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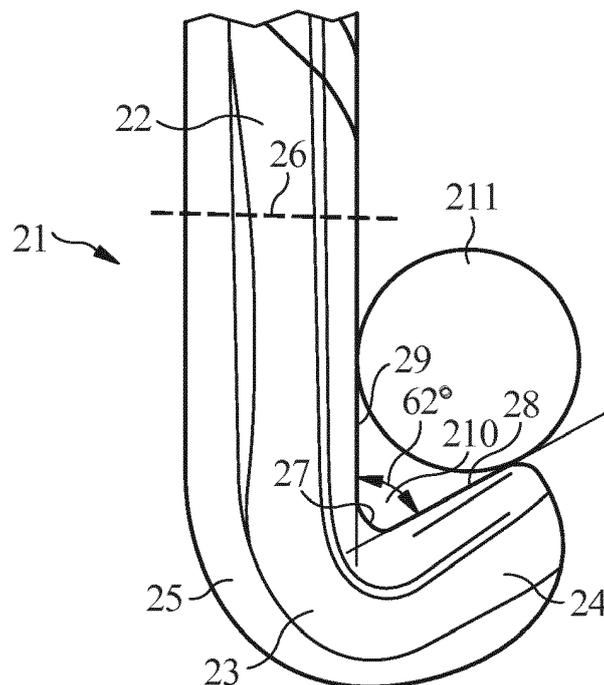
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(54) **FIELD HOCKEY STICK**

(57) The present invention relates to a field hockey stick (21, 41) comprising a shaft (22, 42) and a head (23, 43). The head (23, 43) comprises a distal portion (24, 44), a proximal portion (25, 45) being integral with a first end (26, 46) of the shaft (22, 42), and a bend (27, 47) between the distal portion (24, 44) and the proximal portion (25, 45), such that an inner edge (28, 48) of the distal

portion (24, 44) faces an inner edge (29, 49) of the proximal portion (25, 45). A bend angle between the inner edge (28, 48) of the distal portion (24, 44) and the inner edge (29, 49) of the proximal portion (25, 45) is between 30 and 70 degrees. The inner edge (28, 48) of the distal portion (24, 44) is straight or concave.

FIG 2



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Description

1. Technical field

[0001] The present invention relates to a field hockey stick.

2. Prior art

[0002] A field hockey stick comprises a handle and a head. By means of the handle, the stick is held by a player. The head is the part of a field hockey stick which comes into contact with a hockey ball and comprises generally a J or U shape. It is a general objective to provide to a player a hockey stick with maximum control over a hockey ball. Different attempts have been made to pursue this objective.

[0003] For example, US 4,512,573 relates to a hockey stick having a head attached to a handle in such a manner that the free end of the head is bent through 180° with regard to the handle. The hockey stick is formed from a plurality of laminations and the head has a portion which is thickened. The distance between the free end of the head and the handle is such that a hockey ball cannot pass through.

[0004] US 6,547, 683 relates to a hockey stick having a head with an enlarged gape with an extended toe height. The stick exhibits a circulation effect whereby when placed face down on a ball with the lowermost part of the outer edge of the stick in contact with the ground, the stick may be twisted in one direction to the open stick playing position and in the other direction to the reverse stick playing position, whilst the spatial position of the stick is not varied and the outer edge is in rolling contact with the ground and without disturbing the ball. The head also provides enhanced catching features which provide significantly increased control of the ball during play.

[0005] Further prior art is disclosed in WO 97/41 929 A2 and DE 195 01 899 A1.

[0006] The field hockey stick with a head of a J-shape, a U-shape or a similar shape generally has a bend angle at the scoop of the head. This bend angle is normally relatively small, for example, about 30 degrees, which results in the drawback of a bad control over a hockey ball. With such a small bend angle, it is difficult to receive a hockey ball at the scoop of the head because only a small part of the circumference of the hockey ball can be received therein.

[0007] In addition, existing field hockey sticks normally have a convex inner edge at the scoop of the head. When a hockey ball hit and contact with such hockey stick head, the hockey ball can easily bounce off the stick head at random directions and can easily slips off the head.

[0008] Fig. 1 shows a prior art field hockey stick 11 and a hockey ball 13 with typical dimensions (i.e. according to FIH rules) for reference. The inner edge 14 of the head of the hockey stick has a convex shape. As mentioned above, both the rather small bend angle 12 and the con-

vex inner edge result in a rather unpredictable movement of the hockey ball when the same hits and being received by the hockey stick.

[0009] Moreover, prior art field hockey sticks generally have a rounded back surface and a flat front surface. The rounded back surface results in a limited control of the hockey ball, especially when a player would like to lift up the ball, for example for a drag flick.

[0010] Therefore, there is a need to provide to players a hockey stick with a better and optimal control of a hockey ball. It is the object of the present invention to provide a field hockey stick with improved ball control when stopping the ball as well as when playing the ball.

3. Summary of the invention

[0011] According to a first aspect of the present invention, a field hockey stick comprises: a shaft; a head, comprising: a distal portion, a proximal portion being integral with a first end of the shaft, a bend between the distal portion and the proximal portion, such that an inner edge of the distal portion faces an inner edge of the proximal portion, wherein a bend angle between the inner edge of the distal portion and the inner edge of the proximal portion is between 30 and 70 degrees and the inner edge of the distal portion is straight or concave.

[0012] The field hockey stick according to the invention comprises a shaft and a head. The head generally comprises a proximal portion and a distal portion, wherein the proximal portion is located more closely to the shaft and the distal portion is more distant to the shaft. Thus, the terms "proximal" and "distal" can also be defined with respect to a player's hand gripping the field hockey stick in a usual way, namely as the grip located at an upper end of the shaft.

[0013] The proximal portion and the distal portion of the head form a bend, i.e. the distal portion is bend relative to the proximal portion. According to the invention, a bend angle between the inner edge of the distal portion and the inner edge of the proximal portion is between 30 and 70 degrees. Examples of how such bend angle can be defined will be given below. With such bend angle, the opening or scoop formed between the proximal portion and the distal portion of the head of the hockey stick is able to receive more of a hockey ball's circumference. In other words, a hockey ball is more stably received at the scoop of the field hockey stick with such a bend angle, thus makes the motion of the hockey ball more predictable and provides to a player a better control and more secure guidance of a hockey ball.

