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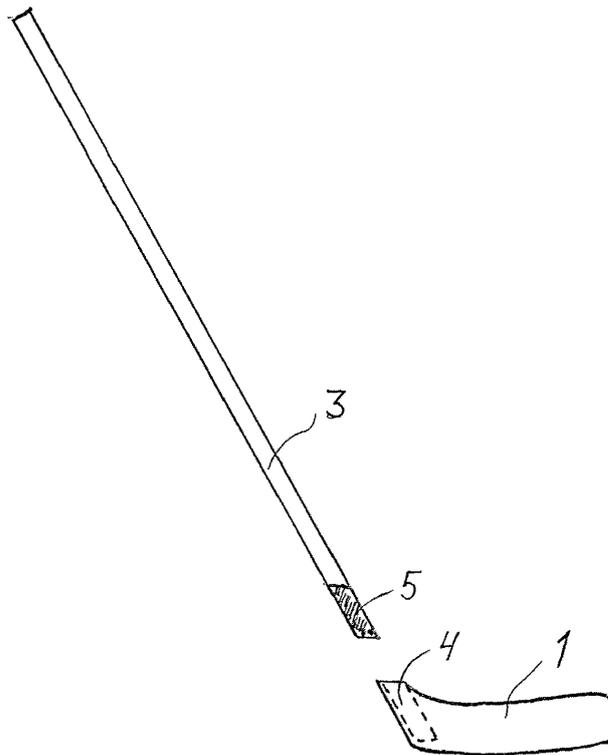
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(54) **STICK COMPRISING SHAFT AND BLADE**

(57) The invention relates to a stick, such as an ice hockey stick, which comprises a shaft (3) and a blade part (1);(2) and in which the shaft and the blade part (1);(2) are separately manufactured and joinable together, an end (5) of the shaft (3) meant for the joint being tapered and the blade part (1);(2) comprising a socket

(4) arranged to receive said shaft (3) end. The socket (4) of the blade part (1);(2) are formable substantially to the heel part of the blade part (1);(2), the structure of the heel part and the socket (4) thus ending at the same level in the direction of the shaft.



*Fig. 1*

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## Description

**[0001]** The invention relates to a stick, such as an ice hockey stick, which comprises a shaft and a blade part and in which the shaft and the blade part are separately manufactured and joinable together, an end of the shaft meant for the joint being tapered and the blade part comprising a socket arranged to receive said shaft end.

### PRIOR ART

**[0002]** The history of evolution of ice hockey sticks knows at least two periods of replaceable blades. US Patent 3,638,942 discloses a plastic blade with a socket in its shaft area into which a traditional stick shaft is inserted. This stick was mainly for small boys and could be conveniently assembled using a wooden shaft and a plastic blade of a broken stick.

**[0003]** Later, when aluminium and composite shafts became more common, a replaceable blade, such as the one shown in Fig. 12 of US Patent 5,407,195, was created, where the shaft portion of the blade had a jointing shank formed thereto, its dimensions corresponding to the inner dimensions of a hollow shaft. Sticks made with this technique were used even on the pro-level and, at the time, they solved a problem related to logistics and quality of service to be discussed below. However, the joint was in an area that is technically sensitive as regards loading of the stick and, to make it strong, the structure had to be locally reinforced, which caused a weight problem in the sticks. Consequently, sticks of this type have disappeared from the market almost completely and they have been replaced by sticks delivered in one piece.

### CURRENT PROBLEM

**[0004]** Current ice hockey sticks are commonly carbon fibre composite structure sticks. They are made either by manufacturing the shaft and the blade together, in one work phase, or the shaft is made separately and the blade is then fixedly fastened to the shaft before finishing of the product. In other words, the sticks are marketed as single, non-disassemblable pieces.

**[0005]** A problem with current sticks arises e.g. when a plural number of shafts of different stiffness, at least 2 to 3 different stiffness classes, are needed due to different habits of the players. Moreover, players have personal preferences regarding blade shape and, naturally, stick handedness. Top brands have usually about ten different blade models commercially available. In addition, tailored blade designs are commonly made for professional hockey players.

