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(54) Method for manufacturing front sheet and microwave oven having the same

(57) The present invention relates to a front sheet of a microwave oven and a method for manufacturing the front sheet. The method for manufacturing the front sheet of the microwave oven according to the present invention comprises a first process including a chemical polishing process of removing foreign materials from and polishing a surface of an aluminum sheet so as to give a predetermined luster thereto; a process of forming a porous anodic oxide film onto the surface of the aluminum sheet; a process of dipping the aluminum sheet into a solution containing a dye and penetrating the dye into a porous film of the anodic oxide film; and a process of sealing the porous film into which the dye has been penetrated. The microwave oven according to the present invention includes a colored front sheet manufactured by anodizing and dyeing the surface of the aluminum sheet and attached to a front face of a door portion or a control panel portion of the microwave oven.

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Description

Technical Field

[0001] The present invention relates to a front sheet, and more particularly, to a method for manufacturing a front sheet of a microwave oven, which is capable of generating a new aesthetic sense by making a desired color represented thereon by means of aluminum material, and a microwave oven with the front sheet attached thereto.

Background Art

[0002] The front sheet of the microwave oven is a part attached to a front portion of the microwave oven in order to wrap around a front side of a door of the microwave oven or a control panel adjacent to the door. Heretofore, a door panel or a control panel made from synthetic resin material has been directly used, as it is, for such a front sheet of the microwave oven, or the front sheet has been manufactured from a metallic material (e.g., stainless steel) having a simple metallic texture.

[0003] However, the front sheet of the microwave oven made of synthetic resin material may be varied to a certain extent in view of colors, designs, etc., but it is still has a shortcoming that due to material limitation of the synthetic resin material, further variability of the design or texture cannot be provided. In addition, the front sheet of the microwave oven may have another shortcoming that it cannot satisfy current trends that recent designs of the electric home appliances pursue high quality exteriors.

[0004] Furthermore, the front sheet of the microwave oven may be also made of stainless steel, like the other electric home appliances. However, the front sheet of the microwave oven made from the stainless steel has an advantage of satisfying the metallic texture and high quality trends, but it still has a difficulty in obtaining a desired color thereof. That is, the coloration of the desired color onto the panel made of the stainless steel material is practically undesirable since it should be subjected to substantially high-priced treatment processes owing to a nature of the material. Therefore, unit cost of production for the front sheet increases.

Summary of Invention

[0005] The object of the present invention is to provide a front sheet of a microwave oven that can have various colors as well as a new metallic texture.

[0006] In order to achieve the above object, a method for manufacturing a front sheet of a microwave oven according to the present invention comprises a first process including a chemical polishing process of removing foreign materials from and polishing a surface of an aluminum sheet so as to give a constant luster thereto, a process of forming a porous anodic oxide film onto the surface of the aluminum sheet, a process of dipping the aluminum sheet into a dye solution containing a dye and of penetrating the dye into a porous film of the anodic oxide film, and a process of sealing the porous film into which the dye has been penetrated.

[0007] A microwave oven according to the present invention comprises a colored front sheet manufactured by anodizing and dyeing a surface of an aluminum sheet and attached to a front side of a door portion or a control panel portion of the microwave oven.

Brief Description of Drawings

[0008]

Figure 1 is an illustrative perspective view of a microwave oven according to the present invention.
Figure 2 is a flowchart illustrating a series of processes for manufacturing a front sheet according to the present invention.
Figure 3 is a sectional view taken along a line A-A of Figure 1 in a condition that a front sheet is attached to a microwave oven.

Detailed Description of the Preferred Embodiment

[0009] Hereinafter, preferred embodiments of the present invention will be explained in detail with reference to the drawings.

[0010] As shown in Figure 1, a front sheet of a microwave oven according to the present invention includes a front sheet 7 for a door panel 1 which is fixed to a front side of the door panel of the microwave oven, and a front sheet 5 for a control panel 3 which is fixed in order to wrap around peripheral portions of the control panel 3 installed to a side of the door panel 1.

[0011] Such a front sheet according to the present invention is made of an aluminum plate. Hereinafter, processes for manufacturing the front sheet according to the present invention using the aluminum plate (hereinafter, referred to as "aluminum sheet") will be described one after another with reference to Figure 2.

[0012] First, a thin aluminum sheet is prepared and then a process of manufacturing the aluminum sheet into a shape of the front sheet is performed (Step 102). Indeed, this step 102 means that the aluminum sheet is completely manufactured in the shape of the front sheet 7 for the door panel or the front sheet 5 for the control panel as shown in Figure 1.