[0014] A further feature of the present invention is that the inner edge of the distal portion is straight or concave. The inventors have found out that a bend angle of between 30 and 70 degrees in combination with a straight or concave inner edge of the distal portion lead to a further improved ball control of the field hockey stick. The field hockey stick of the present invention can more easily and securely receive and guide a hockey ball and thus pro-

vides a player an optimal control over the hockey ball during play.

[0015] In an embodiment, the inner edge of the distal portion may be straight and the bend angle may be the angle between a tangent through a point on the inner edge of the proximal portion being most proximal to the shaft and a line comprising the straight inner edge of the distal portion as a line segment.

[0016] In another embodiment, the inner edge of the distal portion may be concave and the bend angle may be the angle between a tangent through a point on the inner edge of the proximal portion being most proximal to the shaft and a line through those two points of the inner edge of the distal portion being most distant to each other, wherein distance is measured along the inner edge of the distal portion.

[0017] The inner edge of the distal portion may be integral with the inner edge of the proximal portion at the bend, such that the transition between the inner edge of the proximal portion and the inner edge of the distal portion is rounded. This avoids a sharp transition between the inner edge of the proximal portion and the inner edge of the distal portion.

[0018] The bend angle may be between 50 and 65 degrees. The inventors have found out that such a range of the angle further improves control over a hockey ball. In particular, in one embodiment, the bend angle may be 62 degrees.

[0019] A scoop formed between the inner edge of the proximal portion and the inner edge of the distal portion may be adapted to receive a hockey ball having a circumference of between 224 mm and 235 mm. This corresponds to the circumference of a hockey ball according to the FIH (International Hockey Federation) Rules of Hockey 2017. Thus, the hockey stick according to the invention would provide optimal control over such a hockey ball.

[0020] A further aspect of the present invention relates to a field hockey stick, comprising: a shaft; a head, comprising: a front surface comprising a flat portion; and a back surface opposite the front surface, wherein the back surface comprises a flat portion.

[0021] The flat portion of the back surface allows a player to lift up a hockey ball in much more different angles and in different game conditions. In other words, the player has more flexibility and options to play in different ways during the game.

[0022] A lifting angle between the flat portion of the back surface and the flat portion of the front surface may be between 20 and 80 degrees. More particularly, the lifting angle may be between 35 and 55 degrees. The lifting angle is defined as the angle between the flat portion of the front surface and the flat portion of the back surface. Thus, the lifting angle is generally at the bottom of the field hockey stick as the hockey stick being held vertically with the handle positioned on top of the head. With a lifting angle in the mentioned ranges, the hockey stick can be stably placed on and fit to a level surface

when the hockey stick is tilted. This allows a player to more easily and powerfully lift the hockey ball.

[0023] The front surface and the back surface may define a compartment of the hockey stick surrounded by the front surface and the back surface. The compartment of the head may at least be partly hollow. This results in a rather lightweight head of the hockey stick.

[0024] The back surface may comprise a plateau surface and two lateral surfaces connecting the plateau surface with the front surface. A width of the plateau surface may be smaller than a width of the front surface, such that the head has a trapezoidal cross-sectional shape. Such geometry provides a player with optimal control over the direction of the ball during lifting.

[0025] A distance between the front surface and the plateau surface may define a thickness of the head. The thickness tapers from a bend of the head towards a distal end of the head and towards a proximal portion of the head. Such geometry allows a player to flexibly and effectively hit and/or guide a hockey ball using different part of the head. For example, a player can hit the hockey ball powerfully at the bend of the head with a larger thickness, while the player can easily guide and control the hockey ball using the distal end of the head with a smaller thickness.

[0026] The plateau surface and the two lateral surfaces may gradually merge into one flat back surface at a distal end of the head. With the flat back surface and the flat front surface at the distal end of the head, it is easier for a player to tilt the hockey stick and to more flexibly control the hockey stick.

[0027] According to all aspects of the present invention, the head may have a smallest thickness at a distal end of a distal portion. Thus, the distal end may easily be positioned under a portion of a hockey ball to lift the hockey ball. Also, with this smaller thickness at the distal end, a player can more easily control and guide a hockey ball.

[0028] According to all aspects of the present invention, the head may comprise a thickened portion at a bend of the head. This portion may contact a ground when lifting a hockey ball and act like a pivot to allow for a lever action.

[0029] According to all aspects of the present invention, the shaft may have a first end being integral with a proximal portion of the head and a second end opposite to the first end and being integral with a handle of the hockey stick, the shaft having an oval cross-sectional shape at the second end transitioning towards the first end to a trapezoidal cross-sectional shape with rounded corners. Thus, the cross section of the shaft may continuously transition into the cross section of the head according to the invention avoiding any discontinuities.

[0030] The edges of the hockey stick may be rounded and may have a continuous smooth profile. This minimizes the risk of injuries, but is also advantageous for a predictable receiving and playing of the hockey ball.

[0031] According to the invention, a field hockey stick

may comprise features of both aspects of the invention as described above. Thus, the hockey stick may comprise: a shaft; a head, comprising: a distal portion, a proximal portion being integral with a first end of the shaft, a bend between the distal portion and the proximal portion, such that an inner edge of the distal portion faces an inner edge of the proximal portion, wherein a bend angle between the inner edge of the distal portion and the inner edge of the proximal portion is between 30 and 70 degrees and the inner edge of the distal portion is straight or concave. The head may furthermore comprise a front surface comprising a flat portion; and a back surface opposite the front surface, wherein the back surface comprises a flat portion.

4. Short description of the figures

[0032] Aspects of the present invention will be explained in more detail with reference to the accompanying figures in the following. These figures show:

- Fig. 1 a prior art field hockey stick;
- Fig. 2 an exemplary embodiment of an aspect of the present invention;
- Fig. 3 an exemplary embodiment of an aspect of the present invention;
- Figs. 4A-4H an exemplary embodiment according to several aspects of the present invention; and
- Fig. 5 a different view of the embodiment of Figures 4A-4H including cross sections.

