

The invention relates to a process of the type mentioned in the precharacterising clause of Claim 1.

5

The continuous embossing of thermoplastic material by heat and pressure by means of an embossing roller made from silicon rubber is known from the generic Austrian Patent Specification 228 476. By using an embossing roller made from silicon rubber a per se continuous embossing operation is possible, but the use of silicon rubber as the embossing surface, in particular in a fast embossing operation, gives rise to difficulties, as the embossing period is relatively short and the silicon rubber is relatively soft.

15

The embossing of a still soft strip material made of thermoplastic material, which issues from a nozzle, by means of a pair of rollers is known from German Offenlegungsschrift 21 41 613. However the surface of the strip material has a temperature which excludes the penetration of the strip material into fine pores of the embossing surface of the embossing rollers, especially as the surface of the strip material cools down quickly after leaving the nozzle by thermal radiation, as a result of which the flowability is reduced. It is therefore not possible to transfer exactly the embossing surface of an embossing roller made of silicon rubber which is taken from a natural model, e.g. natural leather.

From US-A-2,928,124 is known a process of the respective type, in which the plastic sheet to be embossed is preheated in a preheater, and in fact to a temperature which is lower than the embossing temperature. After this preheating, final heating is performed to the embossing temperature in a long chamber, in which the plastic sheet is freely supported over a long distance by an upwardly acting air cushion against the pressure of a downwardly acting air cushion. The air of

the air cushion is of the temperature required for embossing, which is to be transmitted to the sheet. The heat transmission from air to the sheet is relatively poor, with the result that the passage through the final heater formed by a chamber is relatively long. Thus the final heating of the sheet to the embossing temperature occurs slowly, and as a result of the much better thermal conductivity of the sheet, any differences in the cross section of the sheet are equalised, so that the temperature is practically the same transversally over the cross section of the sheet, when the sheet reaches the embossing nip. This also applies if, as stated in this document, the temperature of the air cushion on the side remote from the embossing side of the sheet is somewhat lower than that of the air on the embossing side. Because of the better thermal conductivity of the sheet in relation to the adjacent air, no noticeable differences in temperature can develop over the cross section of the sheet. Thus the heating of the sheet is however restricted to temperatures with which it still has sufficient strength so that it remains easy to manipulate right up to its entry into the roller nip. Such temperatures do not enable the use of a silicon embossing roller, so that this can emboss its finely-contoured embossing surface into the surface of the sheet to be embossed.

The object of the invention is to provide a process of the respective type which enables the performance of embossing with an embossing roller, the embossing surface of which is made from silicon rubber, so that the embossing operation is performed as quickly as possible, the embossing surface remains undamaged and at the same time embossing is achieved with the greatest possible precision.

The object of the invention is achieved by the teaching given in the characterising part of Claim 1.

Temperatures in the given range result in such a softening, and even in a liquefaction of the surface to be embossed of the thermoplastic sheet, that the thermoplastic material even penetrates into the finest impressions in the embossing surface of the embossing roller made of silicon rubber and thus the embossing structure is transferred exactly. After subsequent cooling, the embossed thermoplastic sheet can be drawn off the embossing roller, whereby the embossing surface of the embossing roller is not impaired because of the elasticity of the silicon rubber.

Advantageous refinements of the teaching are given in the subordinate claims. They are explained in the following example for the performance of the process according to the invention.

Example

An embossing roller is manufactured for the continuous embossing of thermoplastic sheet by means of a pattern made from natural leather, textiles or similar. With this embossing roller a prefabricated thermoplastic sheet is embossed, which consists of an upper layer and a lower layer underneath it. The thermoplastic sheet is heated to a temperature of $180^{\circ} - 250^{\circ}$, according to the material used. At this temperature the upper layer of the thermoplastic sheet has a high flowability and therefore penetrates into the fine contours of the embossing surface of the embossing roller. The upper layer also comprises a softening agent made from a high polymer. At the said embossing temperature the lower layer has a lower flowability. After embossing cooling occurs and the embossed thermoplastic sheet is drawn off the embossing roller.

Claims

1. A process for continuously embossing the surface of a
5 prefabricated thermoplastic sheet by heat and pressure by
means of an unheated embossing roller, the surface of
which has a negative shape of a grain to be embossed,
characterised in that an embossing roller is used, which
10 at least in the region of its peripheral surface is made
of silicon rubber,
in that the thermoplastic sheet is heated from the cold
state only on the side to be embossed directly to the
temperature required for embossing,
and in that this heating is performed to a temperature of
15 at least 150°C, preferably 180 - 250°C.
2. A process according to Claim 1,
characterised in that a thermoplastic sheet is used which
made from a plastic comprising a softener which is a high
20 polymer, a rectilinear long-chain alcohol, a softening
polymer or a combination of these materials.
3. A process according to Claim 1,
characterised in that a thermoplastic sheet is used,
25 which in the region of the surface to be embossed
comprises an outer layer, the viscosity of which at the
embossing temperature is less than that of a lower layer
of the sheet which is underneath it.
- 30 4. A process according to Claim 3,
characterised in that the outer layer is connected to the
lower layer during embossing.