[0013] After the aluminum sheet is completely manufactured to have the shape of the front sheet as mentioned above, a process of treating a surface texture of the front sheet is accomplished in a step 104. Such a texture treatment process is optional, and it means a surface treatment process for imparting a predetermined texture such as a hair line, etc. to the surface of the aluminum sheet. For example, a pattern such a hair is manufactured onto the aluminum sheet surface using

a metallic brush, or the surface of the aluminum sheet is processed to have a predetermined texture by means of a sand blasting method.

[0014] After such optional step 104 is completed, a process of degreasing the surface of the aluminum sheet is performed in a step 106. This process is a process for removing fat ingredients stained on the surface of the aluminum sheet, that is, a process for removing organic pollutants or contaminants with which the surface of the aluminum sheet is stained, by means of organic solvents. After the degreasing step is completed in a manner mentioned above, plural washing processes are performed in a step 108. The washing process is a process of cleaning up the organic solvents and the pollutants remained on the surface during the degreasing step. For example, the surface is cleaned up repeatedly by means of flowing water.

[0015] After the washing step is completed, a chemical polishing process is performed in a step 110. The chemical polishing process is a process for chemically polishing the surface regularly in order to impart surface luster to the aluminum sheet. The chemical polishing process may be performed by simply dipping the front sheet of the present invention into various chemical solutions. Further, according to an embodiment of the present invention, the chemical polishing process may be performed by dipping the aluminum sheet into an acid solution composed of 90% phosphoric acid, 3% sulfuric acid and 7% nitric acid during a predetermined period of time (e.g., 3 minutes). In this case, it is preferable that the temperature of the acid solution be set to be an appropriate temperature most suitable to the chemical polishing. In the embodiment employing the acid solution, the most appropriate temperature of the acid solution is about 110 °°C. Then, the surface of the aluminum sheet may have a predetermined luster after completion of the chemical polishing.

[0016] Further processes for removing foreign materials from the surface of the aluminum sheet, for example, the process for cleaning up the surface after removing the foreign materials from the surfaces by means of an alkali such as sodium hydroxide, etc. may be included between the steps 108 and 110. After completion of the chemical polishing, a washing process is again performed in a step 112. After this washing process is completed, acid treatment for the surface of the aluminum sheet is performed in a step 114. The acid treatment process is a process for perfectly removing impurities contained on the surface of the aluminum sheet. For example, the aluminum sheet cannot have a pure surface since white spots may be created thereon due to various impurities contained therein. Therefore; the treatment to be described below can be more perfectly performed by completely removing the impurities adhered to the surface of the aluminum sheet.

[0017] And then, after such acid treatment is completed, an additional washing process (Step 116) is again performed.

[0018] The foregoing processes correspond substantially to pretreatment. The pretreatment is processes for more efficiently performing the formation of an oxide film onto the surface of the aluminum sheet by anodic oxidation and the dyeing of the aluminum sheet surface, as described later. Thus, after the pretreatment up to the step 116 is completed, an electrolysis process of forming the anodic oxide film onto the surface of the aluminum sheet is performed in a step 118. The formation of the anodic oxide film is performed by the anodic oxidation. More specifically, the anodic oxidation is performed in a manner that the aluminum sheet is dipped into an electric furnace filled with an electrolytic solution comprised of 80% water and 20% sulfuric acid, and that a positive electrode and a negative electrode are applied to the aluminum sheet and the electric furnace, respectively. And, at this time, it is most preferred that the electrolytic solution be maintained at a temperature (e.g., 24 °°C to 27 °°C) where the anodic oxidation can be occurred most actively.

[0019] In the anodic oxidation method, if aluminum is subject to the anodic oxidation in the acid solution such as sulfuric acid, chromic acid, phosphoric acid, etc., a porous oxide film is actually formed on the aluminum surface. The thickness of the porous oxide film is determined depending on the parameters such as time duration of electrolysis, electric current density, etc. As the time duration of electrolysis is prolonged and the current density is raised, the porous oxide film becomes thicker. That is, the porous oxide film grows in proportion to an energizing quantity of the electric current. In general, as the temperature of electrolytic solution becomes low, growth of the oxide film is better and the oxide film thus formed is harder. As the temperature of electrolytic solution becomes high, the thinner and smoother oxide film is formed. Therefore, if the electric current is applied to the aluminum sheet as a positive electrode, the surface of the aluminum sheet is oxidized by oxygen generated from the positive electrode and then the aluminum oxide film, which is substantially a very fine porous film, is formed thereon. Further, such anodic oxide film substantially has a high hardness and has very superior characteristics in view of wear resistance and aesthetic sense. Furthermore, in the process of forming the anodic oxide film, more beautiful and brilliant film can be obtained, as the purity of the aluminum becomes higher. To this end, the foregoing pretreatment including the step 114 should be performed.