5. Detailed description of preferred embodiments

[0033] Fig. 2 shows a field hockey stick 21 according to a first aspect of the present invention. The field hockey stick 21 comprises a shaft 22 and a head 23. The head 23 comprises a distal portion 24, a proximal portion 25 being integral with a first end 26 of the shaft 22, a bend 27 between the distal portion 24 and the proximal portion 25, such that an inner edge 28 of the distal portion faces an inner edge 29 of the proximal portion 25. An angle of the bend 27 between the inner edge 28 of the distal portion 24 and the inner edge 29 of the proximal portion 25 is generally between 30 and 70 degrees. In the exemplary embodiment of Fig. 2, the bend angle 27 is 62°. In other examples, the bend angle 27 can be between 50° and 65°. Also, according to the invention, the inner edge 28 of the distal portion 24 is straight or concave. In the exemplary embodiment of Fig. 2, the inner edge 28 is straight.

[0034] The field hockey stick according to all aspects of the present invention can be made from any suitable material. Suitable materials include wood, carbon fibers

and fiberglass, etc. This list is not limiting. Also, the field hockey stick according to all aspects of the present invention can be manufactured according to different methods and processes available or new in the technical field.

[0035] In the exemplary embodiment of Fig. 2, both the inner edge 28 of the distal portion 24, as well as the inner edge 29 of the proximal portion 25 are straight. Therefore, the bend angle 27 is defined as the angle between the (straight) extensions of these inner edges, which is 62° in this example. If the inner edges have different geometries, the bend angle may be defined, for example, as the angle between a tangent through a point on the inner edge 29 of the proximal portion 25 being most proximal to the shaft 22 and a line comprising the straight inner edge 28 of the distal portion 24 as a line segment. If the inner edge 28 of the distal portion 24 is concave, the bend angle 27 may be defined, for example, as the angle between a tangent through a point on the inner edge 29 of the proximal portion 25 being most proximal to the shaft 22 and a line through those two points of the inner edge 28 of the distal portion 24 being most distant to each other, wherein distance is measured along the inner edge 28 of the distal portion 24. It should be noted that these definitions of the bend angle 27 are examples only and that different geometries of the different portions of the hockey stick's head 23 can have different definitions of the bend angle.

[0036] In the example of Fig. 2, the inner edge 28 of the distal portion 24 is integral with the inner edge 29 of the proximal portion 25 at the bend 27, such that the transition between the inner edge 29 of the proximal portion 25 and the inner edge 28 of the distal portion 24 is rounded. However, in other examples, this transition may not be rounded, but may instead be discontinuous.

[0037] In the example of Fig. 2, a scoop 210 formed between the inner edge 29 of the proximal portion 25 and the inner edge 28 of the distal portion 24 is adapted to receive a hockey ball 211 having a circumference of between 224 mm and 235 mm. This corresponds to the circumference of a hockey ball according to the FIH (International Hockey Federation) Rules of Hockey 2017. However, the invention is generally not limited to such a range of circumference.

[0038] It can be seen in Fig. 2 that, with a bigger bend angle of the head 23 of the hockey stick 21 and the inner edge 28 of the distal portion 24 being straight, the hockey ball 211 can be more stably received at the scoop 210. A larger part of the circumference of the hockey ball 211 is received at the scoop 210 between the two contacting points where the hockey ball 211 contacts with the hockey stick 21 respectively on the inner edge 28 of the distal portion 24 and on the inner edge 29 of the proximal portion 25.

[0039] A further aspect of the present invention is illustrated on the left-hand side of Fig. 3. The exemplary field hockey stick 31 of this exemplary embodiment comprises a shaft 32 and a head 33. The head 33 comprises a front surface 34 comprising a flat portion, and a back surface

35 opposite the front surface 34, wherein the back surface 35 comprises a flat portion 36. It should be noted that Fig. 3 shows the field hockey stick 31 in two positions, namely a more upright position and a more tilted position, wherein the reference numerals refer to the more upright position.

[0040] In the exemplary embodiment, the front surface 34 is defined as the surface on the left side of the field hockey stick 31 when the field hockey stick 31 is vertically positioned and when the handle of the hockey stick is closer to a player's body and the head 33 extends away from the player. Accordingly, the back face 35 is opposite to the front surface and is on the right side of the field hockey stick 31 when the field hockey stick 31 is placed as aforementioned.

[0041] As depicted in Fig. 3 in the more tilted position of the hockey stick, the flat portion 36 of the back surface 35 can be placed on the ground, i.e. fits to a flat surface. This configuration of the flat portion 36 of the back surface 35 allows a player to lift up the hockey ball with more strength and power as the flat portion 36 can be used as a lever. In addition, the player can lift up the hockey ball in much more different angles and different game conditions.

[0042] The right-hand side of Fig. 3 shows a conventional hockey stick which has a completely rounded back surface instead of at least a flat portion on the back surface of the head. It can be seen and understood that, without the flat portion of the back surface, it is more difficult to lift up the hockey ball because the rounded back surface cannot stably lean on the ground and also because there are only a quite small part of the hockey stick can be placed beneath the hockey ball to lift up the hockey ball.

[0043] In the example of Fig. 3, the lifting angle 37 between the flat portion 36 of the back surface 35 and the flat portion of the front surface 34 is 45°. In other examples, the lifting angle can be between 20° and 80° for various demands. More particularly, the lifting angle may be between 35° and 55°.

[0044] Figures 4A through 4H show a field hockey stick 41 according to several aspects of the present invention, wherein Fig. 4A shows an inside view, Fig. 4B shows the head 43 of Fig. 4A in more detail, Fig. 4C shows a back view, Fig. 4D shows a front view, Fig. 4E shows an outside view, Fig. 4F shows the head 43 of Fig. 4E in more detail, Fig. 4G shows a top view and Fig. 4H shows a bottom view.

[0045] The field hockey stick 41 comprises a shaft 42 and a head 43. The head 43 comprises a distal portion 44, a proximal portion 45 being integral with a first end 46 of the shaft 42, a bend 47 between the distal portion 44 and the proximal portion 45, such that an inner edge 48 of the distal portion 44 faces an inner edge 49 of the proximal portion 45. An angle of the bend 47 between the inner edge 48 of the distal portion 44 and the inner edge 49 of the proximal portion 45 is generally between 30° and 70°. In the exemplary embodiment of Figures

4A through 4F, the bend angle 47 is 62°. Furthermore, the inner edge 48 is preferably straight. This configuration essentially corresponds to the embodiment of Fig. 2. Therefore, what has been said with respect to Fig. 2 is valid for the embodiment of Figures 4A through 4F as well.

