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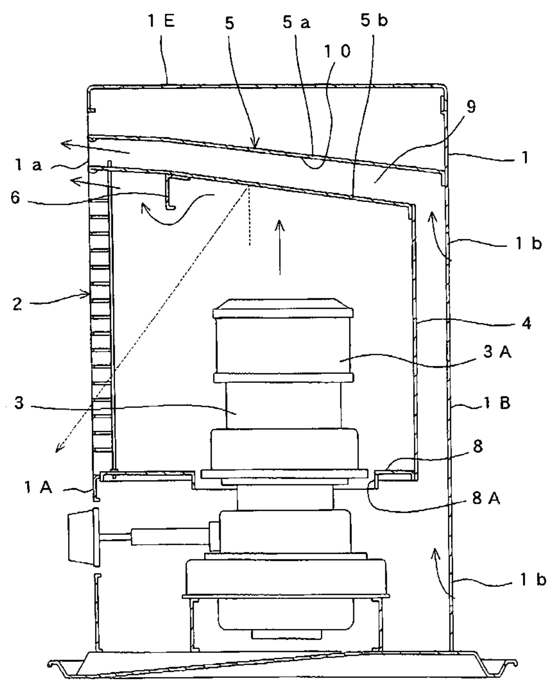
# (54) REFLECTION TYPE OIL BURNING APPLIANCE

(57) The present invention provides a reflection-type oil burner in which a temperature of an upper wall of a frame body can be kept low and radiation efficiency is improved. A combustion-cylinder structure 3 and a reflection plate 4 are provided in a frame body 1. A lower heat-shielding plate 5b is provided between the reflection plate 4 and the upper wall 1E in such a manner that the distance between the lower heat-shielding plate 5b and a partition wall 8 at a side of an opening portion 2 is longer than that at a side of reflection plate 4. Heat ray emitted from the combustion-cylinder structure 3 is reflected by an inclined lower heat-shielding plate 5b and radiates in a forward direction from the frame body 1 through the opening portion 2. Radiation heat radiated by the lower heat-shielding plate 5b, which is to be at high temperature, radiates through the opening portion 2 in a forward direction of the frame body 1. A combustion-gas collision member 6 for blocking a flow of combustion gas running out of the combustion-cylinder structure 3 is provided at the lower heat-shielding plated 5b. Cool air entering through an inlet 1b at a rear wall 1B of the frame body 1 is guided between the upper heat-shield plate 5a and the lower heat-shield plate 5b in a forward direction from the frame body 1. The combustion gas diffuses when flowing over the combustion-gas collision member 6 and lowers its temperature. The combustion gas runs out in a forward direction of the frame body 1 at the end of the lower heat-shielding plate 5b along air running out of the outlet 1a.

Fig.1



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## Description

FIELD OF THE INVENTION

**[0001]** The present invention relates to a reflection type oil burner in which a temperature of an upper wall, or a top plate, of a frame body can be lowered more than that of a conventional device, and more particularly to a reflection type oil burner in which radiation efficiency can be enhanced by lowering the temperature of the upper wall, or of the top plate, of the frame body and also by reflecting a heat ray radiated from a combustion-cylinder structure toward the outside of the frame body.

BACKGROUND OF THE INVENTION

**[0002]** There has been widely known and used a reflection type oil burner provided with a combustion-cylinder structure and with a reflection plate provided behind the combustion-cylinder structure in a frame body. The reflection plate reflects a heat ray radiated from the combustion-cylinder structure in a forward direction from the frame body through an opening portion provided on a front wall of the frame body. Radiant heat, or a heat ray, and high-temperature exhaust gas, or combustion gas run out of this kind of reflection type oil burner. The high-temperature exhaust gas, or combustion gas, flows up out of the combustion-cylinder structure, then is guided by one or more heat-shielding plate provided between an upper portion of the reflection plate and the upper wall, or the top plate, of the frame body, and flows toward the opening portion provided at the front wall of the frame body. The exhaust gas, which has flown out of a front end of the heat-shielding plate through the opening portion, flows up right away. Therefore a temperature is elevated on an upper end of the opening portion located at a front region of the frame body, and on a front portion of the upper wall of the frame body.

**[0003]** Since the heat-shielding plates are located right above the combustion-cylinder structure, a temperature of the heat-shielding plate is elevated by the heat ray and the high-temperature exhaust gas which upwardly run out of the combustion-cylinder structure. Therefore the temperature of the whole upper wall of the frame body is elevated by the high-temperature heat-shielding plates.

**[0004]** In recent years, in order to prevent incidents such as a burn injury of infant by a heater, a temperature of a frame body and a safety guard are defined by the UL safety standard in the United States and the NF safety standard in France. A temperature of a frame body is required to be low enough to prevent a serious burn injury in case one touches a frame body. Or a safety guard is required so as to prevent one's hand from touching high-temperature portions close to an opening portion.

**[0005]** A prior art in which a temperature of a frame body is lowered is proposed as disclosed in Japanese Utility Model Publication No. 6199/1974. According to the art, an upper heat-shielding plate is provided between a lower heat-shielding plate which is to be at a high temperature and the upper wall of the frame body. An electric fan is employed to forcibly send winds into a space between the upper and lower heat-shielding plates, and also between the upper heat-shielding plate and the upper wall, so that the temperature of the upper wall can be lowered. Using the art, however, results in increasing a price of a reflection type oil burner, since an electric fan is required.

**[0006]** Japanese Utility Model Publication No. 15885/1975 discloses a prior art in which a fin is provided at a lower side of an end of a heat-shielding plate to change an angle at which exhaust gas flows out. This fin enables the exhaust gas to flow in a forward direction from a frame body to prevent exhaust gas from approaching an upper wall of the frame body. Thus a temperature of the upper wall of the frame body is kept low.

**[0007]** Japanese Utility Model Publication No. 110308/1992 (United State Patent Publication No. 5,226,811) discloses a structure in which a combustion-gas-collision member extending in a lateral and downward direction is provided at a lower side of a central portion on an end of a lower heat-shielding plate. Exhaust gas, or combustion gas, collides with the combustion-gas-collision member and is diffused while flowing along the lower heat-shielding plate. The combustion-gas-collision member provided at the lower heat-shielding plate can be prevented from forming a region where combustion gas intensively flows out. Consequently a local elevation of a temperature at the central portion on the end of the upper wall of the frame body is prevented.

