or multiple cavities. In multiple cavity molds, each cavity can be identical to form uniform molded components or can be unique to form different molded components within a single cycle. Molds are generally made from tool steels, but stainless steels and aluminum molds are also suitable for certain applications.

FIG. **1** illustrates an injection molding environment, according to one embodiment. When thermoplastics are molded, typically pelletized plastic granules **104** are fed through a hopper **102** into an injection barrel **106** by a reciprocating screw **105**. The reciprocating screw **105** pressurizes and pushes the plastic granules through the injection barrel **106**, where they are heated by one or more heaters **108** into a liquid form. The resulting liquid plastic **110** flows through the injection barrel **106** and into a mold component for molding.

The mold component can include a male mold component **112** and a female mold component **114**. The injection barrel **106** is coupled to the mold component, for instance via a check valve (not illustrated in the embodiment of FIG. **1**). The mold component includes a mold cavity coupled to the injection barrel, and the liquid plastic **110** forcibly flows into the mold cavity, filling the mold cavity. The injection time required to fill the mold cavity can be less than 1 second.

After the mold cavity is filled with the liquid plastic **110**, the check valve can close, separating the filled mold cavity from the injection barrel **106**. The liquid plastic **110** within the mold cavity then cools and solidifies, forming a molded component. To expedite the cooling process, a coolant supply **118** can provide a coolant to the mold via a coolant inlet **120**. Coolant flows from the coolant supply **118** into the mold via the coolant inlet, cooling the liquid plastic within the mold cavity, and out of the mold via one or more coolant outlets **122** (such as coolant outlet **122***a* and coolant outlet **122***b*.

Once the temperature of the plastic within the mold cavity has fallen before a temperature threshold associated with the solidifying temperature of the plastic, the male mold component and the female mold component can decouple, and the molded component can be ejected (for instance, using one or more injection pins) from the mold cavity and down into a receiving container **124** for collection. One or more of the mold components can be coupled to a mold track **116**, allowing the mold components to move and decouple. One or more temperature sensors (not illustrated in the embodiment of FIG. **1**) can be used to determine if the temperature of the plastic within the mold cavity has fallen below a solidifying temperature threshold. For example, the mold components can decouple and eject the molded component into the receiving container in response to a determination by each of a plurality of temperature sensors that the temperature of the plastic within the mold cavity has fallen below the solidifying temperature threshold.

The male mold component **112** and the female mold component **114** can securely couple using one or more securing pins, locks, valves, latches, or any other suitable securing components. In some embodiments, when the mold components are securely coupled, the mold cavity is air tight. In other embodiments, the mold cavity can include an air valve allowing air to escape when liquid plastic flows into the mold cavity from the injection barrel **106**.

FIG. **2***a* illustrates decoupled injection molding mold components, according to one embodiment. The embodiment of FIG. **2***a* includes a male mold component **112** uncoupled from a female mold component **114**. The male mold component includes one or more mold protrusions **204**, and the female mold component includes one or more corresponding mold recesses **206** configured to align with the mold protrusions when the mold components are securely coupled. The male mold component includes a mold inlet **202** configured to allow for the flow of liquid plastic from a source external to and through the male mold component **112**.

FIG. **2***b* illustrates securely coupled injection molding mold components, according to one embodiment. In the embodiment of FIG. **2***b*, the male mold component **112** is securely coupled to the female mold component **114**, forming a mold cavity **208** between the corresponding mold protrusions of the male mold component and the mold recesses of the female mold component. The mold cavity **208** is configured in dimensions selected by (for instance) a manufacturer to produce a molded component of a desired shape. In some embodiments, the mold cavity is configured to produce a plurality of molded components. It should be noted that although an "M"-shaped mold cavity is illustrated in the embodiment of FIG. **2***b*, the mold cavity **208** can be of any shape or shapes as desired by a user of the injection molding environment.

FIG. **3** illustrates an injection molding cooling system, according to one embodiment. In the embodiment of FIG. **3**, a male mold component **112** includes a plurality of mold protrusions, mold protrusions **302***a* and **302***b*, each including a cooling well, cooling well **306***a* and **306***b*, respectively. The outer surface of the mold protrusions **302** are separated from the cooling wells **306** by a mold wall **304**. The mold wall **304** can be made of a thermally conductive material, such as steel or any other suitable material.

The male mold component of FIG. **3** includes a coolant inlet **120** configured to receive a coolant (such as water), and a coolant outlet **122**. The coolant flows from the coolant inlet **120**, through the cooling wells **306**, and out of the coolant outlet **122**. The coolant can be pumped into the male mold component **112**, for instance in response to a determination that the liquid plastic within the mold cavity requires cooling. Upon entering the coolant inlet **120**, the coolant can be configured to reduce the temperature of the mold wall **304** by absorbing heat from the mold wall (and accordingly, from the liquid plastic). Accordingly, the temperature of the coolant flowing out of the coolant outlet **122** is higher than the temperature of the coolant flowing into the coolant inlet **120** after absorbing heat from the mold wall **304**.

Porous Medium-Based Injection Molding Cooling System

To aid in the cooling of molten plastic injected into a mold cavity, a porous medium can be used within a cooling well thermally coupled to a mold wall. As used herein, a porous medium refers to any solid material with cavities or pathways within the material to allow fluid to flow through the medium. One example of a porous medium is a hardened foam. A porous medium may be of uniform porosity and permeability. Alternatively, a porous medium may be of a gradient porosity. In one embodiment, the permeability and the porosity of a porous medium are approximately 3.74×10^{-10} m^2 and 0.45, respectively. In one embodiment, the porosity of the porous medium is between 0.2 to 0.7. The relative density of the porous medium may be between 10% and 30%. As used herein, "relative density" refers to the volume of a solid material within a porous media relative to the total volume of the porous media.

In order to maximize heat exchange, the porous medium may be composed of a highly thermally conductive material. For example, the porous medium may be composed of copper foam, gold or gold-deposited foam, any metallic or otherwise thermally-conductive foam, metallic composites with isotropic or anisotropic properties, micro-machined or photolithographically-produced microchannel inserts, and doped ceramics. The structure of the porous medium may also include pillars extending from the top, bottom and sides of the