**[0006]** The quality of service required by market demands leads to a logistics problem that is extremely difficult to manage because a standard product range of 3 shaft stiffness classes and 10 different blade models alone means a range of 30 different product titles, not to mention the service to pro-level players that may involve

hundreds of different variations.

**[0007]** Today, ice hockey stick manufacturers usually have their production plants in remote countries of cheap labour, which further complicates the service to consumers and the retail trade and makes it more difficult.

### SOLUTION TO THE PROBLEM

**[0008]** An ice hockey stick according to invention has a shaft and a blade that are separately made products. The structure is designed so that the blade may be fastened to the shaft simply by instant glue. The fastening may either take place at the retailer's store or the player may do it. When both the shaft and the blade now have separate product names, the number of product titles in the above-mentioned standard product range drops from 30 to thirteen, which significantly reduces logistics costs and enables a marked improvement in quality of service. The stick according to the invention is characterised in that the socket in the blade part is formed entirely in the heel part of the blade part and thus the structure of the heel part and the socket end at the same level in the direction of the shaft.

**[0009]** In the following, the invention will be explained in closer detail with reference to the accompanying drawing, in which

Figure 1 shows an ice hockey stick with the shaft detached from the blade part.

Figure 2 shows a goalkeeper's stick with the shaft detached from the blade part.

Figure 3 shows a cross section of a portion of a blade part.

Figures 4a to 4d show cross sections of a blade part.

Figure 5 shows a portion of a blade part of an ice hockey stick and a cross section thereof.

**[0010]** Figures 1 and 2 show stick blades 1 and 2 that are manufactured as separate products. They are joined to shafts 3 by means of a jointing element provided by a socket 4 formed to the heel part of the blade part 1, 2 and a taper at a bottom end 5 of the shaft 3 to match the socket 4. The joint is in an area where the bending moment of the stick 3 is close to minimum and the joint merely mostly transmits torsional forces from the shaft to the blade part 1, 2. The bending moment directed to the shaft 3 is the greatest at the lower support hand grip, i.e. approximately in the mid-part of the shaft 3.

**[0011]** Figure 3 shows a blade part 1 with a socket 4 receiving a bottom end 5 of a shaft 3, the socket being complementary in shape to the bottom end 5 of the shaft 3. The blade part 1 shown in Figure 3 and the corresponding cross sections 4a to 4d are made in an injection mould, which has a removable mandrel matching the inner surface of the socket 4 and reinforcing fibres arranged therein. The blade portion 1 is formed by wrapping the mandrel and the lightweight core in a seamless fibre structure, and this preform is placed in the mould into

which resin is injected under pressure. The mandrel has been coated with a release agent allowing it to be withdrawn from the socket 4 once the resin has cured.

**[0012]** Figure 5 shows an upward pointing portion of a blade part 2 of a goal-keeper's stick, which has a socket 4 for the bottom end 5 of a shaft 3. The bottom end 5 of the shaft 3 maintains a constant width along its longer side but tapers along its shorter side. The blade part has a core 6 of a light-foam material or light wood, for example, which is wrapped in fibre reinforcement.

**[0013]** Making the blade parts 1, 2 and the shafts 3 as separate pieces enables significant advantages to be gained also in the manufacturing process. Filament winding may be applied to the shafts 3 to enable a partly continuous manufacturing process and use of more economical raw material. In comparison with the manufacturing of one-piece sticks, separately made blade parts 1, 2 allow significantly more advantageous mould solutions to be obtained. Blade moulds for special sticks can be made of cast resins suitable for small series, which enables to further improve the service provided to an individual player.