**[0008]** However, even though the structure indicated by Japanese Utility Model Publication No. 110308/1992 (United State Patent Publication No.5,226,811) is employed, when a frame body is small or an amount of generated heat at combustion-cylinder structure is increased, combustion high-temperature exhaust gas, or combustion gas, flows up right after flowing out of an opening portion provided on a front wall of a frame body, and contacts a front portion of an upper wall of the frame body. Therefore a temperature is elevated on the front portion of the upper wall of the frame body, which means that the conventional structure could not completely solve the problem that a temperature of a frame body needed to be lowered.

**[0009]** Furthermore a heat ray has emitted from a combustion-cylinder structure and reflected by a reflection plate is radiated in a forward direction from a frame body through an opening portion provided at a front wall of the frame body. According to the conventional structure, a heat ray upwardly emitted from a combustion-cylinder structure and reflected by a lower heat-shielding plate is radiated toward a lower region in a frame body, thereby being unable to advance toward an opening portion. Thus radiation efficiency of the conventional structure was low, thereby elevating a temperature in the frame body.

**[0010]** A part of a heat ray which has been reflected by a reflection plate and radiated in a forward direction from the frame body through an opening portion, reaches a floor surface and warms it up. The heat ray, however, reaches a floor surface far away from the frame body, but not a floor surface close to the frame body, since the angle at which the heat ray is reflected by the reflection plate is not appropriate for the closer surface of the floor. Therefore a temperature of the floor surface close to the frame body is low. If a temperature is low on a part of a floor, the part of the floor surface deprives its surrounding area of the heat, thereby deteriorating heating efficiency. Thus there is much in demand for warming up a wide range of a floor surface.

## DISCLOSURE OF THE INVENTION

**[0011]** The present invention provides a reflection type oil burner which solves the problems as described above. With reference to the accompanying drawings with reference numerals indicated thereon, a reflection type oil burner according to the present invention includes a frame body 1, a combustion-cylinder structure 3, a reflection plate 4, heat-shielding plates 5, a combustion-gas-collision member 6, a partition wall 8, and other components. The frame body 1 includes a front wall 1A having an opening portion 2, a rear wall 1B opposing to the front wall 1A, two side walls 1C and 1D connecting the front wall 1A and the rear wall 1B, and an upper wall 1E connected to an upper end portion of each of the walls. The combustion-cylinder structure 3 is provided in the frame body 1, for radiating a heat ray around a heat ray-radiating section 3A. The partition wall 8 includes a through hole 8A through which the heat ray-radiating section 3A of the combustion-cylinder structure 3 passes, and laterally extends in the frame body 1. A reflection plate 4 is provided at both sides of and behind the heat ray-radiating section 3A of the combustion cylinder 3 so as to reflect a heat ray toward the opening portion 2. A plurality of heat-shielding plates 5 include a lower heat-shielding plate 5b and an upper heat-shielding plate 5a which are vertically spaced between the reflection plate 4 and the upper wall 1E. The plurality of heat-shielding plates 5 prevent the heat, which has emitted from the combustion-cylinder structure 3, from reaching the upper wall 1E. Additionally, according to the present invention, an air passage 9 is formed between the lower heat-shielding plate 5b and the upper heat-shielding plate 5a. At the rear wall 1B and/or the side walls 1C and 1D, one or more air inlet 1b is provided to allow air to enter into the air passage 9 from an outside of the frame body 1. And an air outlet 1a is provided at the front wall 1A so that the air, which has entered into the air passage 9 through the air inlet, flows out of the air outlet 1a in a forward direction from the front wall 1A through the air outlet 1a. The combustion-gas-collision member 6 is provided at the lower heat-shielding plate 5b, and extends in a lateral and downward direction when the opening portion 2 is viewed from the front side. The combustion-gas-collision member 6 is constructed in such a manner that the combustion gas flowing along the lower heat-shielding plate 5b toward the opening portion 2 collides with the combustion-gas-collision member 6. The lower heat-shielding plate 5b is inclined in such a manner that a distance between the lower heat-shielding plate 5b and the partition wall 8 at a side of the opening portion 2 is longer than that at a side of the reflection plate 4.

**[0012]** According to the present invention, a combustion-gas-collision member 6 is provided at a position which is away from the opening portion toward the combustion-cylinder structure 3 with a distance, which is so determined that the combustion gas can flow along said lower heat-shielding plate 5b at an increasing flow speed after flowing over said combustion-gas-collision member 6. With this arrangement, the exhaust gas, or the combustion gas, is diffused to lower its temperature when flowing over the combustion-gas-collision member 6. The combustion gas, then, continues to flow along a lower surface of the lower heat-shielding plate 5b at an increasing flow speed. And the combustion gas flows out of the frame body 1 in a forward direction. Along with increasing a flow speed of the combustion gas flowing out of the opening portion 2, the angle at which the combustion gas flows up right after flowing out through the opening portion 2 starts to increase at a position a certain distance away from the opening portion 2. Thus the upper wall 1E of the frame body can be prevented from being directly heated up by the combustion gas which has flown out of the opening portion 2. As a result, according to the present invention, the elevation of the temperature of the upper wall 1E is suppressed more than that of the prior arts.

**[0013]** Cool air, or air outside the frame body, which has entered through one or more air inlet 1b provided on the rear wall 1B of the frame body 1 passes through between the upper heat-shielding plate 5a and the lower heat-shielding plate 5b, and flows out of the outlet 1a provided at a front portion of the frame body 1. The air which has run out of the outlet 1a advance along an upper side of the flowing the exhaust gas which has flown over the combustion-gas-collision member 6. The air, then, prevents the exhaust gas from flowing up after the exhaust gas flows out through the opening portion 2. That is, the exhaust gas flows out of an end portion of the lower heat-shielding plate 5b in a forward direction of the frame body 1, and advance along the lower side of the running air which has run out of the air outlet 1a. As a result, the high-temperature exhaust gas flows apart from the front portion of the upper wall 1E of the frame body 1 , thereby being able to keep the upper wall 1E at a low temperature.

