in term of sizes and configured to have different porosities.

4. Heat exchanger as recited in any of the above Claims wherein the porous heat sustaining materials are principally made of ceramic, and is in form of square or curved plate.

5. Heat exchanger as recited in any of the above Claims wherein the plurality of surfaces of the hollow frame are used support the installation of a plurality of heat sustaining materials thereby forming more than one layer of surfaces which are spaced apart from each other and the boiler.

6. Heat exchanger for boiler as recited in Claim 5 wherein the porosity of the porous heat sustaining materials being located at the layer closest to the boiler is greater than those of the outer layer.

7. Heat exchanger as recited in Claim 1 wherein the frame comprises a plurality of frames which can be disassembled.

8. Heat exchanger as recited in any of the above Claims wherein the apparatus further comprised a plate located at one end of the frame for controlling the direction of flame.

9. Heat exchanger as recited in any of the above Claims wherein the apparatus can be used with a horizontal or vertical boiler.

10. Heat exchanger as recited in any of the above Claims wherein heat sustaining materials can be manufactured as a part of the surface of the frame.