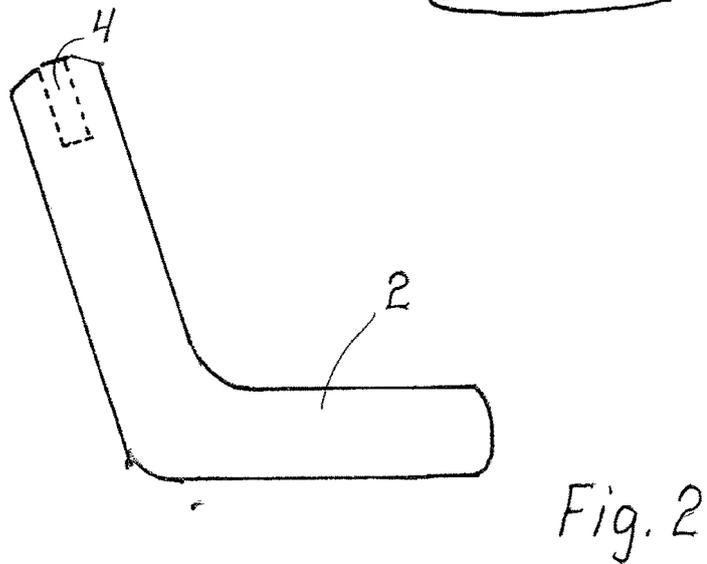
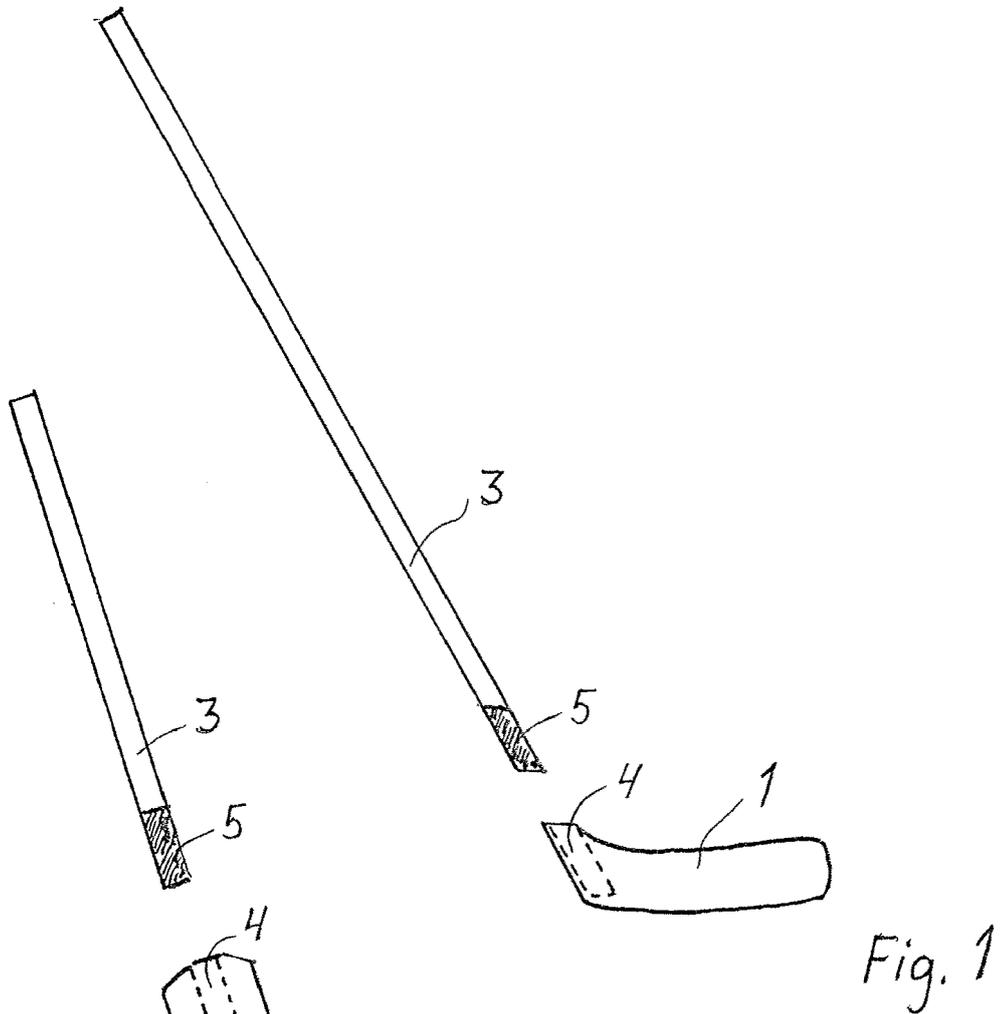
**[0014]** In an embodiment of the invention, at least 75 % of the socket length is arranged inside the heel part of the blade part 1, the rest of the socket, i.e. about 25 mm at the most, extending in the direction of the shaft 3.