**[0014]** Preferably, an inclined angle of a front portion of the lower heat-shielding plate 5b, is smaller than that of a rear portion thereof. The front portion thereof is located in front of the combustion-gas-collision member

6, the rear portion thereof being located behind the combustion-gas-collision member 6. With this arrangement, the air which has run out of the air outlet 1a can advance further away in a forward direction from the frame body 1.

**[0015]** It is preferred that a central portion 6a of the combustion-gas-collision member 6 facing the combustion-cylinder structure 3 is formed lower than side portions 6b located on both sides of the central portion 6a. With this arrangement, combustion gas can flow over the central portion 6a easier than the side portions 6b. This arrangement can alleviate a decrease of a flowing speed of the combustion gas flowing over the central portion 6a of the combustion-gas-collision member 6. Consequently, the combustion gas at the highest temperature, which is to forwardly flow out at the end portion of the lower heat-shielding plate 5b, can advance further away from the front portion of the upper wall 1E of the frame body 1, thereby being able to suppress the elevation of the temperature at the central portion of the front end of the upper wall 1E.

**[0016]** A flow of combustion gas toward the opening portion 2 along the lower heat-shielding plate 5b is hindered by the combustion-gas-collision member 6, thereby elevating a temperature of the lower heat-shielding plate 5b. Thus radiation heat from the lower heat-shielding plate 5b at a high temperature increases, and reflects in a forward direction from the frame body 1 through the opening portion 2. As a result, the combustion gas and the radiation heat which run out in a forward direction from the frame body 1 increase, thereby enhancing radiation efficiency.

**[0017]** Preferably, a plurality of through holes 6c are provided at the side portions 6b, except the central portion 6a, of the combustion-gas-collision member 6. With this arrangement, the combustion gas is blocked by the central portion 6a of the combustion-gas-collision member 6, and then is separated into the right and left. The separated combustion gas passes through the through holes 6c provided at the right and left sides 6b of the combustion-gas-collision member 6. Thus the combustion gas can be prevented from concentrating at the central portion of the combustion-gas-collision member 6. The combustion gas is, then, stirred by diffusing right and left, and by passing through the through holes 6c, thereby lowering the temperature of the combustion gas. The combustion gas passes through the through holes 6c, and then flows toward the opening portion 2 along the lower surface of the lower heat-shielding plate 5b at an increasing flow speed.

**[0018]** Preferably, a plurality of protrusions 7 protruding toward a partition wall 8 are provided, at an area of the lower heat-shielding plate 5b, between a facing region of the lower heat-shielding plate 5b facing the combustion-cylinder structure 3 and the combustion-gas-collision member 6. In this case, the plurality of protrusions 7 are so formed to extend radially from the facing region of the lower heat-shielding plate toward the combustion-gas-collision member 6, and are so spaced as to be capable of guiding the combustion gas while radially diffusing the combustion gas, which has flown out of the combustion-cylinder structure 3 and has hit the facing region of the lower heat-shielding plate, toward the opening portion. Since the plurality of the protrusions 7 guide the combustion gas to the opening portion 2 which radially diffusing the combustion gas, the combustion gas flowing toward the opening portion 2 is diffused, thereby lowering a temperature of the combustion gas when the combustion gas flows out of the opening portion 2. Furthermore, since the combustion gas is also diffused when it flows over the heat-collision member, the temperature of the combustion gas is lowered, thereby suppressing an elevation of a temperature of the upper wall 1E.

**[0019]** The plurality of protrusions can be integrally formed with the lower heat-shielding plate 5b. It is preferred to define a shape of each of the surfaces of the plurality of protrusions 7 in such a manner that a heat ray which has emitted from the combustion-cylinder structure 3 diffusely reflect on the surfaces of the protrusions 7. With this arrangement, the heat ray reflected by the lower heat-shielding plate 5b diffuses and radiates. Since the heat ray diffusely reflects and radiates through the opening portion 2 while diffusing, a wide range of the front portion of the frame body 1 and a floor surface can be evenly warmed up.

**[0020]** A heat ray reflected by the reflection plate 4 and radiated in a forward direction of the flame body 1, and a radiation heat from the reflection plate 4 are radiated toward a floor surface apart from the frame body 1 as well as a floor surface in front of the frame body 1. Also, a heat ray reflected by the lower heat-shielding plate 5b and a radiation heat from the lower heat-shielding plate 5b are reflected toward the floor surface close to the frame body 1. Consequently, a wide range of floor surface including the floor surface in front of the frame body 1 can be warmed up.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0021]**

Fig. 1 is a vertical cross-sectional view cut at a center line showing an embodiment of a reflection type oil burner according to the present invention.

Fig. 2 is a front side elevation view showing an essential part of the embodiment indicated in Fig. 1.

Fig. 3 shows a structure of an essential part of another embodiment according to the present invention.

Fig. 4 is a longitudinal cross-sectional view of an essential part of the embodiment indicated in Fig. 3.

## BEST MODE FOR IMPLEMENTING THE INVENTION

**[0022]** Details of embodiments according to the present invention are described with reference to figures. Fig.1 shows a vertical cross-sectional view cut out a center line showing an embodiment of a reflection type oil burner according to the present invention. Reference numeral 1 indicates a frame body in Fig. 1. A frame body 1 includes a front wall 1A having an opening portion 2, a rear wall 1B opposing to the front wall 1A. two side walls 1C and 1D connecting the front wall 1A and the rear wall 1B, and an upper wall 1E connected to an upper end portion of each of the walls. An opening portion 2 is provided at an upper-half region of a front wall 1A of the frame body 1. A combustion-cylinder structure 3 for radiating combustion gas around it is provided in the frame body 1. A reflection plate 4 is provided at both sides and behind of the combustion-cylinder structure 3 with a space between the combustion-cylinder structure 3 and the reflection plate 4. A reflection plate 4 is provided, and both sides of the reflection plate 4 are connected to both ends of the opening portion 2 of the frame body 1 in a width direction. The reflection plate 4 reflects a heat ray emitted from the combustion-cylinder structure 3 towards the opening portion 2. A partition wall 8 includes a through hole 8A through which the heat-rays-radiating section 3A of the combustion-cylinder structure 3 passes, and laterally extends in the frame body 1.