[0020] If the formation of anodic oxide film onto the surface of the aluminum sheet is completed by means of the foregoing electrolysis process, another washing process is again performed in a step 120.

[0021] After the washing process is completed, a process of dyeing the surface of the aluminum sheet is performed in a step 122. The dyeing process of the surface of the aluminum sheet will be accomplished by penetrating a dye into fine pores formed on the porous aluminum sheet surface as mentioned above. Further, as

an example, a dyeing method made by a dipping process may be used. For example, by dipping the aluminum sheet, which is obtained from the foregoing processes, into a dye solution in which dye and water have been mixed in a constant ratio, the dye penetrates into fine pores, by which the surface of the aluminum sheet is substantially dyed.

[0022] Herein, when the aluminum sheet is dipped into the dye solution, it is preferred that dye particles within the water be most actively penetrated into the fine pores on the surface of the aluminum sheet by properly setting the temperature of the dye solution. It is also preferred that such a temperature be set within a range of 40 °°C to 50 °°C.

[0023] From the foregoing, if the dye is penetrated into the fine pores, the surface of the aluminum sheet can have a predetermined color. Therefore, through a series of treatment processes mentioned above, the surface of the aluminum sheet can have a desired color. Consequently, the front sheet of the microwave oven having a predetermined texture and a desired color can be produced.

[0024] And, another washing process (step 124) is again performed after completion of the aforementioned dyeing process. This washing process is a process for cleaning unnecessary dye remained on the surface of the aluminum sheet.

[0025] If the coloration of the aluminum surface is completed after going though the foregoing processes, a sealing process should be performed in a step 126. The sealing process is a process for stopping up the fine pores formed in the step 118 under the state that a predetermined quantity of the dye is put into the fine pores during the step 122. That is, by stopping up the fine pores, into which the dye has been penetrated, so that discoloration and removal of the dye can be prevented, the front sheet can be constructed such that its change of color can be prevented although it has been used for a long time. The above sealing process is performed by dipping the dyed aluminum sheet into a solution, in which boric acid and nickel acetate are mixed with each other in a constant ratio (i.e., 5 g/l, respectively), during a predetermined period of time. It is most preferable that the dipping process be performed at a temperature above 75 °°C and during a period of time of about 15 minutes.

[0026] The front sheet according to the present invention is completely formed by putting a predetermined color into the aluminum sheet through the foregoing processes. If the surface treatment of the aluminum sheet is completed, the front sheet made of an aluminum sheet material according to the present invention is attached to the front face of the microwave oven in a step 128.

[0027] The front sheet of the present invention, in general, has the same configuration as being shown in Figure 1. In order to attach the front sheet to the door panel 1 of the microwave oven, etc., an adhesive or a double-sided tape, for example, may be used.

[0028] The front sheet of the present invention may be attached to the front face of the microwave oven via the other various methods and constructions. Therefore, it is apparent that the present invention should not be limited to the use of the aforementioned adhesive, etc.

[0029] Figure 3 shows an embodiment in which a front sheet 10 of the present invention is attached to the door panel 1 of the microwave oven. As shown, a mounting hole 1a is formed on a side of a lower end portion of the front sheet 10, and a mounting projection 12 is formed on a lower end of the door panel 1 at a position corresponding to the mounting hole 1a. Therefore, coupling of the front sheet 10 with the lower end of the door panel 1 is substantially maintained, since the mounting projection 12 is fitted into the mounting hole 1a when coupling the front sheet 10 with the door panel 1. Of course, such coupling structure may be applied to upper end portions of the front sheet 10 and the door panel 1. However, since the upper end portion of the door panel 1 can be easily seen by a user, it is preferable in view of its appearance that the mounting hole and projection be not exposed outward. Therefore, it is preferable to couple the upper end portions of the front sheet 10 and the door panel 1 with each other, using the adhesive, etc. as mentioned above.

[0030] In addition to the above coupling structure, it is needless to say that the structure for coupling the front sheet with the front face of the door, etc. may be changed or modified to the other various forms.

[0031] Furthermore, as shown in Figures 1 and 3, it is understood that the front sheet 7 of the present invention is installed to wrap around at least a portion of the front, lateral, upper and lower sides of the door panel 1. In addition, edge portions, where the front side joins with the lateral side and the upper and lower sides, respectively, are treated to have predetermined rounded shapes. By the above treatment, whole appearance of the microwave oven can be constructed to be much smoother.

