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(54) **Feed water valve system of a domestic appliance**

(57) A feed water valve system (10) of a domestic appliance comprises at least one feed water valve (11). The feed water valve includes a valve body. The valve body has coils, and the coils are connected to two electrical conductive terminals. A water intake channel (16) and a water discharge channel (17) are respectively installed on two ends of the valve body. The domestic appliance comprises a box, with a heat sink (18) connected between the valve body and the box so as to conduct heat. With the heat transfer effect provided by the heat sink, the heat generated by the valve body is transferred to the box to reduce the temperature of the box.

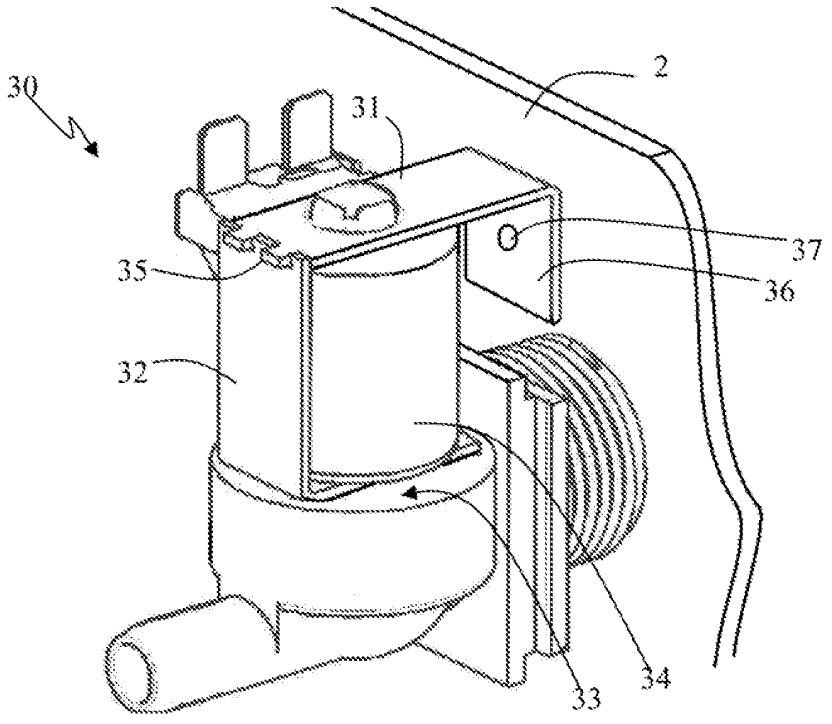

Fig. 4

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Description

[Field of the Invention]

[0001] The present invention is related to a feed water valve system of a domestic appliance, which includes at least one feed water valve. The feed water valve comprises a valve body. The valve body has coils; the coils are connected to two electrically conductive terminals. The feed water valve system of the domestic appliance comprises a water intake channel and a water discharge channel respectively connected to the two ends of the valve body. The domestic appliance includes a box.

[Description of the Related Art]

[0002] Domestic appliances such as washing machines, dryers or washing/drying machines are often connected to a water source to receive water for cleaning clothes and/or condensing water out of air in a drying process. A feed water valve is installed at the leading end of the water resource, to control the water flow. For example, as shown in FIG. 1, the washing machine 1 has a box 2; the box 2 includes an outer barrel 3 and a tumbling barrel 4 placed in the outer barrel 3, which are capable of being rotated. The feed water valve system 5 is connected between an external water source 6 and a pipe and is used for controlling the water supply for the outer barrel 3 and the tumbling barrel 4.

[0003] During operations of the domestic appliance, particularly where it requires a water supply for a long period of time, the coil in the feed water valve is electrically conducted for a long time, leading to a continuous accumulation of heat, which is difficult to dissipate. During operations of the domestic appliance, the air temperature in the box also increases, which reduces the heat dissipation efficiency of the valve. Long term operations at high temperatures significantly reduce both the lifetime and reliability of the feed water valve.