[0046] The head 43 of the exemplary embodiment of Figures 4A through 4F also comprises a front surface 411 comprising a flat portion, and a back surface 412 opposite the front surface 411. The back surface 412 comprises a flat portion 413. This configuration is shown in Figures 4C to 4H and essentially corresponds to the embodiment of Fig. 3. Therefore, what has been said with respect to Fig. 3 is valid for the embodiment of Figures 4A through 4F as well.

[0047] Referring to Fig. 4F, the back surface 412 may comprise a plateau surface 414 and two lateral surfaces 415, 416 connecting the plateau surface 414 with the front surface 411 (not shown and is hidden at the back). In the example shown in Fig. 4F, one of the lateral surfaces 415 is preferably flat and can be considered as the flat portion of the back surface 412, which may refer to the flat portion 413 as shown in Fig. 4D. That is, a lift angle is formed between the flat lateral surface 415 and the front surface 411. The flat lateral surface 415 is preferably located at the bottom of the head 43 of the field hockey stick 41, as shown in Fig. 4F, and can lean on and be stably placed on a ground surface when the hockey stick 41 is tilted. In other words, the lateral surface can contact a ground and act like a pivot to allow for a lever action when the hockey stick 41 is used to lift up a hockey ball.

[0048] Optionally, a width of the plateau surface 414 is smaller than a width of the front surface 411, such that the head 43 has a trapezoidal cross-sectional shape surrounded by the front surface 411, the plateau surface 414 and the two lateral surfaces 415, 416. This is shown in Fig. 5, where the mentioned trapezoidal cross section is denoted by the reference numeral 51.

[0049] Referring to Figs. 4F and 4H, the head 43 preferably comprises a thickened portion at a bend 47 of the head 43, i.e., the portion of the head 43 between the proximal portion 45 and the distal portion 44. This portion of the head 43 at the bend is usually used to hit a hockey ball when the hockey stick contacts with a hockey ball at the front face. A thickened portion at the bend 47 or nearby position helps deliver more power when hitting the ball with the hockey stick, thus provides a player with stronger and more effective ball hit during play

[0050] Another advantage of the novel back surface 412 of the head 43 of the field hockey stick 41 is an improved stiffness of the hockey stick at the bend. Stiffness and a powerful hit of the ball are normally conflicting and are hard to have both for one filed hockey stick. But with the novel bake surface 412, a player could hit a hockey ball at a contacting point with more power, without losing control of the ball and comfort of the player.

[0051] Also, as shown in Fig. 5, a distance between

the front surface and the plateau surface defines a thickness of the head 43. The thickness tapers from the bend 47 of the head 43 towards a distal end 52 of the head 43 and towards the proximal portion 45 of the head 43. Furthermore, as shown in Fig. 5, the plateau surface 414 and the two lateral surfaces 415, 416 gradually merge into one flat back surface at the distal end 52 of the head 43. Accordingly, the head 43 has its smallest thickness at the distal end 52 of the distal portion 44 of the head 43. The tapering of the thickness can also be seen in Figs. 4G and 4H.

[0052] In the exemplary embodiment of Fig. 5, the shaft 42 has an oval cross-sectional shape 54 at an upper end transitioning towards a trapezoidal cross-sectional shape 55 with rounded corners at a lower end that is integral with the head 43. Of course, the transition location of the shapes can be flexibly adjusted depending on various demands and requirements.

[0053] In all embodiments of the present invention, the edges of the field hockey stick are preferably rounded and have a continuous smooth profile.

[0054] It should also be understood that, the embodiments of the field hockey stick according to this invention can have additional features that are feasible and suitable for a field hockey stick. For example, the field hockey stick can have a bow of various levels at different positions with respect to the handle of the field hockey stick. The level and the position of the bow can be chosen and adjusted according to different demands and types of the field hockey stick. Preferably, the bow is with a maximal depth of 25 mm according to the FIH (International Hockey Federation) Rules of Hockey 2017.

[0055] In the following, further examples are disclosed to facilitate understanding the present invention:

1. A field hockey stick (21, 41), comprising:

a shaft (22, 42);

a head (23, 43), comprising:

- a distal portion (24, 44),
- a proximal portion (25, 45) being integral with a first end (26, 46) of the shaft (22, 42),
- a bend (27, 47) between the distal portion (24, 44) and the proximal portion (25, 45), such that an inner edge (28, 48) of the distal portion (24, 44) faces an inner edge (29, 49) of the proximal portion (25, 45), wherein a bend angle between the inner edge (28, 48) of the distal portion (24, 44) and the inner edge (29, 49) of the proximal portion (25, 45) is between 30 and 70 degrees and the inner edge (28, 48) of the distal portion (24, 44) is straight or concave.

2. Field hockey stick (21, 41) according to the preceding example, wherein the inner edge (28, 48) of the distal portion (24, 44) is straight and the bend

angle is the angle between a tangent through a point on the inner edge (29, 49) of the proximal portion (25, 45) being most proximal to the shaft (22, 42) and a line comprising the straight inner edge (28, 48) of the distal portion (24, 44) as a line segment.

3. Field hockey stick (21, 41) according to example 1, wherein the inner edge (28, 48) of the distal portion (24, 44) is concave and the bend angle is the angle between a tangent through a point on the inner edge (29, 49) of the proximal portion (25, 45) being most proximal to the shaft (22, 42) and a line through those two points of the inner edge (28, 48) of the distal portion (24, 44) being most distant to each other, wherein distance is measured along the inner edge (28, 48) of the distal portion (24, 44).

4. Field hockey stick (21, 41) according to one of the preceding examples, wherein the inner edge (28, 48) of the distal portion (24, 44) is integral with the inner edge (29, 49) of the proximal portion (25, 45) at the bend (27, 47), such that the transition between the inner edge (29, 49) of the proximal portion (25, 45) and the inner edge (28, 48) of the distal portion (24, 44) is rounded.