**[0023]** A plurality of heat-shielding plates 5 include a lower heat-shielding plate 5b and an upper heat-shielding plate 5a which are vertically spaced between the reflection plate 4 and the upper wall portion 1E. The plurality of heat-shielding plates 5 prevent the heat out of the combustion-cylinder structure 3 from reaching the upper wall 1E. An air passage 9 is provided between the lower heat-shielding plate 5b and the upper heat-shielding plate 5a. At the rear wall 1B and/or the side walls 1C and 1D, one or more air inlet 1b is provided to supply air from the outside of the frame body 1 into the air passage 9. Moreover an air outlet 1a is provided at the front wall 1A so that the air enters through the air inlet 1a into the air passage 9 and runs out in a forward direction from the front wall 1A through the air outlet 1a. The air passage 9 is also provided between the reflection plate 4 and the rear wall 1B of the frame body 1. The lower heat-shielding plate 5b is inclined in such a manner that a distance between the lower heat-shielding plate 5b and the partition wall 8 at a side of the opening portion is longer than that at a side of reflection plate 4. In this embodiment, the upper heat-shielding plate 5a is inclined as well as the lower heat-shielding plate 5b. As shown in the figure, inclined angles of front portions of the lower heat-shielding plate 5b and the upper heat-shielding plate 5a, are smaller than those of rear portions thereof. The front portions of the lower heat-shielding plate 5b and the upper heat-shielding plate 5a are located at a side of the opening portion 2 relative to the combustion-gas-collision member 6, while the rear portions of the lower and upper heat-shielding plates being located at a rear side to the combustion-gas-collision member 6.

**[0024]** A heat ray emitted from the combustion-cylinder structure 3 is reflected by the reflection plate 4 provided around the combustion-cylinder structure 3, toward the opening portion 2 of the frame body 1, in order to be used for heating. The exhaust gas, or combustion gas which has flown up out of the combustion-cylinder structure 3 flows up to hit the lower heat-shielding plate 5b of the plurality of heat-shielding plate 5 which is located between the upper side of the reflection plate 4 and the upper wall 1E of the frame body 1. The combustion gas is guided toward the opening portion 2 of the frame body 1 along the lower side of the inclined lower heat-shielding plate 5b, and then flows out of the frame body 1.

**[0025]** Cool air, or air outside the frame body, entering through the air inlet 1b runs through between the rear surface of the reflection plate 4 and the rear wall 1B of the frame body 1. The cool air, then, runs through an inclined air passage 9 and runs out of the air outlet 1a located above the opening portion 2 of the frame body 1.

**[0026]** In the structure described above, the heat ray emitted from the combustion cylinder structure 3 is radiated upwardly too and then is reflected by the lower surface of the lower heat-shielding plate 5b.

**[0027]** In the structure where the lower shielding-plate is not inclined, the heat ray upwardly emitted from the combustion cylinder structure 3 does not advance toward the opening portion 2 but only repeat to reflect up and down. Therefore a temperature is elevated in the frame body 1, and the heat ray to be reflected in a forward direction from the frame body 1 is decreased, thereby deteriorating radiation efficiency. As shown in the present invention, the lower heat-shielding plate 5b is inclined in such a manner that a distance, or height, between the lower heat-shielding plate 5b and the partition wall 8 at a side of the opening portion 2is longer, or higher, than that at a side of the reflection plate 4. With this arrangement, the heat ray emitted from the combustion cylinder structure 3 is reflected by the inclined lower heat-shield plate 5b toward the lower part of the opening portion 2 of the frame body 1. Since the heat ray is reflected through the opening portion 2 in a forward direction from the frame body 1, the heat ray to be reflected in a forward direction from the frame body 1 increases. The temperature in the frame body 1, thus, can be prevented from elevating.

**[0028]** A combustion-gas-collision member 6 is provided on the lower surface of the lower heat-shielding plate 5b, and extends in a lateral and downward direction when the opening portion 2 is viewed from a front side. The combustion-gas-collision member 6 is so constructed that a combustion gas, flowing toward the opening portion 2 along the lower heat shielding plate 5b, collides with the combustion-gas-collision member 6. The combustion-gas-collision member 6 is provided at a position which is away from the opening portion toward the combustion-cylinder structure 3 by a distance, which is so determined that the combustion gas can flow along the lower heat-shielding plate 5b at an increasing flow speed after flowing over the combustion-gas-collision member 6. In this embodiment, the combustion-gas-collision member 6 is located behind approximately a quarter of longitudinal length of the lower heat-shielding plate 5b from the opening portion 2. The combustion gas which has flown out of the combustion-cylinder structure 3 hits the lower heat-shielding plate 5b and flows along the lower surface of the inclined lower heat-shielding plate 5b towards the opening portion 2 of the frame body 1. Then the combustion gas is blocked by the combustion-gas-collision member 6 shaped in a partition provided at the lower heat-shielding plate 5b, and is diffused right and left along the combustion-gas-collision member 6. Therefore the combustion gas is temporarily accumulated on the lower surface of the lower heat-shielding plate 5b by the combustion-gas-collision member 6. The combustion gas elevates a temperature on the rear portion of the lower heat-shielding plate 5b behind combustion-gas-collision member 6. As a result, the reflection heat from the lower heat-shielding plate 5b increases, and is reflected through the opening portion 2 of the frame body 1 in a forward direction from the frame body 1.

**[0029]** In addition to the heat ray reflected in a forward direction by the reflection plate 4, the heat ray and the radiation heat which are radiated in a forward direction from the frame body 1 by the lower heat-shielding plate 5b , increase radiation efficiency to warm up effectively.