[0032] According to the present invention constructed as such, it is understood that the front sheet of the microwave oven is manufactured to have a desired color by using the aluminum sheet when manufacturing the front sheet. Therefore, the microwave oven that can have both a metallic texture and a desired color can be obtained by the application of the present invention.

[0033] Although the present invention has been illustrated and described with reference to the exemplified embodiments of the present invention, various changes, modifications and additions to the present invention will be apparent to those skilled in the art without departing from the spirit and scope of the present invention, and the present invention should be construed only from the appended claims.

Claims

1. A method for manufacturing a front sheet of a microwave oven, comprising:

   a first process including a chemical polishing process of removing foreign materials from and polishing a surface of an aluminum sheet so as to give a predetermined luster thereto;
   a process of forming a porous anodic oxide film onto said surface of said aluminum sheet;
   a process of dipping said aluminum sheet into a solution containing a dye and penetrating said dye into a porous film of said anodic oxide film; and
   a process of sealing said porous film into which said dye is penetrated.

2. The method for manufacturing a front sheet of a microwave oven as claimed in Claim 1, further comprising a texture treatment process of surface treating said aluminum sheet in order to give a predetermined texture to said surface of said aluminum sheet prior to said first process.

3. The method for manufacturing a front sheet of a microwave oven as claimed in Claim 1, wherein said first process comprises the steps of removing organic contaminants from said surface by using an organic solvent, and of polishing said surface of said aluminum sheet by using a chemical solution containing phosphoric acid, sulfuric acid and nitric acid.

4. The method for manufacturing a front sheet of a microwave oven as claimed in Claim 3, further comprising removing foreign materials from said surface of said aluminum sheet by using an alkaline solution.

5. A microwave oven, comprising:

   a colored front sheet manufactured by anodizing and dyeing a surface of an aluminum sheet and attached to a front face of a door portion or a control panel portion of said microwave oven.

6. The microwave oven as claimed in Claim 5, wherein said front sheet is constructed to wrap around at least a portion of a front side, opposite lateral sides, and upper and lower sides of said door portion of said microwave oven.

7. The microwave oven as claimed in Claim 5 or 6, wherein said front sheet is attached to said front face by using an adhesive.

8. The microwave oven as claimed in Claim 5 or 6, wherein said front sheet is attached by coupling mounting projections formed on upper and lower portions of said door portion or said control panel portion with mounting holes formed on said front sheet at positions corresponding thereto, or by using an adhesive therebetween.

9. The microwave oven as claimed in Claim 6, wherein edge portions, where said front side joins with said lateral sides and said upper and lower sides, respectively, are treated to have predetermined rounded shapes.