5. Field hockey stick (21, 41) according to one of the preceding examples, wherein the bend angle is between 50 and 65 degrees.

6. Field hockey stick (21, 41) according to one of the preceding examples, wherein a scoop (210) formed between the inner edge (29, 49) of the proximal portion (25, 45) and the inner edge (28, 48) of the distal portion (24, 44) is adapted to receive a hockey ball (211) having a circumference of between 224 mm and 235 mm.

7. A field hockey stick (31, 41), comprising:

a shaft (32, 42);

a head (33, 43), comprising:

- a front surface (34, 411) comprising a flat portion; and
- a back surface (35, 412) opposite the front surface (34, 411), wherein the back surface (35, 412) comprises a flat portion (36, 413).

8. Field hockey stick (31, 41) according to the preceding example, wherein a lifting angle (37) between the flat portion (36, 413) of the back surface (35, 412) and the flat portion of the front surface (34, 411) is between 20 and 80 degrees.

9. Field hockey stick (31, 41) according to the preceding example, wherein the lifting angle (37) is between 35 and 55 degrees.

10. Field hockey stick (31, 41) according to one of examples 7 to 9, wherein the front surface (34, 411) and the back surface (35, 412) define a compartment of the hockey stick (31, 41) surrounded by the front surface (34, 411) and the back surface (35, 412).

11. Field hockey stick (31, 41) according to the preceding example, wherein the compartment of the head (33, 43) is at least partly hollow (33, 43).

12. Field hockey stick (31, 41) according to one of examples 7 to 11, wherein the back surface (35, 412) comprises a plateau surface (414) and two lateral surfaces (415, 416) connecting the plateau surface (414) with the front surface (34, 411).

13. Field hockey stick (31, 41) according to the preceding example, wherein a width of the plateau surface (414) is smaller than a width of the front surface (34, 411), such that the head (33, 43) has a trapezoidal cross-sectional shape.

14. Field hockey stick (31, 41) according to one of examples 12 to 13, wherein a distance between the front surface (34, 411) and the plateau surface (414) defines a thickness of the head (33, 43), the thickness tapering from a bend of the head (33, 43) towards a distal end (52) of the head (33, 43) and towards a proximal portion (53) of the head (33, 43).

15. Field hockey stick (31, 41) according to one of examples 12 to 14, wherein the plateau surface (414) and the two lateral surfaces (415, 416) gradually merge into one flat back surface at a distal end (52) of the head (33, 43).

16. Field hockey stick (21, 31, 41) according to one of the preceding examples, wherein the head (23, 33, 43) has a smallest thickness at a distal end (52) of a distal portion (24, 34, 44).

17. Field hockey stick (21, 31, 41) according to one of the preceding examples, wherein the head (23, 33, 43) comprises a thickened portion at a bend (27) of the head (23, 33, 43).

18. Field hockey stick (21, 31, 41) according to one of the preceding examples, wherein the shaft (22, 32, 42) has a first end (46) being integral with a proximal portion of the head (23, 33, 43) and a second end opposite to the first end and being integral with a handle of the hockey stick (21, 31, 41), the shaft (22, 32, 42) having an oval cross-sectional shape (54) at the second end transitioning towards the first end (46) to a trapezoidal cross-sectional shape (55) with rounded corners.

19. Field hockey stick (21, 31, 41) according to one

of the preceding examples, wherein the edges of the hockey stick (22, 32, 42) are rounded and have a continuous smooth profile.

20. Field hockey stick (21, 31, 41) according to one of examples 1 to 6 and one of examples 7 to 19.

Claims

1. A field hockey stick (21, 41), comprising:

a shaft (22, 42);
a head (23, 43), comprising:

- a distal portion (24, 44),
- a proximal portion (25, 45) being integral with a first end (26, 46) of the shaft (22, 42),
- a bend (27, 47) between the distal portion (24, 44) and the proximal portion (25, 45), such that an inner edge (28, 48) of the distal portion (24, 44) faces an inner edge (29, 49) of the proximal portion (25, 45), wherein a bend angle between the inner edge (28, 48) of the distal portion (24, 44) and the inner edge (29, 49) of the proximal portion (25, 45) is between 30 and 70 degrees and the inner edge (28, 48) of the distal portion (24, 44) is straight or concave.

2. Field hockey stick (21, 41) according to the preceding claim, wherein the inner edge (28, 48) of the distal portion (24, 44) is straight and the bend angle is the angle between a tangent through a point on the inner edge (29, 49) of the proximal portion (25, 45) being most proximal to the shaft (22, 42) and a line comprising the straight inner edge (28, 48) of the distal portion (24, 44) as a line segment.

3. Field hockey stick (21, 41) according to claim 1, wherein the inner edge (28, 48) of the distal portion (24, 44) is concave and the bend angle is the angle between a tangent through a point on the inner edge (29, 49) of the proximal portion (25, 45) being most proximal to the shaft (22, 42) and a line through those two points of the inner edge (28, 48) of the distal portion (24, 44) being most distant to each other, wherein distance is measured along the inner edge (28, 48) of the distal portion (24, 44).

4. Field hockey stick (21, 41) according to one of the preceding claims, wherein the inner edge (28, 48) of the distal portion (24, 44) is integral with the inner edge (29, 49) of the proximal portion (25, 45) at the bend (27, 47), such that the transition between the inner edge (29, 49) of the proximal portion (25, 45) and the inner edge (28, 48) of the distal portion (24, 44) is rounded.