**[0030]** A part of the heat ray is radiated in a forward direction from the frame body 1 through the opening portion 2 and reaches a floor surface to warm it up. In the conventional art, the heat ray does not reach a floor surface close to the frame body 1 after being reflected by the reflection plate 4 and radiated in a forward direction from the frame body 1, thereby lowering a temperature of the floor surface close to the frame body 1. According to the present invention, the heat ray reflected by the lower heat-shielding plate 5b and the radiation heat from the lower heat-shielding plate 5b advance toward the floor surface close to the frame body 1. Thus the floor surface close to the frame body 1 can be warmed up. Consequently, a wide range of the floor surface can be warmed up to enhance heating efficiency.

**[0031]** The air, which has run through the air passage 9 and has run out of the air outlet 1a in a forward direction from the frame body 1, runs along an upper side of the exhaust gas which has forwardly flown along the lower surface of the inclined lower heat-shielding plate 5b. The air runs in such a manner to guide the combustion gas in a forward direction from the frame body 1. According to the present invention, the combustion gas is blocked by the combustion-gas-collision member 6, and diffuses along the whole portion of the combustion-gas-collision member 6. A temperature of the exhaust gas is lowered when the exhaust gas flows over the combustion-gas-collision member 6 and diffuses, and then flows out of the frame body 1. Therefore the highest temperature of the exhaust gas is suppressed, which can suppress the power of the exhaust gas for flowing up when the exhaust gas runs out of the frame body 1. Consequently the combustion gas can be guided in a forward direction from the frame body 1 by the air running toward the outside of the frame body 1 through the air outlet 1a, thereby suppressing the elevation of the temperature on the front end of the upper wall 1E.

**[0032]** When a large amount of heat is generated in a combustion cylinder structure 3, and a temperature of the exhaust gas is high, the highest temperature of the exhaust gas is still high even though a combustion-gas-collision member 6 is provided. Thus a temperature of an front end of the upper wall 1E may not be lowered than expected. As a solution of this problem, as with other embodiments shown in Figs. 3 and 4, a plurality of protrusions 7 protruding toward a partition wall 8 are provided at an region 11 of a lower heat-shielding plate 5b, which is located between an facing region 10 opposing to the combustion-cylinder-structure 3 and the combustion-gas-collision member 6. The plurality of protrusions 7 are so formed to extend radially from the facing region 10 of the lower heat-shielding plate 5b toward the combustion-gas-collision member 6, and spaces therebetween are so formed to guide the combustion gas, which has flown out of the combustion-cylinder structure 3, toward the opening portion 2 while radially diffusing, and has hit the facing region of the lower heat-shielding plate 5b. In this structure, the exhaust gas flows up from the combustion-cylinder structure 3 and, then, flows along the lower heat-shielding plate 5b between the protrusions 7 while being guided between the protrusions 7 toward the opening portion 2. And the exhaust gas radially diffuses. Consequently, the heat of the combustion gas diffuses to lower its temperature. Furthermore, when the exhaust gas flows over the combustion-gas-collision member 6 while advancing toward the opening potion 2, the exhaust gas diffuses to lower its temperature. Then a temperature of the upper wall 1E is kept low.

**[0033]** When the lower heat-shielding plate 5b is press-formed in a wave shape, and is so formed integrally with the protrusions 7 that the protrusions 7 connect with the lower surface of the lower heat-shielding plate 5b and protrude, a heat ray emitted from the combustion-cylinder structure is diffusely reflected by an inclined surface of the protrusions 7 and is radiated while spreading. Therefore the heat ray advancing toward a floor surface does not concentrate on a certain part but evenly reaches in a forward direction from the frame body 1 or on a floor surface, thereby enhancing heating efficiency as well as radiation heat ray efficiency.

**[0034]** As shown in Figs. 2 and 3, a central portion 6a of the combustion-gas-collision member 6 facing the combustion-cylinder structure 3 is formed lower than side portions 6b located on both sides of the central portion 6a thereof. With this arrangement, combustion gas can flow over the central portion 6a easier than the side portions 6b. This arrangement can alleviate a decrease of a flow speed of combustion gas flowing over the central portion 6a of the combustion-gas-collision member 6. Thus a flow of the combustion gas composed of the exhaust gas is flashed out in a forward direction from the frame body at the end of the lower heat-shielding plate 5b, and the high-temperature combustion gas can flow further away from the front portion of the upper wall 1E of the frame body 1. Consequently a elevation of temperature of the upper wall 1E is suppressed.

**[0035]** As shown in Figs 2 and 3, it is preferred that a plurality of through holes 6c are provided at side portions 6b, except a central portion 6a, of the combustion-gas-collision member 6. With the through holes 6c provide, a part of the combustion gas is blocked by the combustion-gas-collision member 6. The combustion gas passes through the through holes 6c provided at the right and left sides 6b of the combustion-gas-collision member 6. The combustion gas is separated into the right and left and, then, can be prevented from concentrating at the central portion of the combustion-gas-collision member 6. The combustion gas is, then, stirred by diffusing when passing through the through holes 6c, thereby lowering the temperature of the combustion gas. The combustion gas of even temperature diffuses and flows in a wide range over the whole of the combustion-gas-collision member 6.

**[0036]** According to the embodiment described above, a combustion-gas-collision member 6 for blocking the flow of the combustion gas is provided on the lower-heat-shielding plate 5b so as to increase the radiation heat from the lower-heat-shielding plate 5b which is to be at high temperature by the combustion-gas-collision member 6A. The radiation heat can be radiated in a forward direction from the frame body 1 through the opening portion 2. Thus a wide range in front of the flame body 1 can be warmed up so as to enhance heating efficiency.

## INDUSTRIAL APPLICABILITY

**[0037]** According to the present invention described above, a lower heat-shielding plate is provided in such a manner to be higher at an opening portion. Thus a heat ray reflected by an inclined surface of the lower heat-shielding plate as well as a heat ray reflected by the reflection plate can be reflected in a forward direction of the frame body through the opening portion. With this arrangement, there are benefits in that radiation efficiency is enhanced, and a temperature in the frame body can be kept low by suppressing an elevation of the temperature by a heat ray in the frame body.