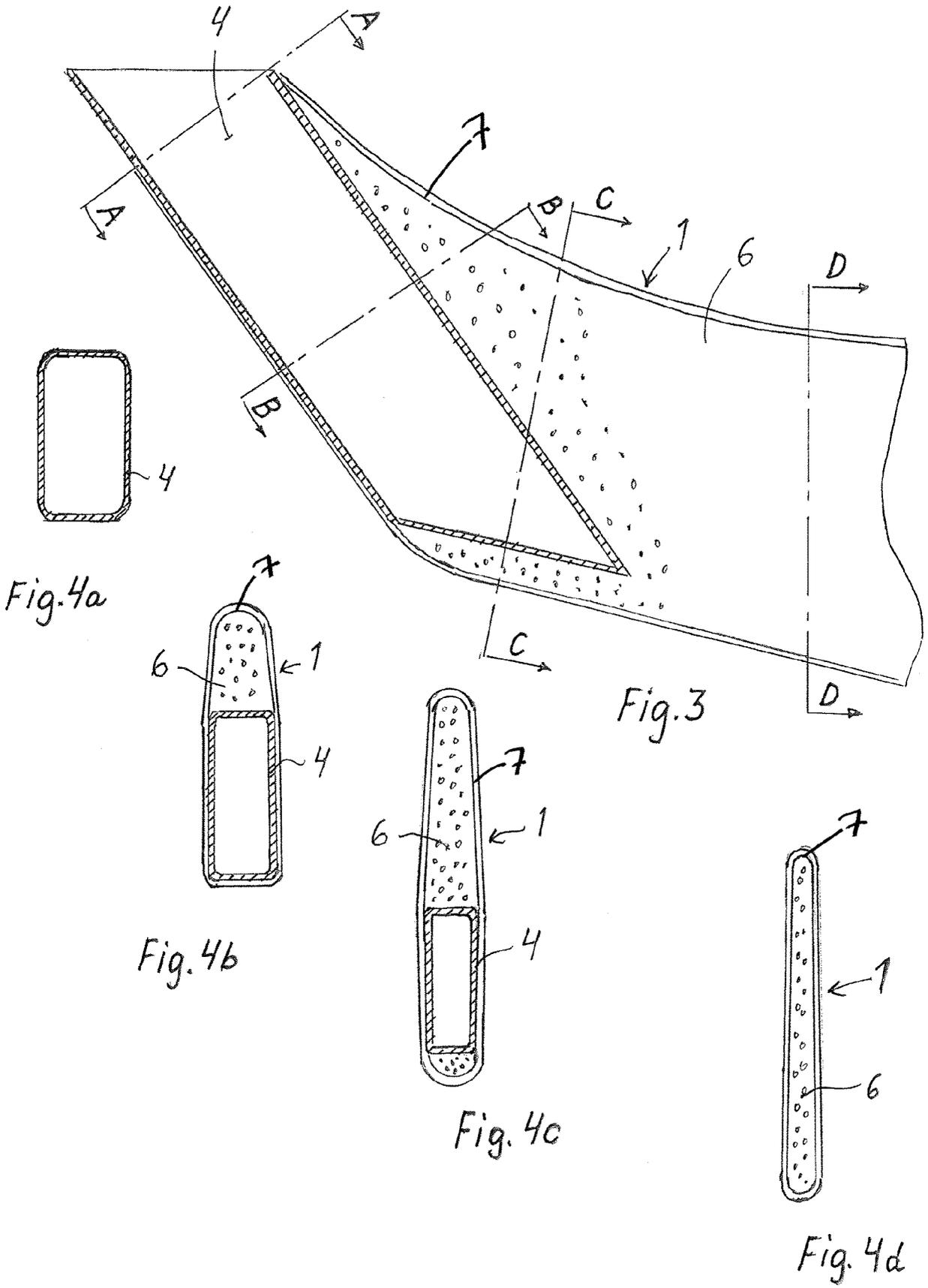
**[0015]** In another embodiment of the invention, the blade part 1, 2 comprises a pre-fabricated socket 4 and a plastic core attached in association with it, with fibre laminate layers glued under pressure to their surfaces on both sides of the blade part 1, 2. The plastic core has a shape corresponding to the light-foam core shown in Figures 3 to 5.