5. A field hockey stick (31, 41), comprising:
- a shaft (32, 42);
 - a head (33, 43), comprising:
 - a front surface (34, 411) comprising a flat portion; and
 - a back surface (35, 412) opposite the front surface (34, 411), wherein the back surface (35, 412) comprises a flat portion (36, 413).
6. Field hockey stick (31, 41) according to the preceding claim, wherein a lifting angle (37) between the flat portion (36, 413) of the back surface (35, 412) and the flat portion of the front surface (34, 411) is between 20 and 80 degrees.
7. Field hockey stick (31, 41) according to the preceding claim, wherein the lifting angle (37) is between 35 and 55 degrees.
8. Field hockey stick (31, 41) according to one of claims 5 to 7, wherein the front surface (34, 411) and the back surface (35, 412) define a compartment of the hockey stick (31, 41) surrounded by the front surface (34, 411) and the back surface (35, 412).
9. Field hockey stick (31, 41) according to the preceding claim, wherein the compartment of the head (33, 43) is at least partly hollow (33, 43).
10. Field hockey stick (31, 41) according to one of claims 5 to 9, wherein the back surface (35, 412) comprises a plateau surface (414) and two lateral surfaces (415, 416) connecting the plateau surface (414) with the front surface (34, 411).
11. Field hockey stick (31, 41) according to the preceding claim, wherein a width of the plateau surface (414) is smaller than a width of the front surface (34, 411), such that the head (33, 43) has a trapezoidal cross-sectional shape.
12. Field hockey stick (31, 41) according to one of claims 10 to 11, wherein a distance between the front surface (34, 411) and the plateau surface (414) defines a thickness of the head (33, 43), the thickness tapering from a bend of the head (33, 43) towards a distal end (52) of the head (33, 43) and towards a proximal portion (53) of the head (33, 43).
13. Field hockey stick (31, 41) according to one of claims 10 to 12, wherein the plateau surface (414) and the two lateral surfaces (415, 416) gradually merge into one flat back surface at a distal end (52) of the head (33, 43).
14. Field hockey stick (21, 31, 41) according to one of the preceding claims, wherein the shaft (22, 32, 42) has a first end (46) being integral with a proximal portion of the head (23, 33, 43) and a second end opposite to the first end and being integral with a handle of the hockey stick (21, 31, 41), the shaft (22, 32, 42) having an oval cross-sectional shape (54) at the second end transitioning towards the first end (46) to a trapezoidal cross-sectional shape (55) with rounded corners.
15. Field hockey stick (21, 31, 41) according to one of claims 1 to 4 and one of claims 5 to 14.