**[0038]** The air outside the body frame has been drawn through one or more air inlet provided at the rear wall portion of the frame body, and flows between an upper heat-shielding plate and the lower heat shield in plate. And then the air runs out of the outlet in a forward direction from the outlet. The air which has run out of an air outlet advance along an upper side of the flowing exhaust gas and prevents the exhaust gas, which has flown over the combustion-gas-collision member, from flowing up after the exhaust gas flows out of the opening portion. Additionally, according to the present invention, since a combustion-gas-collision member for blocking a flow of the exhaust gas is located not closer to a front end of a lower heat-shielding plate but closer to a combustion-cylinder structure, the exhaust gas flows along the lower heat-shielding plate again toward the opening portion at an increasing flow speed after flowing over the combustion-gas-collision member. And the exhaust gas flows out in a forward direction from the frame body. Along with increasing a flow speed of the combustion gas flowing out of the opening portion, the angle at which the combustion gas flows up right after flowing out of the opening portion starts to increase at a position a certain distance away from the opening portion. As a result, it is possible to prevent an upper wall of the frame body from directly being heated up by the combustion gas which has flown out of the opening portion, and to suppress an elevation of a temperature of the upper wall rather than that of the conventional arts.

## Claims

**1.** A reflection type oil burner comprising:

a frame body (1) including a front wall having an opening portion (2), a rear wall opposing to said front wall, two side walls connecting said front wall and said rear wall, and an upper wall connected to an upper end portion of each of said walls;

a combustion-cylinder structure (3) provided in said frame body (1), for radiating a heat ray around a heat ray-radiating section thereof,

a partition wall (8) laterally extending in said frame body (1) and having a through hole (8a) through which said heat ray-radiating section of said combustion-cylinder structure (3) passes,

a reflection plate (4) provided at both sides of and behind said heat ray-radiating section of said combustion-cylinder structure (3), for reflecting said heat ray toward said opening portion (2).

a plurality of heat-shielding plates (5) including a lower heat-shielding plate (5b) and an upper heat-shielding plate (5a) which are vertically spaced between said reflection plate (4) and said upper wall portion, for preventing heat emitted from said combustion-cylinder structure (3) from reaching said upper wall,

an air passage (9) formed between said lower heat-member (6) is provided at a position which is away from said opening portion toward said combustion-cylinder structure (3) by a distance, which is so determined that said combustion gas can flow along said lower heat-shielding plate (5b) at an increasing flow speed after flowing over said combustion-gas-collision member (6).

**2.** The reflection type oil burner as defined in Claim 1, **characterized in that** in a central portion (6a) of said combustion-gas-collision member (6) facing said combustion-cylinder structure (3) is formed lower than side portions (6b) located on both sides of said central portion (6a), so that said combustion gas can flow over said central portion easier than said side portions.

**3.** The reflection type oil burner as defined in Claim 1 or 2, **characterized in that** a plurality of through holes (6c), passing through said combustion-gas-collision member (6) toward said opening portion (2), are formed at said side portions (6b) of said combustion-gas-collision member (6).

**4.** The reflection type oil burner as defined in Claim 1, **characterized in that** a plurality of protrusions (7) protruding toward said partition wall (8) are provided at an area of said lower heat-shielding plate (5b) between a facing region of said lower heat-shielding plate (5b) facing said combustion-cylinder structure (3) and said combustion-gas-collision member (6):

and said plurality of protrusions (7) are so formed to extend radially from said facing region of said lower heat-shielding plate toward combustion-gas-collision member (6), and are so spaced as to be capable of guiding said combustion gas while radially diffusing said combustion gas, which has flown out of said combustion-cylinder structure (3) and has hit said facing region of said lower heat-shielding plate, toward said opening portion.

**5.** The reflection type oil burner as defined in Claim 4, **characterized in that** said plurality of protrusions (7) are integrally formed with said lower heat-shielding plate (5b), and a shape of each surface of said plurality of protrusions (7) is so defined that a heat ray emitted from said combustion-cylinder structure (3) diffusely reflects.

**6.** The reflection type oil burner as defined in Claim 4 or 5, **characterized in that** heights of said plurality of protrusions (7) are smaller than that of said combustion-gas-collision member (6).

**7.** The reflection type oil burner as defined in Claim 4, **characterized in that** said combustion-gas-collision member (6) is long enough in said lateral direction to face all end portions of said plurality of protrusions (7) that are located closer to said opening portion.

**8.** The reflection type oil burner as defined in Claim 1, **characterized in that** an inclined angle of a front portion of said lower heat-shielding plate (5b), located at a side of said opening portion relative to said combustion-gas-collision member, is smaller than that of a rear portion thereof, located at a rear side relative to said front portion.