Fig.1

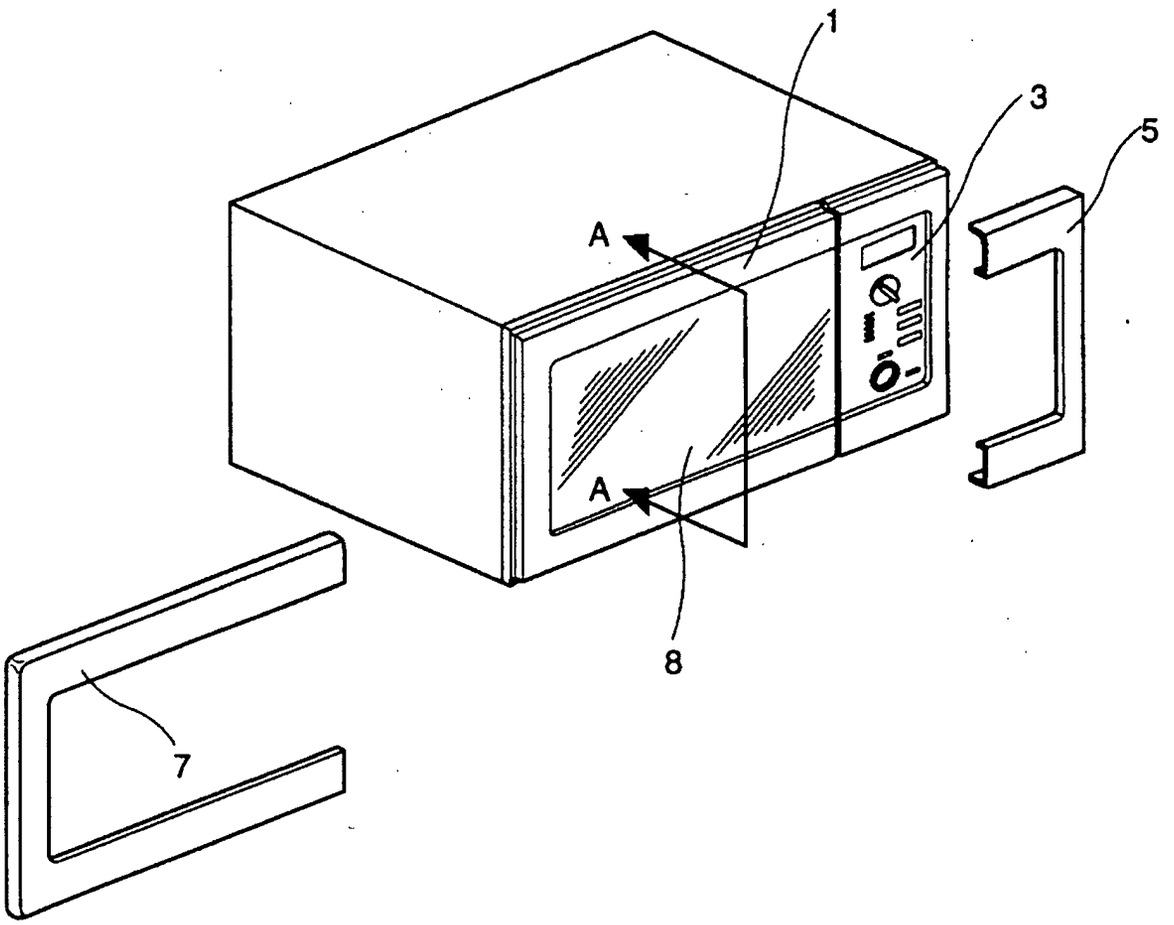

Fig.2

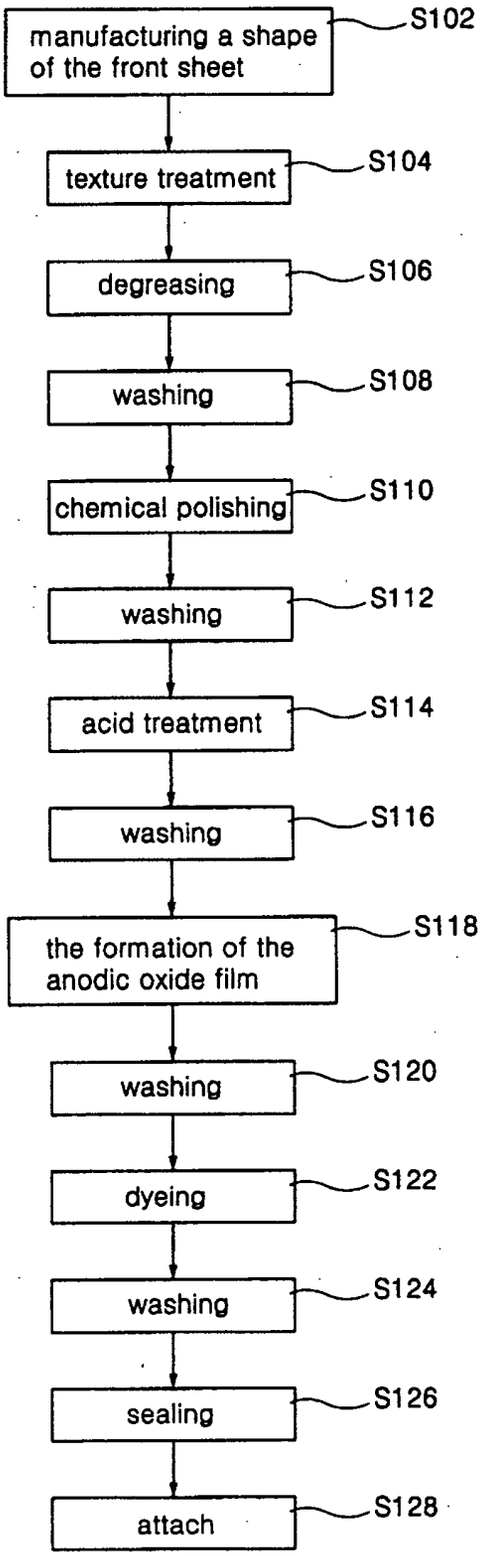
manufacturing a shape of the front sheet
S102
texture treatment
S104
degreasing
S106
washing
S108
chemical polishing
S110
washing
S112
acid treatment
S114
washing
S116
the formation of the anodic oxide film
S118
washing
S120
dyeing
S122
washing
S124
sealing
S126
attach
S128

Fig.3