FIG 1

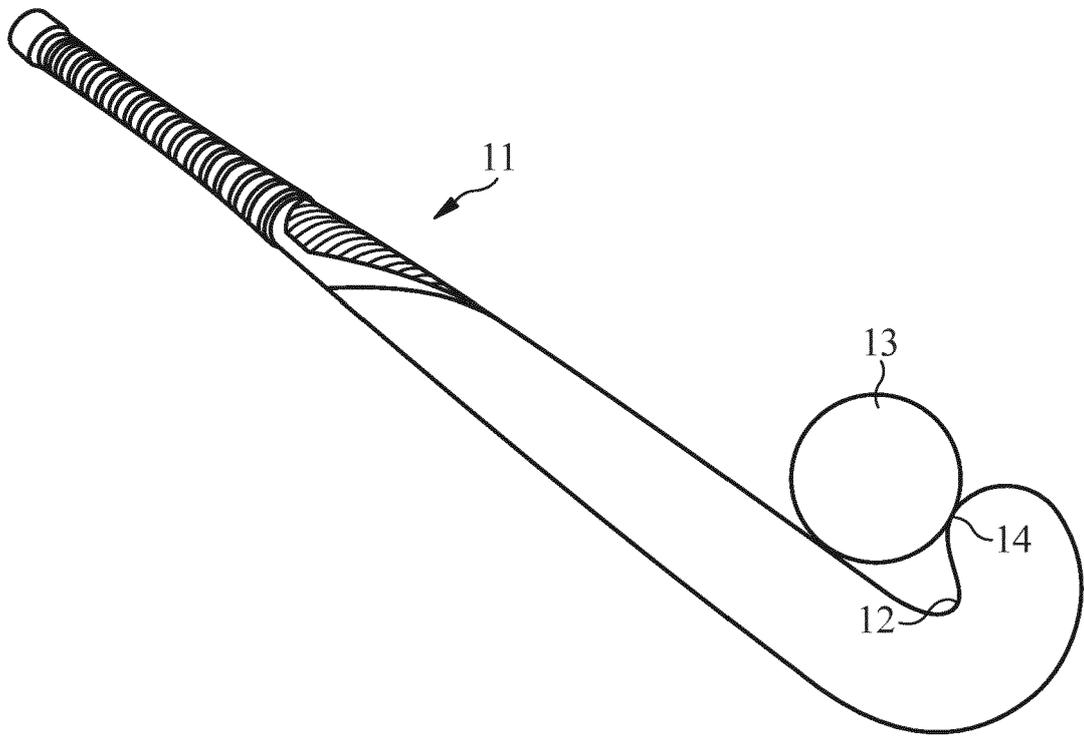


FIG2

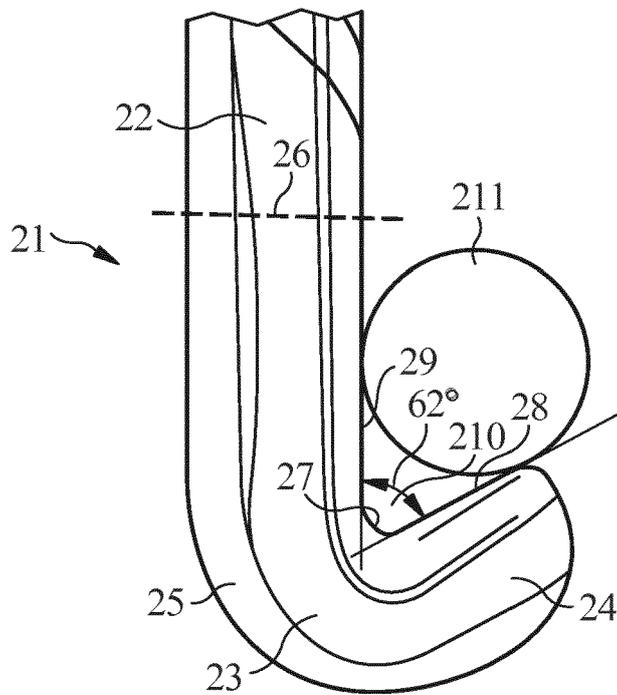


FIG3

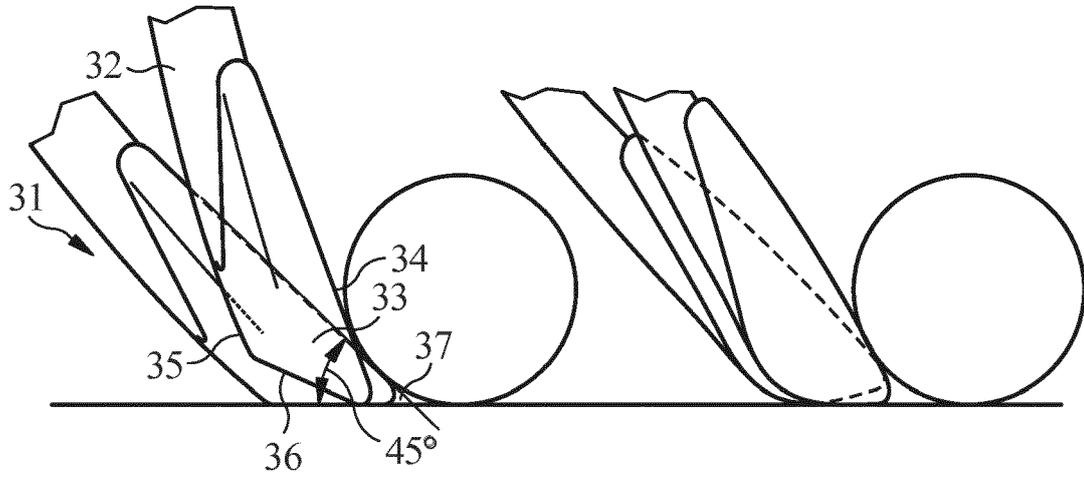


FIG4A



FIG4B

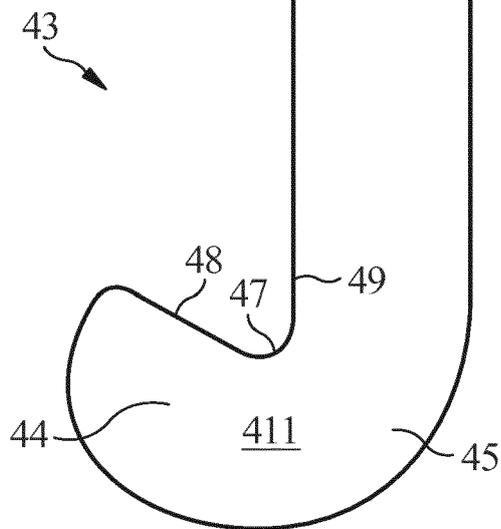


FIG4C



FIG4D

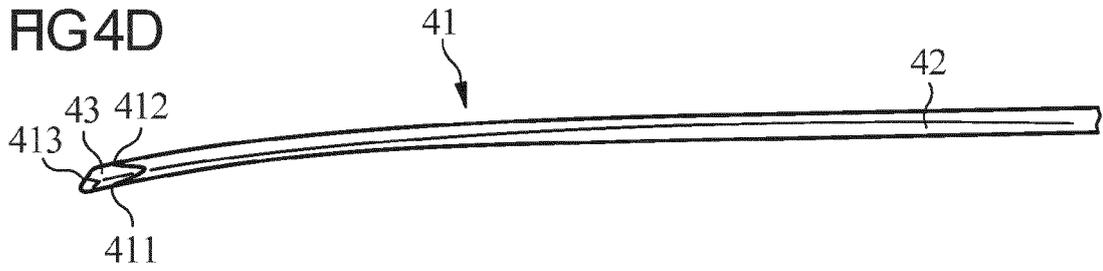


FIG4E

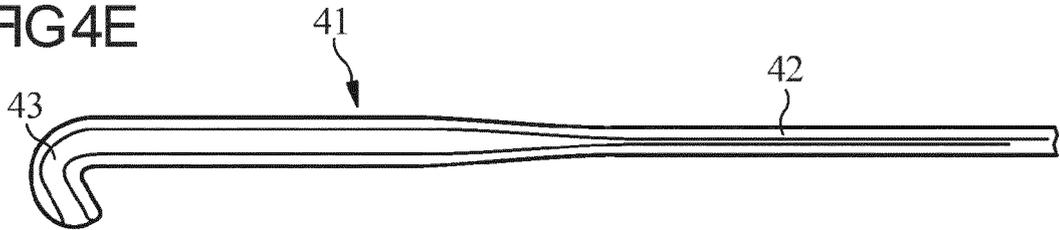


FIG4F