[0004] In the condensation process of a dryer or a washing/drying machine, the feed water valve for condensing water operates continuously throughout the entire drying process, which usually lasts more than one or even two hours. The accumulated heat in the valve body is not easily dissipated. In addition, the temperature within the box during the drying process is typically much higher than the temperature outside the box. Therefore, it is even more difficult for the heat of the valve body to dissipate. The feed water valve for condensing water is exposed to high temperatures for many hours, which explains why the failure frequency of such a feed water valve is much higher than other feed water valves operating under normal working conditions.

[SUMMARY OF THE INVENTION_]

[0005] An objective of the present invention is to provide a feed water valve system for a domestic appliance which efficiently reduces the valve body temperature of the feed water valve.

[0006] In order to achieve the above-mentioned objective, the feed water valve system for a domestic appliance of the present invention comprises at least one feed water valve. The feed water valve includes a valve body; the valve body has coils; the coils are connected to two electrically conductive terminals; and a water intake channel and a water discharge channel are installed respectively at the two ends of the valve body. The domestic appliance includes a box, and a heat sink is thermally conductively connected between the valve body and the box. With the heat transfer effect provided by the heat sink, the heat generated by the coils in the valve body can be transferred to the box. Since the box has a large surface area which is in direct contact with the external air, this transfers the heat from the valve body rapidly, to reduce the temperature of the valve body.

[0007] As one improvement of the present invention, thermally conductive silicone fills gaps between the heat sink and the valve body and/or between the heat sink and the box. The thermally conductive silicone fills up the gaps in order to increase the heat transferring area for higher heat transferring efficiencies.

[0008] As one improvement of the present invention, the heat sink is made of a metallic material. The metallic material has better heat conduction such that the heat sink can have better thermal conductivity. Furthermore, the metallic material has better deformability, which can be formed into a structure corresponding to the shape of the valve body.

[0009] As one improvement of the present invention, at least one portion of the heat sink is disposed along the periphery of the valve body and at least partially around the valve body. This structure provides a larger contact area for heat conduction between the heat sink and the valve body.

[0010] As one improvement of the present invention, at least one portion of the heat sink extends inside of the valve body. The inside of the valve body has a higher temperature than the outside of the body, and the heat sink can remove the large amount of heat energy in the valve body by extending into the valve body.

[0011] As one improvement of the present invention, the water discharge channel is connected to a condensing device of the domestic appliance. With its temperature reduced, the feed water valve can provide long water supply times for the condensing device.

[0012] As one improvement of the present invention, there are at least two feed water valves, and the heat sink is thermally conductively connected to each or all of the feed water valves so that the heat sink can simultaneously transfer the heat from the feed water valves to the box to reduce the body temperature of the valves.

[0013] As one improvement of the present invention, the heat sink includes a first heat sink and a second heat sink; wherein at least one portion of the first heat sink is disposed along and around the periphery of the valve

body, and the second heat sink is thermally conductively connected between the first heat sink and the box. Since the feed water valve system is more complicated and has a smaller installation space, the shapes of the first and the second heat sinks can be designed differently.

[0014] As one improvement of the present invention, the heat sink comprises an integral component in direct contact with both the valve body and the box. This design enables the heat sink to provide better heat transferring capabilities.

[BRIEF DESCRIPTION OF THE DRAWING]

[0015] The invention will be better understood with reference to the following drawings and detailed descriptions:

FIG. 1 is a perspective view of a washing machine with the top cover removed, wherein a prior art feed water valve system is shown;
FIG. 2 is a perspective view of a feed water valve system of a washing/drying machine of a preferred embodiment;
FIG. 3 is an exploded view of the first heat sink shown in FIG. 2; and
FIG. 4 is a perspective view of a feed water valve system according to another embodiment of the present invention.

[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]

[0016] A first embodiment of the present invention is used in a washing/drying machine, in which the basic structure of the washing/drying machine is similar to that of the washing machine 1 shown in FIG. 1. The washing/drying machine comprises a box 2, and the box 2 has an outer barrel 3 and a tumbling barrel 4 disposed in the outer barrel 3, and both outer barrel 3 and a tumbling barrel 4 may be rotated.