# Fig.1

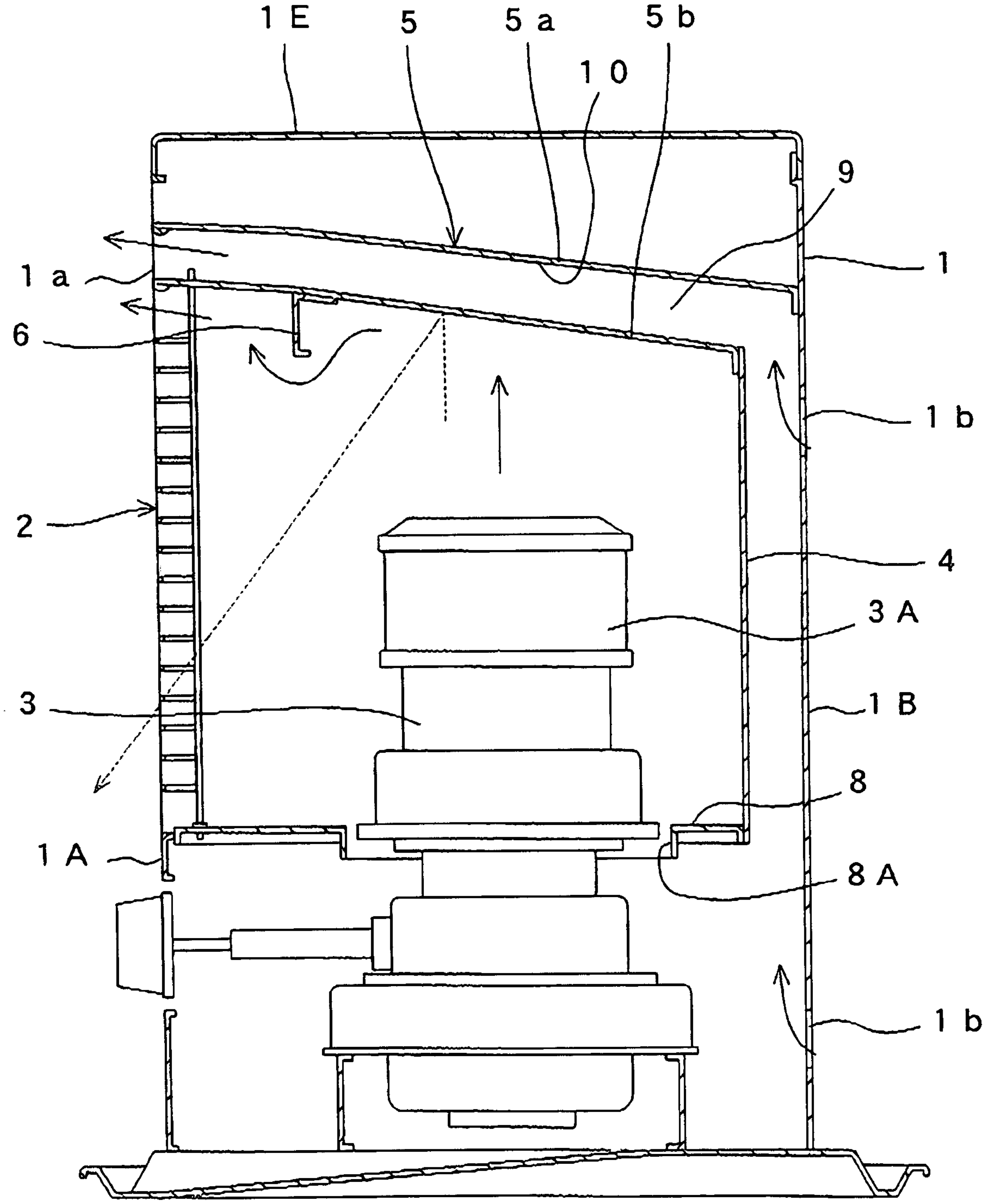


Fig.2

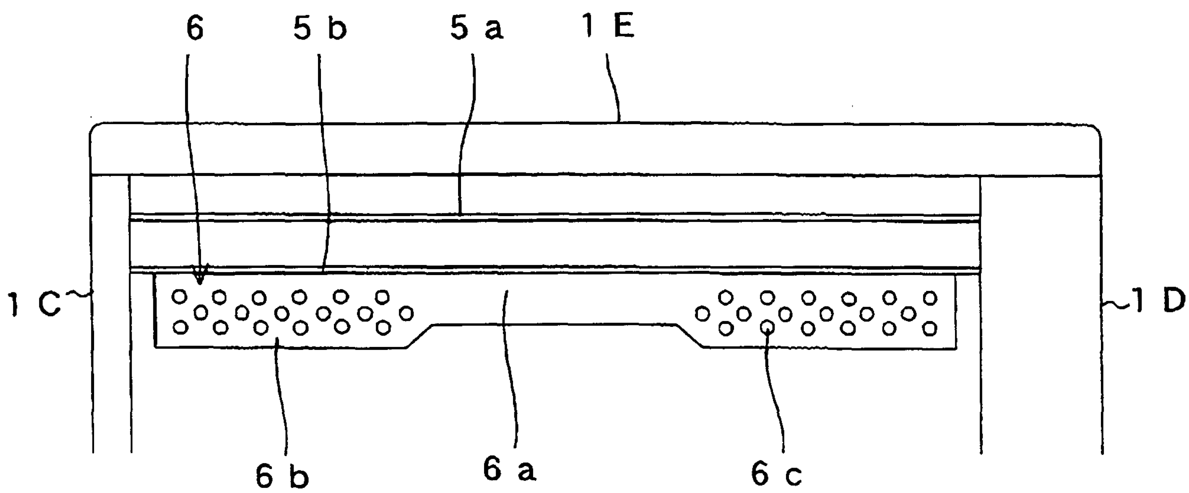
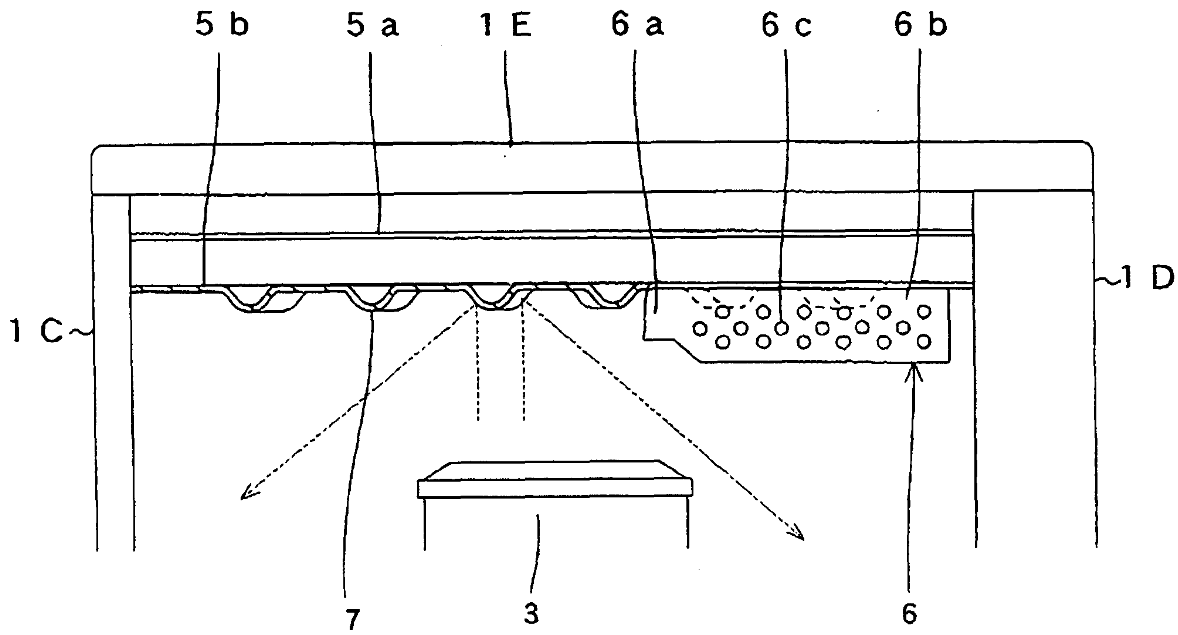
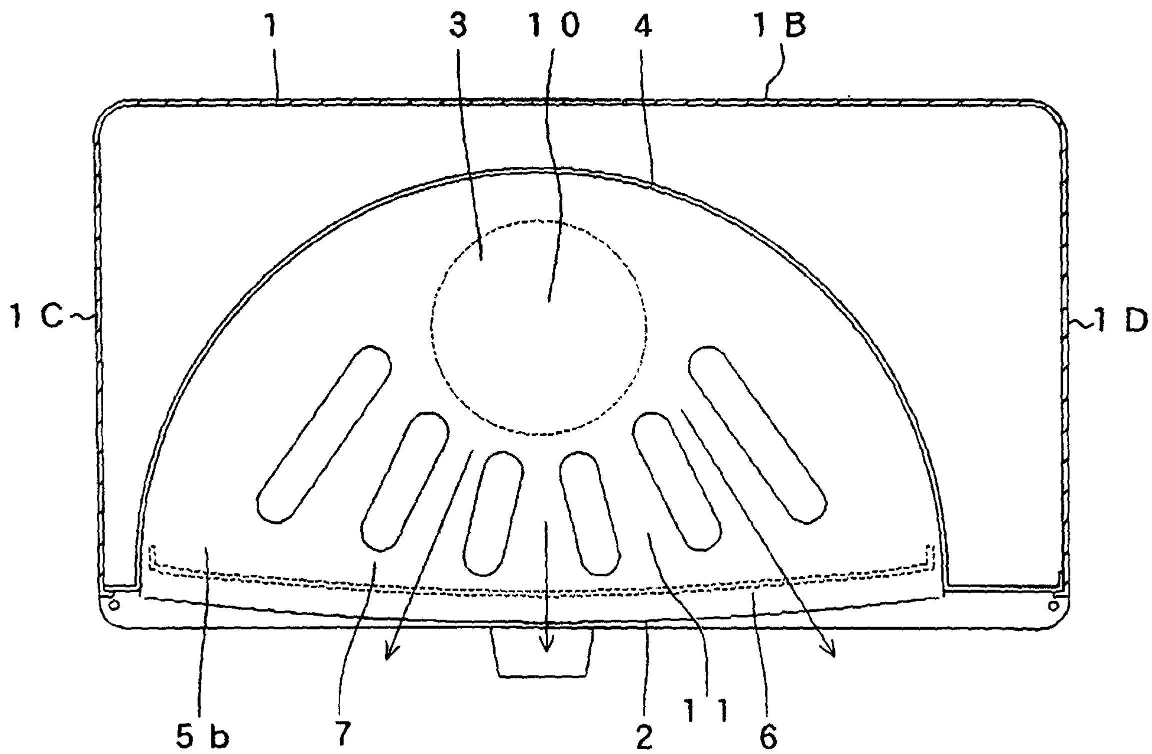