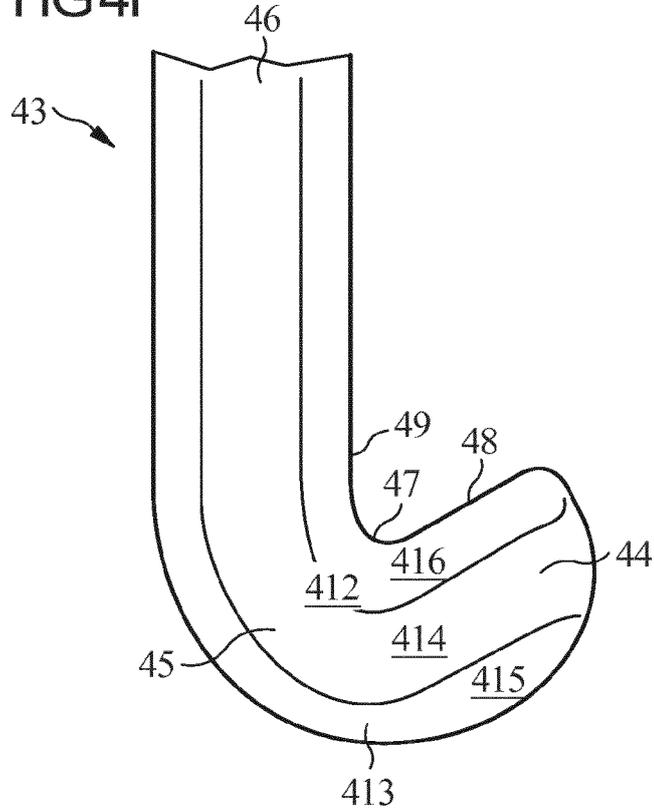


FIG4G

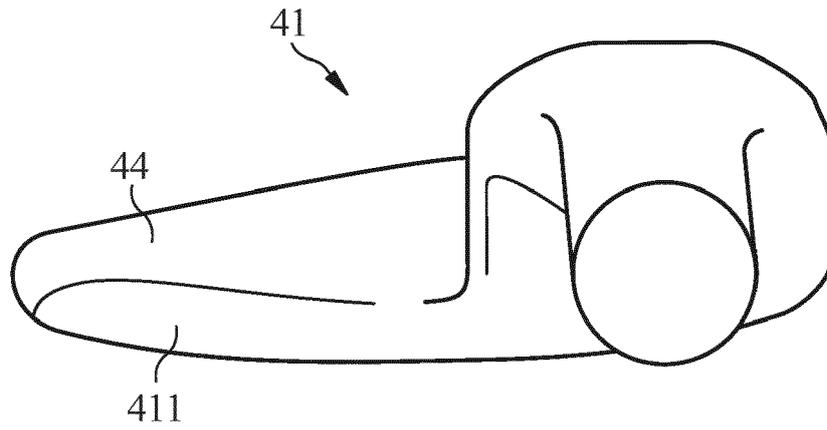


FIG4H

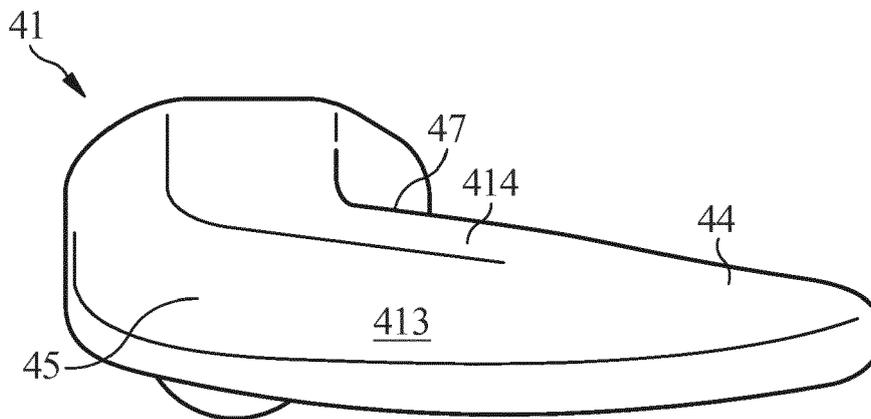
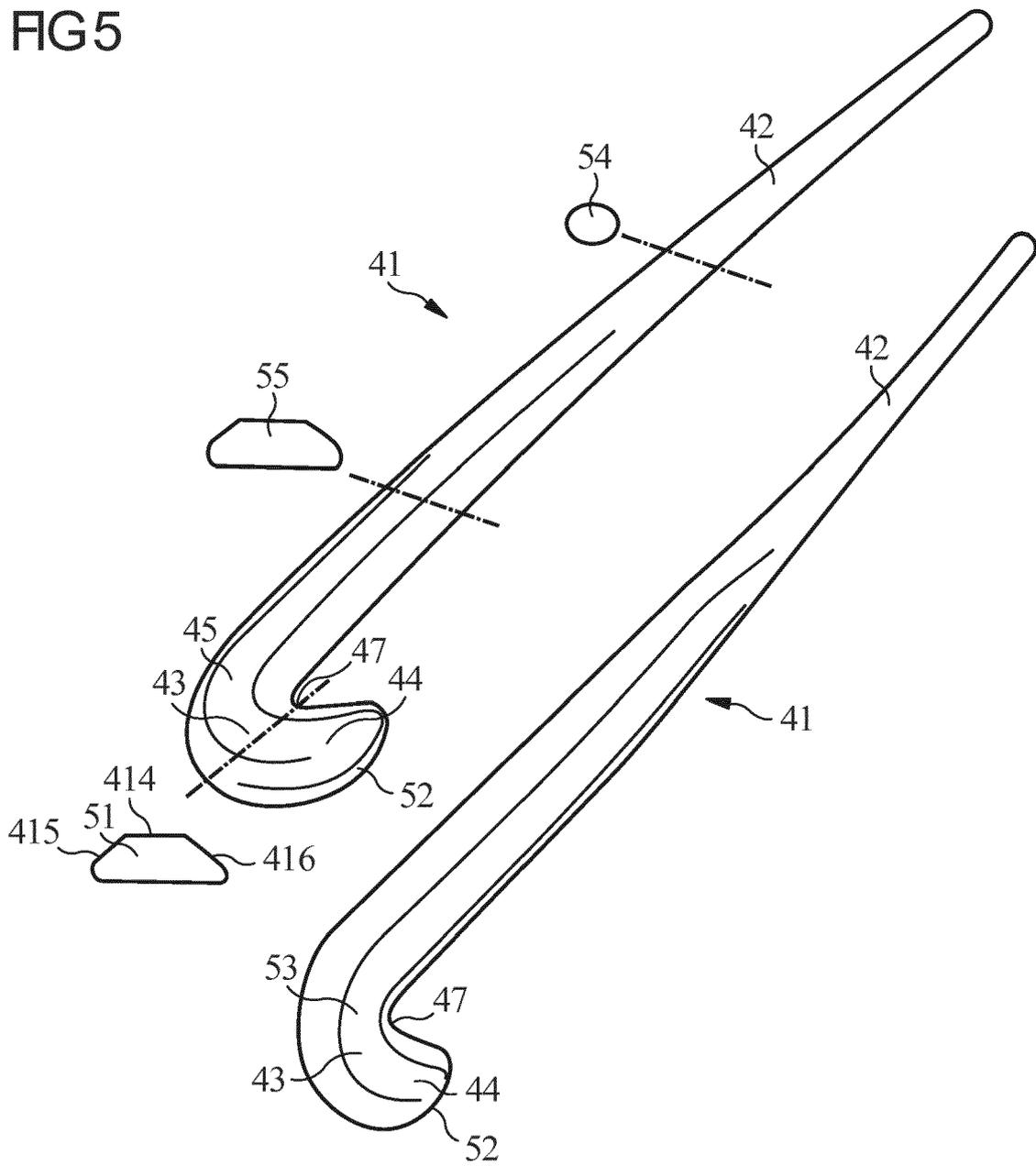


FIG 5



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 4512573 A [0003]
- US 6547683 A [0004]
- WO 9741929 A2 [0005]
- DE 19501899 A1 [0005]