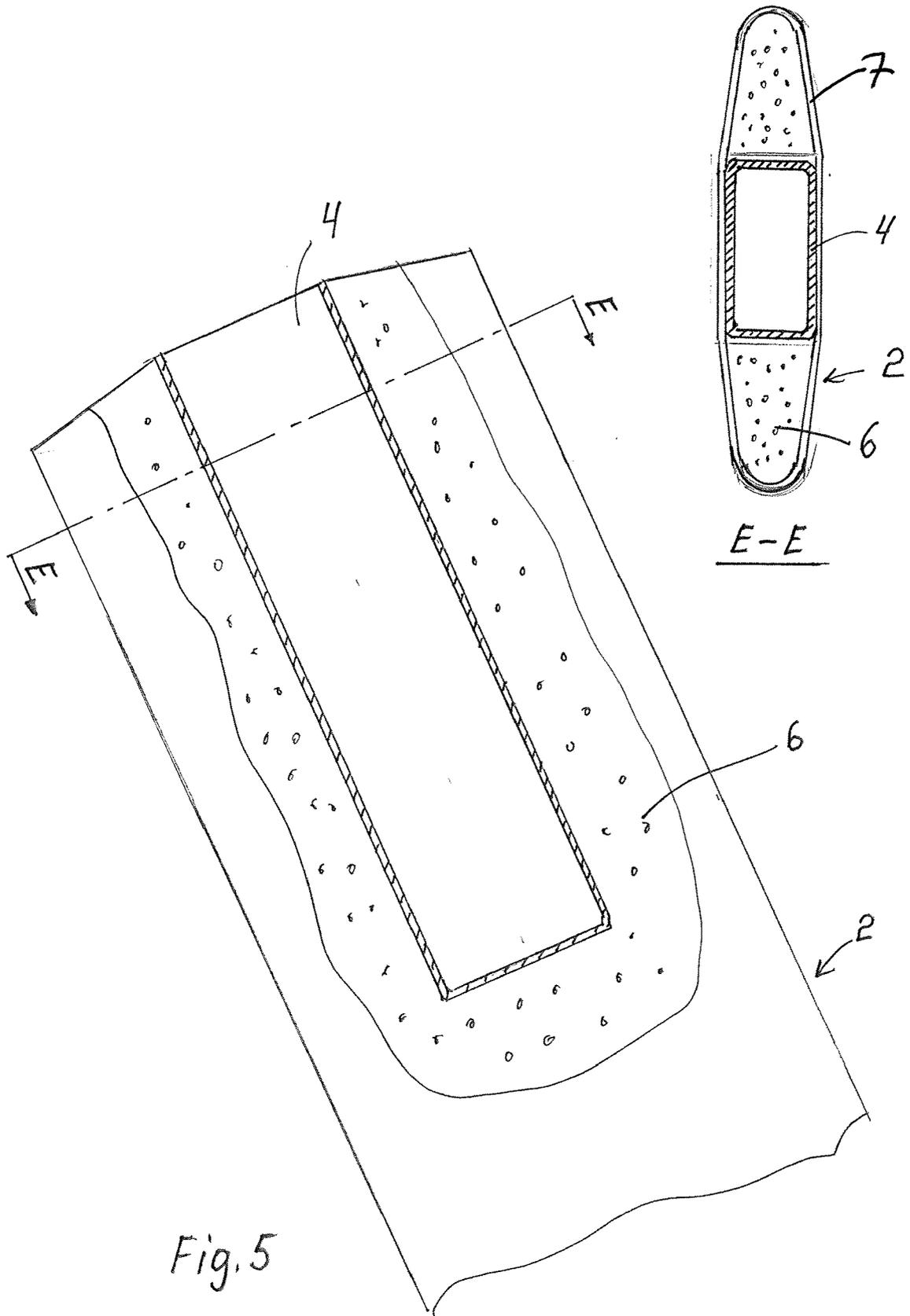
**[0016]** In an embodiment, the blade 1, 2 comprises a socket 4 with thin walls and a core 6, together with a surface layer 7 formed around the socket 4 and the core. The socket 4 may be of a seamless reinforcing material, such as fibre reinforcement. The socket may be formed by means of at least one uniform, seamless braided layer of fibre reinforcement to be installed around a mandrel. The fibre reinforcement layer may be formed by means of a carbon fibre braid, for example, or by winding a uniform continuous carbon fibre band around the mandrel. The core 6 of the blade 1, 2 may be made of light foam, plastic, expanded thermoplastic or cast resin lightened with microballoons. The formed core 6 of the blade 1, 2 and the socket 4 are joined together by coating them with at least one seamless layer of reinforcement fibre. The fibre reinforcement layer may be made in the same way as the fibre reinforcement layer of the socket. Next, the preform of the blade is placed into a mould, where it is impregnated with resin and cured under pressure and heat. The surface layer 7 of the blade 1, 2 may comprise reinforcing fibre, such as carbon fibre or a similar fibre reinforcement, and a bonding agent, such as epoxy resin. The seamless carbon fibre structure allows the socket 4 and the blade 1, 2 to be provided with maximum strength.