[0017] The feed water valve system 10 of the washing/drying machine shown in FIG. 2 comprises three feed water valves 11. Each feed water valve 11 has a valve body 14. The valve body 14 has coils (not shown) connected to two electrically conductive terminals 15. A water intake channel 16 and a water discharge channel 17 are connected respectively to the two ends of the valve body 14. The water discharge channel 17 of the feed water valve 11 is connected to a condenser (not shown) to provide water to the condenser in order to condense water from the hot air generated by a clothes drying process in the outer barrel 3 as the air flows through the condenser.

[0018] The first heat sink 18 is secured onto the three feed water valves 11 and has a frame body 12 disposed along the periphery of the valve body 14 and around the feed water valve 11. A second heat sink 19 is disposed around the three feed water valves 11 in contact with the first heat sink. Preferably, thermally conductive silicone fills gaps between the valve body 14 and the first heat sink 18, and the first heat sink 18 and the second heat sink 19, to transfer heat completely. The second heat sink 19 has an extended portion 20, and the extended portion 20 and the box 2 are secured to each other via screws (not shown). The extended portion 20 is a flat board fixed flat onto the box 2. Preferably, the thermally conductive silicone also fills in gaps between the extended portion 20 and the box 2. The first heat sink 18 and the second heat sink 19 are made of materials with a high thermal conductivity. In this embodiment, the heat sinks are made of metallic materials.

[0019] As shown in FIG. 3, the first heat sink 18 is composed of a first portion 21 and a second portion 22. The first portion and the second portion respectively have a tubular portion 23 extending inside the valve body 14. The heat in the valve body 14 is dissipated by the tubular portion 23.

[0020] FIG. 4 is a perspective view of the feed water valve system according to another embodiment of the present invention. In this embodiment, the third heat sink 31 and the fourth heat sink 32 are secured to the valve body 34 of the feed water valve 33 and engaged with each other via teeth 35. The third heat sink 31 has an extended portion 36, and the extended portion 36 and the box 2 are secured to each other via screws 37. Similar to the first heat sink 18 shown in FIG. 3, the third heat sink 31 and the fourth heat sink 32 each respectively have a portion (not shown) extending into the inside of the valve body 34.

[0021] In this embodiment, the connections between the first heat sink 18, the second heat sink 19, the third heat sink 31, the fourth heat sink 32 and the valve body 14, 34 and the box 2 are not restricted to the means described above, and can be implemented by any means of connection capable of transferring heat, such as a welded connection, a riveted connection, direct adhesion, a connection employing thermal glues, a mechanical interconnection, etc.

[0022] It is understood that the examples and embodiments along with drawings described herein are for illustrative purposes only, and that various modifications or changes may be suggested based on the information herein by persons skilled in the art, and these are to be included within the spirit and purview of this application and scope of the claims.

Claims

1. A feed water valve system of a domestic appliance comprising at least one feed water valve (11, 33), the feed water valve (11, 33) including a valve body (14, 34); the valve body (14, 34) having a coil; the coil connected to two electrically conductive terminals (15); a water intake channel (16) and a water discharge channel (17) respectively installed on two

ends of the valve body (14, 34); the house appliance including a box (2) **characterized in that** a heat sink (18, 19, 31, 32) is connected between the valve body (14, 34) and the box (2) so as to conduct heat.

2. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** thermally conductive silicone fills gaps between the heat sink (18, 19, 31, 32) and the valve body (14, 34), or between the heat sink (18, 19, 31, 32) and the box (2).

3. The feed water valve system of a domestic appliance of claim 1 or 2, further **characterized in that** the heat sink (18, 19, 31, 32) is made of a metallic material.

4. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** at least one portion of the heat sink (18, 19, 31, 32) is disposed along the periphery of the valve body and at least partially around the valve body.

5. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** at least one portion of the heat sink (18, 31, 32) extends into the inside of the valve body.

6. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** the water discharge channel (17) is connected to a condenser of the domestic appliance.

7. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** the feed water valve system comprises at least two feed water valves (11, 33), and the heat sink (19) is thermally conductively connected to each or all of the feed water valves (11, 33).

8. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** the heat sink (18, 19) includes a first heat sink (18) and a second heat sink (19); wherein at least one portion of the first heat sink (18) is disposed along the periphery of the valve body (14), and the second heat sink (19) is thermally conductively connected between the first heat sink (18) and the box (2).

9. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** the heat sink (31, 32) comprises an integral component (31) directly in contact with both the valve body (34) and the box (2).

10. The feed water valve system of a domestic appliance of claim 1, further **characterized in that** the domestic appliance is a clothes treatment device (1).

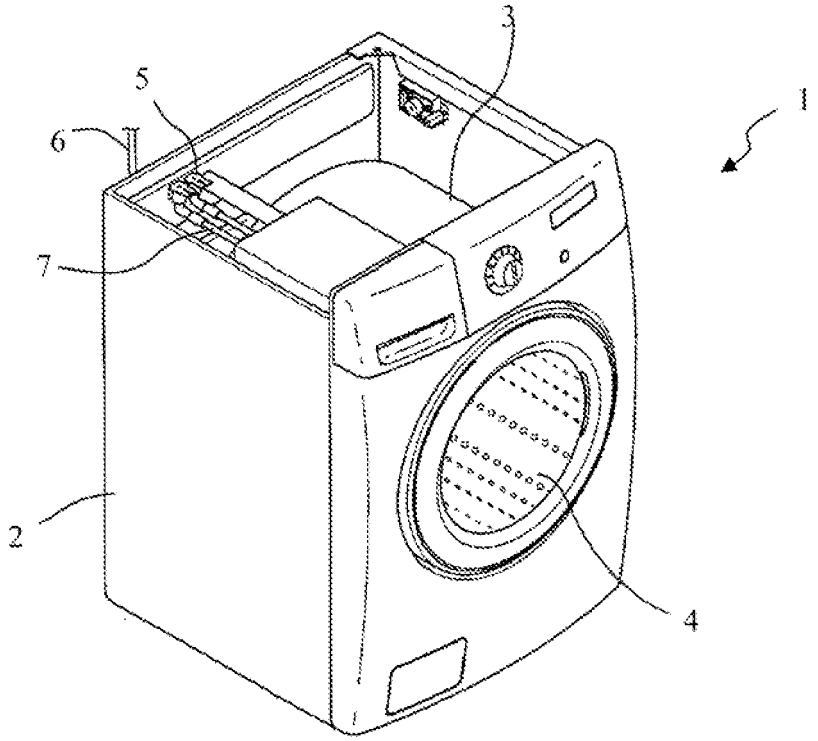

Fig. 1

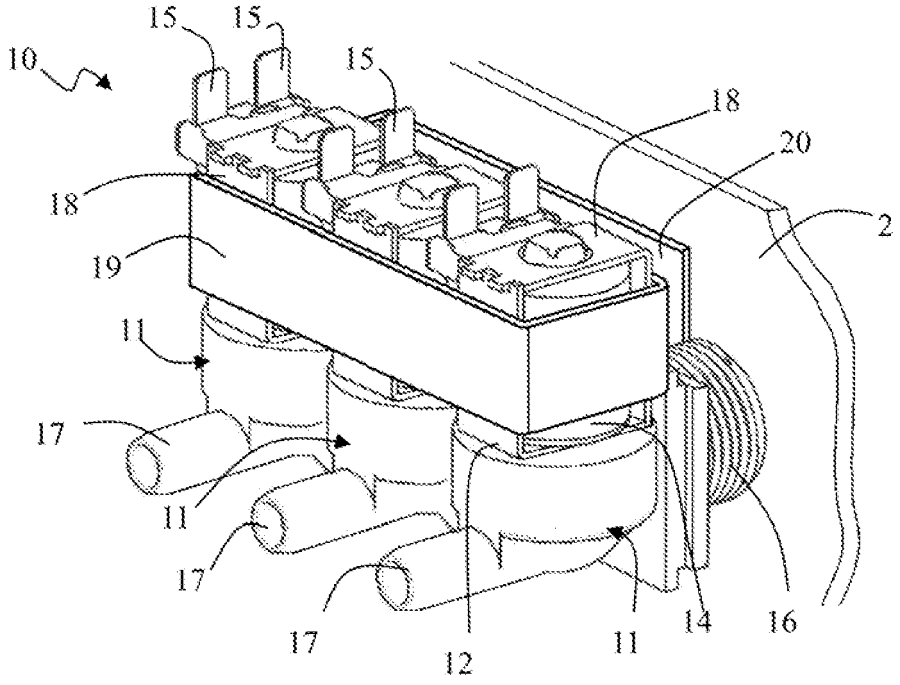

Fig. 2

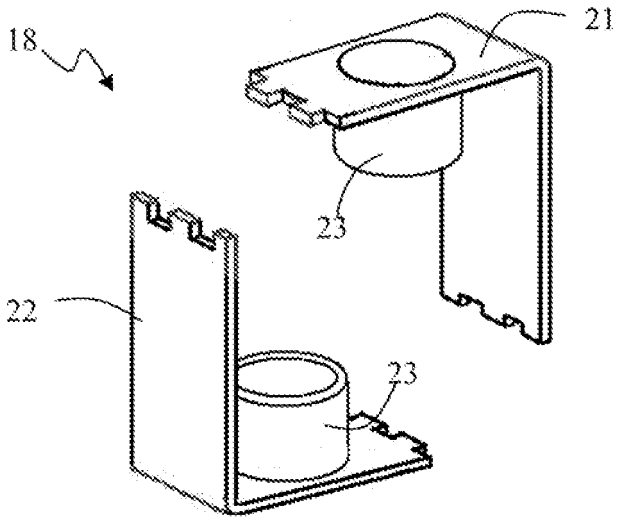

Fig. 3

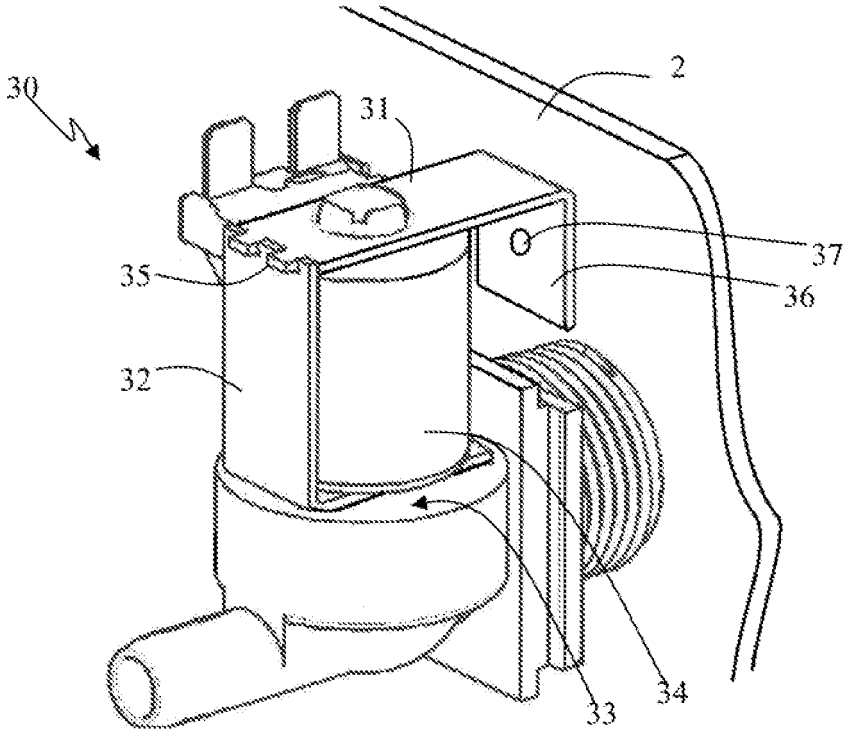

Fig. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 09 18 0843

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	US 5 231 722 A (SHACKLOCK FRANK W [NZ] ET AL) 3 August 1993 (1993-08-03) * figure 10 * -----	1	INV. D06F58/24 D06F39/08
A	US 3 337 130 A (ERICKSON HOWARD L) 22 August 1967 (1967-08-22) * figure 1 * -----	1	

TECHNICAL FIELDS SEARCHED (IPC)

D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	28 May 2010	Stroppa, Giovanni

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 09 18 0843

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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28-05-2010

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