the foam core can, as a function of the shape of the same, produce a large amount of off-cut material.

In one variant, described in WO 2012/052219, the foam core is inserted together with a woven material – e.g. carbon fibres – within a mould and the resin – e.g. epoxy resin – is injected into the said mould and hardened. Although, on the one hand, joints are avoided here, on the other hand this process has the same disadvantages as the process described above in respect of off-cut material, process speed and complication.

The pultrusion process is an established process that derives from initial developments at the beginning of the 1950s. The pultrusion process is used to produce continuously fibre-reinforced plastics profiles, among which are also by way of example hollow profiles, in particular pipes. In the original method here, a polyester resin or an epoxy resin was used to impregnate a plurality of glass fibres (glass rovings), and these were then brought together by way of one or more shaping moulds to give the final shape. Finally, the resin is hardened, and the continuously produced profile is sawn into sections to give individual workpieces.

Object

The object ~~underlying the present invention~~of the embodiments disclosed herein was primarily to provide a novel process for the production of fibre-reinforced hollow profiles comprising a PMI foam material, examples of these profiles being pipes.

In particular, it was an object of the ~~present invention~~embodiments disclosed herein to provide a process which permits very good linkage between foam core and exterior layers. A further intention is that the process according to the ~~invention~~ disclosure can also use, as outer material, materials that cannot be exposed to the foaming temperature of the PMI.

Another object was that the process can be carried out rapidly, in a small number of steps and at low cost. In particular, it would be advantageous if the process can be executed on existing plants with minimal modifications.

Another object was continuous conduct of the process.

Another object of the ~~present invention~~embodiments disclosed herein was to provide novel hollow profiles comprising a PMI foam and having a) no adhesive layer between the PMI foam core and the outer material of the hollow profile, b) no joints and c) good bonding between outer material and PMI foam core. A particular object here was to provide hollow profiles whose outer material is composed of a fibre material bonded with a polymer resin, and whose core is composed of a PMI foam core, where the pore size and therefore the density of the foam core, can be adjusted flexibly.

Further objects can be apparent from the description, from the drawings and from the examples without being explicitly mentioned here.

Achievement of object

The objects are achieved by means of a novel process for the continuous production of fibre-reinforced continuous profiles comprising a PMI foam core. This process involves a pultrusion process in which a foam core made of PMI is introduced in the centre. Furthermore, an outer layer made of a fibre material and of a thermoplastic or of a thermoset is formed around the said foam core by means of the pultrusion process. This novel pultrusion process with introduction of a PMI foam core into a pultrusion product is hereinafter termed pul-core process.

In a first aspect, there is provided a process for the continuous production of fibre-reinforced continuous profiles comprising a PMI foam core, characterized in that the process involves a pultrusion process in which a foam core made of PMI is introduced in the centre and, by means of the pultrusion process, an outer layer made of a fibre material and of a thermoplastic or of a thermoset is formed around the said core.

In a second aspect, there is provided a hollow profile comprising PMI foam and composed of a foam core and of an outer material, characterized in that the outer material involves thermoset reinforced with a fibre material and the foam core involves a PMI foam, and that the hollow profile comprising PMI foam has no adhesive layer and no joints.

In a third aspect, there is provided use of the hollow profiles comprising PMI foam as defined above, in automobile construction, commercial vehicle construction, shipbuilding, aircraft construction, and helicopter construction, in the construction of installations for obtaining energy from wind, and in space travel.

The pultrusion process involves a process in which, in a first step, a plurality of fibres or rovings are saturated with a resin. A distinction is made here between what is known as an open pultrusion process in which the said resin saturation takes place in a saturation trough through which the fibres are passed and a closed process in which the saturation with the resin takes place only when the material has reached the actual shaping instrument, under pressure. The plants generally have, upstream of the saturation process, devices such as carding grids, by means of which the fibres are distributed in a manner that is necessary for the subsequent shaping process, and optionally provided rovings can be broken up to give individual fibres. Another possibility is to use non-wovens, wovens and/or laid scrims as fibre material as an alternative to, or a supplement to, rovings or fibres.

After the saturation of the fibre material with the resin, this is then subjected to a preforming process by means of one or more moulds; in the integrated process, this takes place simultaneously. The said preforming process can by way of example use one or more mould