Fig.3



# Fig.4



## INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/09827

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl$^7$ F24C15/34, F24C5/00, F24C5/08, F24C5/16, F24C1/14

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
Int.Cl$^7$ F24C15/34, F24C5/00, F24C5/08, F24C5/16, F24C1/14

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

| | | | |
|---|---|---|---|
| Jitsuyo Shinan Koho | 1926-1996 | Toroku Jitsuyo Shinan Koho | 1994-2003 |
| Kokai Jitsuyo Shinan Koho | 1971-2003 | Jitsuyo Shinan Toroku Koho | 1996-2003 |

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y<br>A | JP 2543332 Y2 (Toyotomi Co., Ltd.),<br>06 August, 1997 (06.08.97),<br>Full text<br>(Family: none) | 1,3,4,8<br>2,5-7 |
| Y<br>A | US 5226811 A1 (Toyotomi Co., Ltd.),<br>13 July, 1993 (13.07.93),<br>Full text<br>(Family: none) | 1,3,4,8<br>2,5-7 |
| Y | US 4653464 A1 (Toshiba Heating Appliances Co., Ltd.),<br>31 March, 1987 (31.03.87),<br>Full text<br>(Family: none) | 1,4,8 |

[X] Further documents are listed in the continuation of Box C. [ ] See patent family annex.

* Special categories of cited documents:
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"&" document member of the same patent family

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|---|---|
| Date of the actual completion of the international search<br>04 November, 2003 (04.11.03) | Date of mailing of the international search report<br>18 November, 2003 (18.11.03) |
| Name and mailing address of the ISA/<br>Japanese Patent Office | Authorized officer |
| Facsimile No. | Telephone No. |

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## INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP03/09827

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | JP 2-71011 A (Sanyo Electric Co., Ltd.), 09 March, 1990 (09.03.90), Full text (Family: none) | 1,8 |
| Y | JP 6-48265 Y2 (Sanyo Electric Co., Ltd.), 12 December, 1994 (12.12.94), (Family: none) | 1,8 |
| Y | JP 1-312353 A (Sanyo Electric Co., Ltd.), 18 December, 1989 (18.12.89), Full text & CN 1038511 A & US 491912 A1 & KR 9204748 B & KR 9204880 B | 1,8 |
| Y | JP 60-96841 A (Matsushita Electric Industrial Co., Ltd.), 30 May, 1985 (30.05.85), Full text & AU 3462084 A1 & CA 1239085 A & US 4834064 A1 | 4 |
| Y | Microfilm of the specification and drawings annexed to the request of Japanese Utility Model Application No. 156361/1983(Laid-open No. 66946/1985) (Sharp Corp.), 13 May, 1985 (13.05.85), Full text (Family: none) | 4 |
| A | JP 52-36459 Y2 (Kabushiki Kaisha Uchida Seisakusho), 19 August, 1977 (19.08.77), Full text (Family: none) | 1-8 |

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