

MOLDED POLYOLEFIN AND POLYPHENYLOXIDE PRODUCTS AND METHOD FOR PRODUCTION

Background of The Invention

This invention relates to molded polyolefin and polyphenyloxide products and to methods for their production. The invention has application to the production of products of a variety of types but will be described with respect to vehicle parts, particularly parts of that type which are used in vehicle interiors and which therefore require a pleasing exterior appearance.

Parts of the type described may comprise, for example, panels which are attached on the inside of automobile doors. The doors typically are made of sheet metal and plastic panels are attached directly to the steel or other sheet metal support to achieve a pleasing interior appearance. Patent No. 4,766,025 describes such products and a method for their manufacture. In the background section of the patent, reference is made to the formation of discrete plastic parts followed by assembly in a piece-by-piece manner during installation. The patent then goes on to describe a method wherein a vinyl sheet is stretched over a mold cavity, heated, and then pulled into the cavity using a vacuum. Moldable polyvinylchloride or polyurethane is then injected to form the part in one piece comprising the plastic body and the vinyl skin.

Attempts have also been made to make automobile door panels and other parts using expanded polystyrene. In this system, for example as reported in the March, 1996 issue of "Plastics Technology", an EPS part is first molded, a film of polystyrene is located in a mold along with the previously molded EPS part, and steam is introduced to bond the two materials together.

These prior art systems are characterized by certain disadvantages. Thus, parts made using injection molded PVC, polyurethane and the like are relatively heavy. The EPS parts are more lightweight but production methods are unduly complex leading to additional manufacturing costs. Furthermore, difficulties are encountered during installation of the EPS parts since the plastic is not sufficiently strong for use of screws and other fastening methods commonly used for assembly of the parts with a steel or other sheet metal door or the like.

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beads are in place, air is evacuated through openings 26 by connecting them to vacuum source 22. Air removal is critical to achieving bonding between beads and between beads and skin.

Steam is then introduced through openings 26 to soften the beads and to allow for bonding as described. Excess moisture may be removed through openings 26 by using valving to connect the openings to vacuum source 22. In contrast with conventional molding using polyolefin beads, the steam introduction occurs from one side only since the sheet 18 blocks the passages defined by the female mold part. Steam pressure of 4 to 9 bar is typically employed.

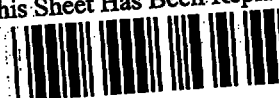
The mold part surfaces are provided with a PTFE (Teflon®, for example) coating to facilitate release of the molded parts. It has also been found that this coating enhances conformation of the sheet 18 to the mold part surface since the sheet moves more easily over the surface when vacuum and/or other pressure is applied prior to introduction of the beads.

As an example of the preferred practice of the invention, the mold parts 10 and 12 are closed and preheated to 176°F and 230°F, respectively. The cavity side is preheated to a lower temperature because the heating coils are associated with the core side having steam chest 28. (Figure 7). Negative pressure is applied within the steam chest to draw excess heat from the cavity through openings 26.

A preheated vinyl sheet is suspended on the pins and the mold parts are again closed. This preferably involves a relatively slow early movement to gradually press the sheet into the cavity. Negative pressure is then applied to the cavity mold part whereby air is withdrawn from the cavity through openings 20. The sheet thereby is brought into conformance with the cavity surface and the mold is then completely closed.

Air pressure through openings is then applied through openings 26 in the core mold part to insure complete conformance of the skin to the cavity surfaces. Thereafter, fill guns introduce polyolefin beads through openings 24.

The mold is then purged of air and moisture by applying negative pressure through openings 26. As indicated, the removal of air is particularly necessary for achieving good bonding conditions. This is followed by pressure steaming (4 to 9 bar) through openings 26 which results in bonding of the beads to each other and the bonding of sheet 18 to the adjacent layer of beads.



of or under the part. Any exposed part of the frame could itself have a decorative finish to complement the part.

As noted, the skin 18 for the part may be vinyl but other materials bondable with the polyolefin or polyphenyloxide are contemplated including textiles, TPO, urethane, leather, paper or screen. It is also contemplated that the foil or skin be a non-compatible material which has a backing formed of one of the materials mentioned.

The polyolefin or polyphenyloxide part of the invention may include an integrated arm rest area which will have the desired shape and also a soft feel and soft side impact area provided by the polyolefin or polyphenyloxide. This and other areas of a part will thus have these features without the need for molding a separate part as would be the case where a hard plastic is employed.

The part may be readily molded with tubes, tunnels or channels integrally molded to provide room for wiring or for HVAC air flow. Cover flaps for such areas can also be readily molded with integral living hinges.

Because of the versatility of the parts and methods described, a panel component as much as 75% lighter than the commonly used parts is achieved with fewer production and assembly steps required. The polyolefin or polyphenyloxide has additional advantages due to being a better barrier against road noise and thermal transfer, and due to improved sound absorption to enhance interior sound systems. As noted, side impact management is also improved. In addition to labor savings, production efficiency is improved relative to injection molding since heat energy consumption is considerably reduced.

It will be understood that various changes and additions may be made in the concepts of the invention without departing from the spirit thereof particularly as defined in the following claims.

6. A method according to claim 1 including the steps of preheating said one mold part to a temperature between 140 and 180°F and preheating the other mold part to a temperature between 190 and 250°F, and thereafter delivering said beads to said cavity.
7. A method according to claim 1 including the step of coating said interior surfaces with polytetrafluoroethylene.
8. A method according to claim 1 including the step of attaching a support frame to said plastic product.
9. A method according to claim 8 including the step of locating said support frame in said cavity before closing of same mold parts.
10. A molded plastic part produced in accordance with the method of claim 1.
11. A molded plastic part according to claim 10 wherein said sheet comprises vinyl.
12. A molded plastic part according to claim 10 wherein said sheet comprises a composite of different materials, and wherein the sheet defines an interior surface adapted to bond with said beads.
13. A molded plastic part produced in accordance with the method of claim 9.
14. A molded plastic part according to claim 13 wherein said support frame defines means for attaching the part to a sheet metal support.
15. A molded plastic part according to claim 13 wherein said frame is formed of polypropylene.
16. A molded plastic part according to claim 14 comprising an interior panel for a vehicle, said sheet metal support being part of the vehicle.
17. A molded plastic part according to claim 14 including a decorative piece attached to said support frame when the support frame is being located in said cavity.
18. A molded plastic part according to claim 10 including attachment means integrally molded to the part.

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