## Claims

1. A stick, such as an ice hockey stick, which comprises a shaft (3) and a blade part (1);(2) and in which the shaft and the blade part (1);(2) are separately manufactured and joinable together, an end (5) of the shaft (3) meant for the joint being tapered and the blade part (1);(2) comprising a socket (4) arranged to receive said shaft (3) end, **characterised in that** the socket (4) in the blade part (1); (2) is substantially formable to the heel part of the blade part (1);(2) and thus the structure of the heel part and the socket (4) end at the same level in the direction of the shaft.
2. A stick as claimed in claim 1, **characterised in that** the socket (4) is formable of at least one uniform, continuous, seamless fibre structure layer.
3. A stick as claimed in claim 2, **characterised in that** the seamless fibre structure layer of the socket (4) is formable by arranging the fibre structure layer to be wound around a mandrel matching the inner part of the socket.
4. A stick as claimed in any one of the preceding claims, **characterised in that** the blade part (1);(2) comprises the socket (4), a core filling (6) and at least one uniform, continuous, seamless fibre structure layer, some of the fibre structure layers being arranged to be wound also around the socket (4) belonging to the blade part.
5. A stick as claimed in claim 4, **characterised in that** and the shape and strength of the blade part (1),(2) are formable by means of a casting mould and resin injected therein.
6. A stick as claimed in any one of claims 1 to 3, **characterised in that** the blade part (1);(2) comprises a pre-fabricated socket (4) and a plastic core attached in association with it, with fibre laminate layers glued under pressure to their surfaces on both sides of the blade part (1);(2).
7. A stick as claimed in any one of the preceding claims, **characterised in that** at least 75 % of the socket's (4) length is arranged inside the heel part of the blade part (1).









EUROPEAN SEARCH REPORT

Application Number  
EP 16 16 2136

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search <b>Munich</b>		Date of completion of the search <b>19 July 2016</b>	Examiner <b>Jekabsons, Armands</b>
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... & : member of the same patent family, corresponding document	

EPO FORM 1503 03/82 (P04/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

**REFERENCES CITED IN THE DESCRIPTION**

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